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Preface

The Research Summit 2025, which took place from 16-18 July, was themed around "AI in Research". This forum aims to encourage important debates within the research community at the University of Aveiro, foster and increase collaboration, advance the state of the art and boost research efforts on campus. This year, discussions also focused on the use of AI in research. The objectives of the Research Summit 2025 were:

- To strengthen networking among faculty members, researchers and students on campus, and to develop sustainable research partnerships that make more efficient use of infrastructure and facilitate the sharing of knowledge and contacts.
- To reflect on the past and discuss the future of the institution.
- To showcase the research carried out at the Research Units.
- To provide PhD students with the opportunity to present their work and encourage them to develop their communication and networking skills.

Research Summit 2025 was organised into four stages. The first stage comprised two parallel activities: (i) one organised by and for PhD students, including a pre-course and the AIM Further event, which is a special occasion for discussing the life of PhD students; and (ii) one organized by the Research Support Office (GAI) for researchers, demonstrating research tools and opportunities at the University of Aveiro, as well as sharing the experience of researchers who have won projects from the European Research Council.

The second stage included a day on which the research units showcased their latest research and discussed future projects. The following two days featured presentations by PhD students, as well as first- and second-cycle students. Further training was provided to PhD students, and a 'Best Communication Award' was presented at the end of the Summit.

We thank the participants for their involvement.

This Book of Abstracts and Proceedings, of the Research Summit 2025, is the result of the remarkable contributions of young scientists and PhD students working on the topics of the Doctoral Programmes of the University of Aveiro. Although the Research Summit 2025 is aimed at young researchers, senior researchers also contributed to the conference's success by fostering discussion and collaboration on the research papers included in this book. The presence of senior scientists and PhD supervisors proved very beneficial for all participants, and it is hoped that young researchers and PhD students benefited from this experience.

The organisers hope that Research Summit 2025 provided a valuable opportunity for participants to exchange ideas and that it will be remembered as a milestone in the history of Forums at the University of Aveiro.

Artur M.S. Silva
A. Gil Andrade-Campos

Aveiro, Portugal, July 2025.

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Ambientes realidade virtual imersiva no ensino superior: uma reflexão sobredesign pedagógico sustentável

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Abstract. A Realidade Virtual Imersiva (iVR), através de capacetes de realidade virtual, tem vindo a afirmar-se como uma ferramenta pedagógica, no ensino superior, oferecendo experiências de aprendizagem realistas e interativas, difíceis de replicar por métodos tradicionais. A literatura destaca o potencial da iVR para promover a imersão, a sensação de presença e a aprendizagem experimental, apoiando na compreensão de conceitos abstratos e o desenvolvimento de competências procedimentais em áreas como ciência, engenharia e medicina.

Contudo, revisões sistemáticas recentes evidenciam limitações recorrentes, tais como: ausência de fundamentação teórica robusta no design das aplicações, escassa integração de teorias de aprendizagem, foco predominante em aspetos de usabilidade em detrimento da avaliação de resultados educativos, metodologias de avaliação pouco consistentes e amostras reduzidas. Estas limitações comprometem a generalização dos resultados e o impacto pedagógico da iVR.

Assim, este trabalho reflete sobre a necessidade de um design instrucional em iVR ancorado em teorias de aprendizagem, que permita o desenvolvimento de ambientes virtuais de forma sustentável que potenciem a aprendizagem e promovam resultados mensuráveis e transferíveis. Defende-se a adoção de metodologias de investigação mais rigorosas e multimodais, que combinem métricas quantitativas e qualitativas, e a definição de indicadores claros de eficácia pedagógica.

Combinar as potencialidades tecnológicas com os elementos do design instrucional e as estratégias pedagógicas, de forma alinhada e sustentada aos processos de aprendizagem, pretende consolidar a iVR como uma ferramenta educativa capaz de responder aos desafios do ensino superior e de formar profissionais mais preparados para a sua utilização no respetivo contexto.

Keywords: *Realidade Virtual Imersiva; Design Instrucional;*

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Diffusion model-based augmentation for skin lesion diagnosis

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Abstract. Diffusion models generate images with fine-grained control and are increasingly favoured for medical data augmentation (Ho et al., 2020). To prepare a robust pipeline for dermoscopic imagery, we began with well-studied benchmarks whose scale permits rapid iteration, like MNIST and CIFAR-10 datasets.
Skin-lesion classifiers often fail to generalize because training sets omit subtle color and texture variations. Existing augmentation methods, especially GAN-based frequently blur these fine cues or introduce artefacts, limiting their clinical value.
We propose leveraging the original Denoising Diffusion Probabilistic Model (DDPM) as a high-fidelity generator to create synthetic skin-lesion variants. Before moving to dermoscopy, we first validate a faithful DDPM implementation on widely studied benchmarks, more specifically MNIST and CIFAR-10 datasets, to ensure correct behaviour and to quantify baseline quality. Our implementation reproduces the original diffusion framework by Ho et al., without architectural modifications or training enhancements. We trained the model on two datasets: MNIST, as a greyscale sanity check, and CIFAR-10, as a three-channel, small-resolution proxy for dermoscopic imagery. Both experiments were conducted on a single GPU with standard data splits. Evaluation employed the Fréchet Inception Distance (FID) computed on equal numbers of real and synthetic images.
The MNIST model generated sharp digits with quality comparable to those in prior baseline diffusion studies, confirming implementation accuracy. On CIFAR-10, the unmodified DDPM achieved an FID of 8.0, demonstrating competitive quality without guidance or schedule shortcuts. These findings show that a strictly paper-accurate diffusion baseline already provides reliable, diverse samples, giving us the confidence to extend the approach to the ISIC skin-lesion archives in the next phase of the project.

Keywords: *Image Synthesis, Data Augmentation, Diffusion Models, Medical Imaging*

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Pathways of the dehydration/reconstruction of magnetic layered double hydroxides via in situ low-pressure diffraction study using synchrotron radiation

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Abstract. Layered double hydroxides (LDH) are composed of alternating positively charged mixed-metal MšMş hydroxide layers intercalated with anions and water molecules [1]. The metal cations in the layers are coordinated by six oxygen atoms, forming 2D structures. LDH structural stability arises mainly from electrostatic interactions between the metal hydroxide layers and the interlayer anions Ay. Water molecules surround these anions, screening their repulsion and contributing to hydrogen bonding between the layers. LDHs can undergo non-destructive changes in chemical composition via anion exchange, enabling important applications such as water treatment and drug delivery. In LDHs with Mš = Co, Ni, and/or Mş = Fe, Mn, Cr, magnetic properties like coercive field and ordering temperature depend on the cation content, their ratio, and the interlayer distance [2,3]. These features make magnetic LDHs promising candidates for magnetic stimuli-responsive materials, applicable in sensing, energy storage, and conversion. The interlayer distance can be tuned by intercalating anions of different sizes and charge. Another, less explored, approach is adjusting the amount of crystal water interlayers. Partial dehydration, induced by heating or reduced pressure, often leads to rearrangement of intercalated anions and a decrease in interlayer distance. In magnetic LDHs, this enhances dipole interactions between layers [3]. Typically, LDH crystal structure is characterized at ambient pressure, while magnetic and spectroscopic measurements are performed in vacuumsometimes high vacuum. This raises the question of how the layered structure evolves under low-pressure conditions and whether these changes are reversible.
Therefore, we proposed to study in situ the dehydration/reconstruction behavior of magnetic LDHs to identify the pressure ranges in which the structure remains layered and to describe how the interlayer distance changes with pressure, using diffraction of monochromatic synchrotron radiation.

Keywords: *Layered double hydroxide, Magnetic ordering, Interlayer distance*

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Evaluating brain injury outcomes in female subjects: a computational approach to accident reconstruction of fatal and non-fatal cases

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Abstract. Traumatic brain injury (TBI) is a leading cause of death and disability worldwide, affecting millions annually and contributing to long-term cognitive, behavioral, and physical impairments [1,2]. Despite growing recognition of sex-specific differences in neuroanatomy and TBI outcomes [3,4], most finite element head models (FEHMs) remain male-centric. To address this gap, this study employs the Female Finite Element Head Model (FeFEHM) [20] to assess brain injury outcomes in real-life accident reconstructions involving female subjects.

Two scenarios were simulated: a non-fatal e-scootervehicle collision [5] and a fatal work-related accident involving a falling prop [6]. Multibody dynamics analyses (V-SIM 6.0) were used to replicate both scenarios and extract translational and rotational head accelerations. These were applied to the FeFEHM using center of gravity (COG) boundary conditions in Abaqus/Explicit. Injury risk was assessed using maximum principal strain (MPS), von Mises stress, and pressure, focusing on critical regions such as the corpus callosum (CC) and pituitary gland (PG) due to their known roles in neurodegeneration and endocrine dysfunction [7,8,9].

In the e-scooter scenario, the 5th percentile model consistently showed higher MPS in the cerebellum, parietal sulci, and CC, indicating greater vulnerability to strain-related injuries. Conversely, the 95th percentile model exhibited higher stress and pressure in the PG. In the work accident, simulated results closely matched forensic findings, with elevated loads in the frontal and temporal lobes and severe mechanical failure in the PG. The use of a safety helmet significantly reduced both strain and stress across brain regions, especially in the CC and PG.

These results underscore the importance of sex and size-specific models in TBI research and support the integration of refined FEHMs in forensic analysis, injury prediction, and the design of protective equipment tailored to female anthropometry.

Keywords: *Accident reconstruction; Multibody; Traumatic brain injury; Finite Elements; Head model*

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And galen crossed the atlantic. the syncretism of luso-brazilian medical practices and knowledge (1500-1650).

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Abstract. By defining the sources different point of view, the issues of theory and practice transmission and the medical and medicinal consequences of bringing two civilizations in contact, this thesis seeks firstly to highlight the hybridization of Portuguese medical practices and knowledge, heirs of Galenism and Indigenous one, centered around the figure of the pajé (BOTELHO, 2004). The medical hybridization really developed in the 17th century in Brazil due to a shortage of European doctors and pharmacopoeia, which is perfectly emphasized by municipal and Jesuit registers and inventories. If in the 16th century the Portuguese seem to have dedicated themselves to the discovery and description of a ńnewż medicine, the context of the 17th century rather corresponds to a need to apply this ńnewż medicine (MARCGRAVE, 1648). What I call the tryptic business-conquest-religion is the best resume for the Luso-Brazilian medical case. Science and innovation were here at the service of colonization and evangelization. I think here about the Jesuits grabbing the local medical and medicinal knowledge in order to replace the societal pillar that pajés are and to, ultimately, acculturate indigenous people (PELLIER, 2023).
Im now focused on the diffusion of iatrochemistrical and iatromechanical conceptions and on the slow marginalization of the galenical pharmacopoeia on both sides of the Atlantic. Many Luso-Brazilian works from the beginning of the century cross humoral-miasma theory and chemical therapeutics. For example, while the Farmacopeia Lusitana of D. Caetano is mainly composed in 1704 of remedies heirs of the galenical and medieval tradition, the second edition of 1711 quotes mostly the works of Nicolas Lémery (Cours de chymie, 1675; Pharmacopée universelle, 1679) and Moyse Charas (Pharmacopée royale galénique et chimique, 1676). The study of those valuable sources is one of the reasons that pushed me to postpone the timeline of my thesis until 1711.

Keywords: *History of medicine, pharmacopoeias, 16th and 17th centuries, colonial Brazil, Jesuits.*

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Medicinal plants against acanthamoeba keratitis: anti-amoebic, anti-adhesive and cytocompatible effects of garcinia brasiliensis mart. and mangifera indica l. leaf extracts

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Abstract. Acanthamoeba keratitis (AK) is a vision-threatening infection primarily affecting contact lens users. Treatment remains a clinical challenge due to the pathogens ability to form highly resistant cysts and the toxicity of conventional therapies¹. As resistance and recurrence rates increase, plant-derived compounds offer a promising avenue for safer and more effective treatments². This study evaluated the anti-Acanthamoeba properties of Garcinia brasiliensis Mart. and Mangifera indica L. leaf extracts against A. polyphaga and A. castellanii trophozoites and cysts. Minimal inhibitory concentration (MIC) and minimal parasiticidal concentration (MPC) and scanning electron microscopy (SEM) were used to assess efficacy and morphological changes. Anti-adhesive properties were evaluated on polystyrene surfaces, against trophozoites of the Acanthamoeba strains (ATCC 30461 and ATCC 50739). The cytotoxicity of both plants was also determined on mammalian Vero cells (CCL-81-ATCC) using the MTT assay. G. brasiliensis inhibited trophozoites and cysts at 1 mg/mL and 32 mg/mL, respectively, whereas M. indica showed trophocidal activity at 2 mg/mL and cysticidal effects at 432 mg/mL depending on the strain. SEM revealed extensive morphological disruptions, including membrane damage and loss of acanthopodia. Both extracts significantly inhibited trophozoite adhesion, comparable to a commercial multipurpose solution. Cytotoxicity assays showed >80% Vero cell viability at sub-inhibitory concentrations, indicating favorable biocompatibility. These results support the potential of both plant species as novel therapeutic candidates against AK, combining direct amoebicidal activity, anti-adhesion properties, and low host-cell toxicity. Future research should explore targeted delivery systems to advance clinical translation³.

Keywords: *Acanthamoeba, Anti-adhesion, Garcinia brasiliensis Mart, Mangifera indica L, Medicinal plants*

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Metabolic reprogramming of plasmacytoid dendritic cells in the context of fibrosis associated with systemic sclerosis

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Abstract. Systemic Sclerosis (SSc) is a rare autoimmune disorder characterized by vascular injury, immune dysregulations and fibrosis.¹ The main tissues affected include the skin and lungs, significantly impacting quality of life and, in severe cases, leading to death.² Plasmacytoid dendritic cells (pDCs), known for their massive production of type I interferons (IFN-I), have been increasingly linked to the progression of fibrosis in SSc.³ Emerging evidence suggests that pDC metabolic activity may play a critical regulatory role in this process, yet the specific metabolic adaptations of pDCs and their contribution to fibrotic mechanisms remain poorly understood.^{3,4}
This project investigates pDC metabolism as a potential therapeutic target in SSc-associated fibrosis, a condition with currently limited and often ineffective treatment options. The study aims to: (i) Examine the impact of increased substrate stiffness on pDC metabolic activity; (ii) Characterize the metabolic profile of pDCs in response to immune complexes and SSc-relevant stimuli; (iii) Explore the metabolic crosstalk between pDCs and fibroblasts using co-culture systems; and (iv) Determine how metabolic reprogramming influences pDC effector functions in fibrotic environments. Through different biochemical techniques, namely LC-MS and NMR metabolomics, flow cytometry (SCENITH) and qPCR, this work aims to deepen our understanding of the interplay between the metabolic profile and fibrosis-related effector functions in pDCs in the context of SSc, promoting the advancement of novel therapeutic strategies for SSc and other fibrotic diseases.

Keywords: *Fibrosis, Systemic Sclerosis, Immunometabolomics, Mechanosensing*

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Solubility enhancement with ai designed hydrotropes

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Abstract. Nonpolar compounds have poor solubility in water, requiring solvents to be processed. However, these solvents are often toxic, flammable, non-biodegradable, and costly, making them environmentally unsustainable. Hydrotropes, due to their amphiphilic nature, can enhance the solubility of hydrophobic solutes in water, offering a safer and greener alternative for industries such as pharmaceuticals and agrochemicals. Their mechanism involves the interaction between hydrophobic regions of hydrotropes with solutes to prevent their aggregation and precipitation. Despite their potential, predicting solubility in hydrotropic systems remains challenging due to complex interactions and limited consistent data. Machine learning (ML), particularly Gaussian Processes (GPs), offers a promising approach to bypass extensive experimental work. GPs are well-suited for small datasets and have shown success in predicting physicochemical properties of organic compounds.
This study aims to develop a GP model to predict the aqueous solubility of syringic acid (SA), a phenolic compound with industrial relevance and low water solubility, in hydrotropic systems. Using experimental data from the literature, we demonstrated that GPs accurately predict syringic acid solubility in aqueous solutions, with hydrotropes belonging to different chemical families, such as alcohols, alkanediols and glycerol esters. The model identified the optimal hydrotrope concentration ranges to maximize solubility of SA, emphasizing the importance of hydrotrope composition and concentration. Additionally, we expanded the analysis using a broader dataset of compounds, without experimental solubility data available. Sigma Profiles were used as molecular descriptors since they contain chemical information, reflect electron density asymmetries and polarity distribution, which influences the molecular properties. They were obtained with DFT calculations and COSMO-RS. Trained only on this data, the GP model evaluated interactions between polar regions of hydrotropes and the solute, and predicted which compounds most effectively enhance solubility of SA in the greenest solvent, water.

Keywords: *Hydrotropy, Machine Learning, Green Chemistry, Artificial Intelligence*

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Gerontogeriatric competencies and ageism in newly graduated nurses: evidence from a doctoral research in gerontology and geriatrics

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Abstract. Population ageing presents significant challenges for nursing education, necessitating professionals equipped with robust gerontogeriatric competencies and devoid of age-related bias to ensure high-quality care for older adults. This doctoral research had two main objectives: (1) to validate a scale for assessing gerontogeriatric competencies, and (2) to examine the influence of sociodemographic and educational variables on ageism among newly graduated registered nurses (RNs) in Portugal. Two studies were conducted. The first was a methodological study to validate the Gerontogeriatric Competency Scale (GGC), comprising 64 items across nine domains. A total of 242 newly graduated RNs participated. Confirmatory factor analysis supported the construct validity of the scale, and internal consistency was excellent (Cronbachs = 0.992). Higher competency scores were significantly associated with the inclusion of gerontogeriatric content in nursing curricula, self-confidence, and satisfaction with the training received. The second study was a nationwide survey investigating the relationship between sociodemographic and educational variables and ageism among RNs. The findings indicated that clinical training focused primarily on basic care was associated with higher levels of hostile ageism (<em style="background-color: initial;»p = 0.038). Greater self-confidence in caring for older adults was unexpectedly linked to increased levels of benevolent ageism (<em style="background-color: initial;»p = 0.044). Moreover, communication difficulties, particularly with older adults experiencing cognitive impairments, were associated with elevated hostile ageism. These findings underscore the imperative to enhance gerontogeriatric content within undergraduate nursing education, not only to develop clinical competencies but also to address ageist attitudes that may compromise care. The results contribute to the design of more humanised and person-centred nursing curricula that promote equitable, respectful, and high-quality care for an ageing population.

Keywords: *Ageism; Gerontogeriatric competencies; Nursing education; Newly graduated nurses; Older adults*

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Reading or finding the right word: exploring generation in the animacy effect

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Abstract. People remember animate (e.g., lion) better than inanimate (e.g., chair) conceptsa finding known as the animacy effect. Evolutionary accounts predicted such advantage as animates are more relevant to ones survival/reproduction[1]. Although empirically robust, the effects underlying mechanisms remain unclear. The possibility that animates are inherently more distinctive (thus enhancing recall) was tested using a generation paradigm[2,3]whereby items actively generated (e.g., solving anagrams) are better remembered than passively processed ones (e.g., reading)and resorting to a processing-redundancy argument[4]. Sixty-one participants (Mage=20.36, SD=2.64) saw 32 words (half animate, half inanimate;[5]) presented either as anagrams or for reading. After a distractor task, participants completed a surprise free-recall task. A 2 (Encoding Condition:Anagram vs.Reading) X 2 (Animacy:Animate vs. Inanimate) repeated-measures ANOVA revealed significant main effects of Animacy and Condition, but no interaction. These findings suggest distinctiveness is unlikely to underly the animacy effect, contributing to our understanding of this robust memory phenomenon.

Keywords: *Animacy; Generation effect; Distinctiveness; Adaptive Memory*

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Geotechnical valorisation of byproducts from the forestry value chain in transport infrastructures: unpaved roads

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Abstract. The objective of this work is to add value to byproducts from the forest value chain for geotechnical applications in transport infrastructure. The work is innovative and aims to enhance the sustainability of these projects by promoting a circular economy [1], particularly for unpaved roads. It is proposed to reduce the amount of natural borrow materials typically used, replacing them, wholly or partially, with byproducts. To ensure adequate performance of these solutions, geosynthetic reinforcements will be employed. The materials will undergo geotechnical characterisation. The solutions to be analysed will be based on experimental data obtained from element tests (CBR and triaxial, both static and cyclic), small-scale physical tests [2], and full-scale tests (experimental section). This information will be complemented by numerical modelling using the finite element method, employing advanced constitutive models. Prototype solutions for unpaved forest roads using byproducts reinforced with geosynthetics will be proposed. Support tools for the design and management of forest roads will be developed.

Keywords: *Geotechnical valorisation; Industrial byproducts; Reinforcement with geosynthetics; Physical modeling; Case study; Numerical modeling*

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Integrated methodology to support the design and maintenance of unpaved forest roads

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Abstract. Unpaved forest roads are essential to support all forestry activities. Road construction typically relies on large quantities of natural resources, particularly good quality aggregates. This approach reflects short-term decision-making, favouring granular materials that are inexpensive to apply but demand frequent maintenance and generate considerable environmental impacts [1].

To address these issues, an integrated methodology is proposed to evaluate and compare both traditional and non-conventional construction solutions [2], such as those incorporating industrial by-products and geosynthetics, from technical, economic, and environmental perspectives. Industrial residues, which would otherwise be landfilled, offer a promising alternative to virgin materials, contributing to resource efficiency and circular economy practices while maintaining adequate bearing capacity for traffic loads. Geosynthetics [3], on the other hand, enhance the mechanical performance of road layers by improving load distribution, reducing materials used, and lowering emissions related to material production and transport.

Adopting a life cycle approach allows to compare various design alternatives and construction practices over time, supporting the development of informed recommendations for each stage in the road's life cycle.

Keywords: *Road construction; Sustainability; Life cycle assessment*

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Waste valorisation for geotechnical applications: feasibility of using meso to micro-scale rubber-based inclusions within a granular matrix

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Abstract. This project investigates the valorisation of rubber-based waste for geotechnical applications, aligning with circular economy principles. Common geotechnical solutions rely on non-renewable granular materials, contributing to environmental degradation. Alternatively, selected rubber-based wastes will be processed mechanically or transformed through additive manufacturing (AM) into inclusions to distribute within a granular matrix formed by natural soils/aggregates. Inclusions at different scales, relative to the granular matrix, will be analysed: meso-scale (sheet/grid) to micro-scale (granular or fibre shaped). The research will assess the mechanical and hydraulic performance of these waste-derived composites through element tests (e.g., California Bearing Ratio, CBR; triaxial) and small-scale physical tests. Statistical analyses will support the interpretation and validation of results, while constitutive models will be fitted or adapted to represent both the behaviour of inclusions (in-isolation) and of composite materials. The goal is to assess the technical feasibility of these materials for real-world geotechnical applications while promoting sustainability and resilience.

Keywords: *Waste valorisation, Geotechnical Engineering, Additive Manufacturing, rubber-based inclusions, Circular economy.*

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Real-time thermal characterization and monitoring of build heritage

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Abstract. The preservation of cultural heritage in museums requires careful control of the indoor environment, particularly temperature and relative humidity, as these factors can cause irreversible damage to highly sensitive materials. A specific case involves panel paintings, which are particularly vulnerable due to their composition of hygroscopic materials, that allow moisture transfer depending on environmental conditions [1-4].
This study focuses on the characterization and hygrothermal monitoring of indoor spaces, using the National Museum Grão Vasco as a case study. The museum houses national treasures such as paintings and sculptures, with the central goal of preserving its collection. In this context, the aim is to create a detailed digital twin of the Paço dos Três Escalões building, which will enable the tracking and monitoring of temperature and relative humidity around the various artworks, as well as assess how these parameters, among others, influence conservation strategies and actions over time.
The project is currently in an initial phase, including a literature review on the use of the digital twin tool for managing the hygrothermal environment of museum spaces. At the same time, some monitoring campaigns have already begun, namely the monitoring of hygrothermal conditions and the deformation of wooden panels of the painting São Pedro using fiber optic sensors based on Bragg gratings. Additionally, real-time data is being collected from both the outdoor environment via a weather station and from some interior compartments using IoT technology.

Keywords: *Digital twin; Wooden panel paintings; Relative humidity; Temperature; Fiber optic*

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Development of sustainable concrete incorporating perlite and end-of-life wind turbine waste for prefabricated constructions

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Abstract. This research proposes the development of a novel concrete incorporating natural perlite and end-of-life wind turbine waste as partial replacements for conventional aggregates. Perlite provides improved thermal insulation and weight reduction, while wind turbine waste offers enhanced durability potential and supports end-of-life material valorisation. Despite the individual potential of these materials, their combined influence on concrete properties remains unexplored.

The research includes comprehensive testing at both material and structural levels, evaluating various mix formulations using the selected materials individually and in combination. Formulations will be further explored for their applicability in prefabricated construction elements. The developed solutions will be numerical modelled with the objective of simulating long-term performance and potential degradation mechanisms. A Life Cycle Assessment will be also performed to quantify environmental impacts.

Several studies have explored alternative aggregates such as perlite [1] and glass fiber-reinforced polymer (GFRP) waste from wind turbine blades [2] as partial substitutes in concrete, aiming to enhance sustainability and reduce environmental burdens.

By incorporating waste-derived materials into concrete, the study provides environmentally responsible solution that addresses gaps in sustainable construction, particularly in reusing waste from renewable energy infrastructure.

Keywords: *Sustainable concrete Prefabricated elements RAW Perlite End-of-life wind turbine waste Microstructural analysis Circular economy*

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Dynamic wall panel with an innovative pcm-based heat exchange system

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Abstract. This research project proposal focus on the development of a dynamic wall panel compatible with modular construction, designed to improve thermal comfort and energy efficiency. The system will integrate innovative technology using phase change materials to benefit from the latent heat, that could increase the heat/cool exchanged during the ventilation process, allowing for the preconditioning (preheating or precooling) of fresh air. The first phase involves the optimisation of the dynamic wall elements through parametric design. Subsequently, an instrumentation plan will be developed to implement an automated system for monitoring both indoor and outdoor environment conditions. The system will incorporate a predictive intelligent controller based on neural networks to manage the real-time operation considering short-term weather forecast. The model will be trained using experimental and simulated data. This research enhances building energy efficiency and comfort, cuts carbon emissions, and promotes sustainable, smart construction, benefiting society and the environment.

Keywords: *Dynamic Wall Panel; Phase Change Materials (PCM); Thermal Comfort; Energy Efficiency; Modular Construction; Sustainable Building.*

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Healthier, comfortable and more productive learning spaces: a user-centered evaluation of indoor environmental quality

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Abstract. This research focuses on promoting improved learning environments by combining extended reality (XR) simulations with physiological monitoring and cognitive performance assessment. The project addresses key indoor environmental quality (IEQ) domains: thermal comfort, acoustics, lighting, air quality, and visual factors. These parameters will be explored both individually and in combination through immersive XR environments that are integrated with controlled physical conditions.
IEQ has a significant impact on health, comfort, and cognitive function, with poor environmental conditions contributing to symptoms associated with Sick Building Syndrome (SBS), reduced productivity, and absenteeism (Mansor et al., 2024; Subri et al., 2024). While thermal comfort is the most extensively studied domain, others such as acoustics, lighting, and visual perception remain comparatively underexplored (Roumi et al., 2022). Additionally, current methodologies often rely on subjective post-occupancy evaluations, which lack the ability to capture real-time physiological responses (Wang et al., 2021).
The project is currently in its initial phase, with the systematic literature review underway, XR scenario development in progress, and physiological monitoring tools being tested. This study aims to build a database of physiological responses using biometric tools such as EEG, ECG, eye-tracking, and galvanic skin response, in combination with cognitive testing. The results will support the development of a parametric virtual model and an intelligent design interface, allowing simulation and evaluation of IEQ scenarios. The multidisciplinary methodology bridges civil engineering, architecture, and health sciences, contributing to the development of evidence-based strategies for healthier and more effective educational spaces.

Keywords: *Healthy buildings; Learning spaces; Indoor Environmental Quality (IEQ); Extended Reality (XR); Well-being; User-Centred Design*

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Radiant floor systems incorporating phase change materials: innovative solutions for high performance buildings

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Abstract. People spend nearly 90% of their time indoors, which makes indoor thermal comfort an increasingly pressing challenge for contemporary society. In fact, indoor heating and cooling is still the core motive for energy consumption in buildings, contributing heavily to CO2</sub> emissions in the sector. Thermal energy storage systems are promising strategies to improve the overall performance of buildings, thermal and energy wise. The incorporation of Phase Change Materials (PCM) into radiant floors is gaining interest in the scientific literature, given the latent heat storage properties and high energy density characteristic of these materials, acting as thermal batteries in radiant floor systems (RFS). With the aim of improving indoor thermal comfort and energy efficiency of buildings, different RFS configurations incorporating PCMs were developed and studied. An experimental RFS specimen incorporating microencapsulated PCM within the mortar matrix embedding the water pipes was constructed. Additionally, a new RFS configuration was put forward, incorporating two macroencapsulated PCM solutions with different operating temperatures, selected to meet heating and cooling demands. The developed experimental PCM-RFS specimens were tested under different operating schedules. The thermal behaviour of the RFS specimen incorporating microencapsulated PCM revealed the benefits of adopting timer-controlled intermittent heating combining renewable solar energy and off-peak electricity tariffs. As for the RFS specimen incorporating two different macroencapsulated PCMs, the thermal performance highlighted the advantages of incorporating more than one PCM into the same RFS configuration, allowing an operation in cascade, extending thermal comfort temperatures. Currently, the ongoing stage of the research focuses on developing calibrated numerical simulation models of the studied PCM-RFS to analyse additional variables.

Keywords: *Phase change material; Radiant floor system; Thermal energy storage; Thermal performance;*

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Structural assessment of historical construction at multiple scales: application to the batalha monastery

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Abstract. Historic masonry structures present unique difficulties in structural analysis and assessment. In contrast to modern buildings, which tend to follow standardized "box"behaviour, historic masonry structures often show complex, non-linear responses due to factors such as masonry mass, joints weakness, discontinuity and nonlinearity, and the natural asymmetry of their structural de-sign. Understanding the dynamic, non-linear behaviour of these structures is crucial for their preservation [1]. Material non-linearity is another challenge when it comes to modelling historic masonry. The importance of incorporating material uncertainty in numerical models and its impact on structural performance is discussed in [2].
The choice of modelling approach depends on the type of results being sought. For two-dimensional (2D) models, thrust analysis can be a viable tool to estimate the stability of masonry arches. However, with 3D models, this method can lead to conservative results. For masonry arches, [3] has demonstrated that the ultimate load-bearing capacity can be predicted using the thrust zone method. Which refers to the application of thrust line analysis in addition to adding geometric constraints [4]. In 2D analysis, a direct correlation exists between thrust lines in masonry arches and their associated collapse mechanisms. Hinges are predicted to form at locations where the thrust line alternately contacts the intrados and extrados of the arch. However, such relationship has not yet been demonstrated for masonry vaults. [5]
At the current stage, the focus is on identifying failure mechanisms within a single frame of the church. Both 2D and 3D FEM models are being developed for the same section. First analysed as a 2D frame using plane stress theory, then as a 3D model that accounts for the thickness and the structural behaviour of the vaults. The analysis of these results will serve as a benchmark for the subsequent analysis of the complete church model

Keywords: *Structural Assessment; Box Behavior; Numerical Modelling; Collapse Mechanisms*

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A review on the fire safety of light timber frame structures

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Abstract. Timber construction is gaining momentum as a sustainable solution in the transition toward a low-carbon and energy-efficient built environment. Among the various timber technologies, modern multilayered light-frame systems stand out for their adaptability, ease of prefabrication, and suitability across diverse building types and heights. Despite these advantages, the inherent combustibility of wood and engineered wood products presents challenges in ensuring fire safety. This study highlights fire safety considerations specific to light timber frame systems. Emphasis is placed on passive fire protection strategies and the evolving regulatory landscape. As construction practices evolve to include more complex and innovative timber assemblies, the development and application of advanced modelling techniques, such as finite element analysis and multiscale simulations, are becoming essential. These tools enable accurate prediction of thermal and structural responses under fire exposure, supporting performance-based design and material innovation. Therefore, an overview of modelling approaches for simulating fire behaviour in timber structures is also explored, and research needs are highlighted.

Keywords: *timber construction, light frame systems, fire resistance, passive protection, advanced modelling*

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Muceque soils of icolo and bengo, angola

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Abstract. The surroundings of Centrality KK8800, Zango 5, Calumbo Municipality, Icolo e Bengo Province, Republic of Angola, are predominantly composed of red sands, similar to those found in Luanda, known locally as muceque soils [1]. Despite the existence of some studies on the collapsible behaviour of Luanda's red sands [1, 2, 3, 4, 5] and the damage caused to the foundations of buildings, roads, aerodromes and agricultural areas, with significant socio-economic consequences for the population [1, 3], we did not find any study on the collapse potential of the red sands that occur in the study area, around the KK 8800 Centrality, in Zango 5, in the Municipality of Calumbo, province of Icolo and Bengo, Republic of Angola. To help fill this gap, this work aims to briefly present the geological and geotechnical characteristics of the red sands in the vicinity of the KK8800 Centrality, Zango 5, Icolo and Bengo Province, as well as to present the first results of laboratory tests to assess the collapsibility of the red sands in the vicinity of the KK8800 Centrality, Zango 5, such as geotechnical characterisation, scanning electron microscopy (SEM), among others. The ongoing research is part of the preparation of the PhD Thesis in Civil Engineering entitled Study of ravines in collapsible soils of Luanda, Angola.

Keywords: *Red sands, collapsible soils, muceque soil, Zango 5, Angola*

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Acoustic performance of a biocomposite, developed from end-of-life wind turbine blades waste

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Abstract. With the rapid global growth of wind energy, wind turbines face a major challenge: the increasing generation of non-recyclable waste at the end of their operational life. In 2024, the world added 117 GW of new wind power capacity, reaching a total of 1,136 GW, with an annual growth rate of 11% [1]. Forecasts suggest that by 2050, Europe alone is expected to manage around 2.9 million tons of waste from end-of-life turbine blades [2]. However, current recycling methods struggle to preserve material properties or are economically unviable due to the complex composition of these materials, typically including glass fibers, carbon fibers, and resins. Therefore, there is an urgent need to develop sustainable and economically viable waste management solutions.

This study explores a potential solution by valorizing end-of-life wind turbine blade waste through the development of a biocomposite for acoustic insulation in buildings. The process involves mechanical recycling via cutting and shredding, followed by mixing the material with a bio-binder in proportions of 15%, 20%, and 25% to produce acoustic panels. The sound performance was evaluated using the impedance tube method, measuring the sound absorption coefficient (), normalized transmission loss (TLn), and noise reduction coefficient (NRC).

Results show that the biocomposite performs similarly to commercial materials like mineral wool. NRC values for BioGF15 and BioGF20 (0.440.45) are close to mineral wools 0.54, while BioGF25 shows slightly lower performance (0.38). Transmission loss values also surpass those of mineral wool in the 1004000 Hz range, highlighting the materials acoustic insulation potential. These findings confirm the technical viability of the so-obtained panels for use in the construction sector. Thus, the proposed solution represents a technically feasible and environmentally friendly approach for the reuse of end-of-life wind turbine blades waste, promoting sustainability and contributing to a circular economy.

Keywords: *nan*

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Correlating destructive and non-destructive tests for the assessment of timber in traditional portuguese buildings

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Abstract. Timber elements, whether structural or decorative, have always been an integral part of traditional Portuguese construction. An increasing number of companies are adopting timber as a structural material in new buildings due to its sustainability, aesthetic appeal, and versatility. Timber offers several advantages over traditional construction materials such as concrete and steel, including lower carbon emissions, faster construction times, and the ability to create warm and natural interiors.
In traditional construction, structural components such as roofs, floors, and internal walls are predominantly made of timber, many of which have survived to the present day while retaining their structural integrity. However, efforts to adapt buildings to modern safety and health standards often lead designers to opt for reinforced concrete or steel solutions. These typically result in the replacement of lighter timber structures - known for their superior thermal and acoustic performance - with heavier materials that increase the loads on masonry elements and may introduce pathologies that would otherwise not occur.
A major factor behind the widespread replacement of existing timber structures is the lack of knowledge regarding the mechanical properties of the wood used in traditional buildings.
This study aims to establish correlations between destructive and non-destructive testing methods, as well as between laboratory and in-situ tests, as a means of mechanically characterizing real timber structures. The methodology involves the correlation of bending tests, ultrasound, resistograph, and moisture content measurements performed on four types of new timber (Chestnut, Maritime Pine, Eucalyptus, and Douglas Fir), and one type of pine wood elements extracted from an old traditional adobe building in the Aveiro region.
The results demonstrate that it is possible to characterize the mechanical properties of existing timber using non-destructive testing methods, as evidenced by the correlations established through laboratory testing.

Keywords: *Timber structures, Non-destructive testing, Mechanical characterization, Traditional portuguese construction, Sustainability*

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Estudo paramétrico das características das ações do vento para o dimensionamento de torres tubulares metálicas segundo os eurocódigos

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Abstract. O comportamento estrutural de torres metálicas é maioritariamente influenciado pela ação do vento, sendo a principal carga externa atuante para esse tipo de estrutura. Por isso, compreender e entender como as diferentes condições do vento afetam esse tipo de estrutura é essencial.

A investigação realizada envolve modelação e análise de resultados obtidos na realização de um estudo paramétrico da influência de diferentes condições de vento sobre uma torre tubular metálica, dimensionada de acordo com os eurocódigos 1 e 3. O objetivo é observar e analisar a influência da variação de alguns parâmetros principais do vento e a resposta estrutural de uma torre padrão para essas alterações. Para tal, foram consideradas diferentes condições do vento, contempladas pelo eurocódigo 1, nomeadamente a zona de vento, rugosidade do terreno, categoria do terreno e orografia.

Foram analisados o comportamento global da estrutura, com foco na obtenção de alguns parâmetros da torre para as diferentes condições, como deslocamento no topo, deflexão e rácio máximo entre tensão atuante e tensão resistente. Também foram analisados as solicitações induzidas pelo vento para cada condição, para obtenção de alguns parâmetros da interação entre o vento e a estrutura, como o coeficiente estrutural (cscd), que tem em conta o efeito da não simultaneidade na ocorrência de pressões de pico sobre a superfície em conjunto com o efeito das vibrações da estrutura devidas à turbulência.

Os resultados permitem analisar o impacto das diferentes condições do vento para o dimensionamento de torres tubulares, contribuindo para o desenvolvimento e fomentação de diretrizes de projeto mais robustas para esse tipo de estrutura.

Keywords: *Ação do vento, torres tubulares, eurocódigos, estudo paramétrico, telecomunicações.*

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Investigating earthquake scenarios for portugal: the good, the bad and the most probable.

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Abstract. Earthquake scenarios play a crucial role in developing effective seismic risk mitigation strategies, including preparedness measures, emergency response plans, earthquake drills, and public awareness campaigns. These scenarios typically simulate the expected impacts of earthquakes such as building damage, fatalities, injuries, and economic losses based on historical events or hypothetical ruptures informed by current understanding of the tectonic environment. In this study, fault systems near continental Portugal were reviewed to identify those capable of generating damaging earthquakes. For each identified fault, a series of rupture scenarios were modeled, varying in magnitude and rupture dimensions. The impact of each rupture scenario on the residential, commercial, and industrial building stock was then assessed. Finally, the annual rate of occurrence for each rupture scenario was estimated to evaluate the probability of surpassing different levels of loss. These results provide valuable insights for disaster risk management and contribute to a better understanding of seismic risk in Portugal.

Keywords: *Earthquake scenarios, Portugal seismic risk, Rupture modeling, Loss estimation, Disaster risk management,*

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Bim-based grading and visualisation of corrosion in steel bridges

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Abstract. This article presents a structured method for grading and visualising corrosion in steel pedestrian bridges using Building Information Modelling (BIM). Traditional inspection approaches are often based on manual visual assessment, which can be subjective and difficult to compare over time. These limitations reduce the reliability, traceability, and usefulness of inspection data for long-term maintenance planning (Gkoumas et al., 2024). To address this issue, a five-level corrosion severity grading system was developed based on matched photographic observations from two field inspections carried out in February 2024 and April 2025. The grades were assigned using visible indicators such as surface rust, coating loss, flaking, and colour change.

Each grade was directly linked to the corresponding structural elements in a Revit-based BIM model using a Dynamo script. The script applied colour overrides to show the severity level across the bridge in a simple and visual way. This integration supports a digital representation of the bridge condition that is easier to understand, share, and update than traditional reports (Choi et al., 2023).

The workflow was tested using case studies from a 318-metre steel pedestrian bridge located in Aveiro, Portugal. The model enables engineers and decision-makers to identify areas with more advanced deterioration and monitor the development of corrosion over time (Zhao ; He, 2021). It also supports better inspection planning and maintenance prioritisation by offering a visual summary of structural condition. By combining structured visual assessment with digital modelling, the proposed approach enhances the quality and accessibility of bridge inspection data and contributes to more effective asset management strategies (Hattori et al., 2024).

Keywords: *visual inspection, corrosion grading, parametric modelling, steel bridge, bridge condition assessment*

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Earthquake impact assessment using a digital twin model

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Abstract. Recent advances in machine learning, detailed building inventories, and low-cost sensors have enabled the development of digital twinsvirtual replicas of physical structures or urban systems that can simulate real-time impact caused by earthquakes. A digital twin system is designed that integrates these components to transform earthquake impact assessment at the urban scale. Traditional methods often rely on broad assumptions, leading to significant uncertainty. In this approach, a machine learning model is first implemented to predict building damage as a function of the estimated earthquake shaking. Next, the potential of real-time data from sensors to reduce the bias and uncertainty in these initial predictions is tested. The system is applied to a detailed digital twin of the Alvalade parish in Lisbon, using advanced simulations to evaluate building responses. Various sensor placement strategies are also explored to minimize uncertainty. Results show that digital twins can significantly reduce bias in damage estimates, supporting more effective urban planning and disaster response.

Keywords: *Digital twin, Seismic risk, Loss assessment, Urban planning*

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Bond-slip modeling for reinforced concrete beam-column joints with plain reinforcement bars: insights from numerical validation

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Abstract. The previous seismic events indicated the vulnerability of old reinforced concrete (RC) structures against earthquakes due to the absence of seismic detailing and capacity design specifications in such buildings. In this context, beam-column joints (BCJ) of the existing RC structures built before the 1970s, have exhibited poor structural performance under earthquake scenarios. Among the governing factors contributing to such brittle failures in BCJs, the bond-slippage phenomenon occurring between longitudinal steel bars and concrete is one of the major contributing factors to such failures and requires further investigated since limited research has been conducted on the topic. In the present study, in the first section, the results of several pull-out tests are presented, and a numerical validation of different bond-slip models is established. Moreover, the corresponding bond-slip models have been employed for the numerical model of a beam-column joint equipped with plain rebar, and the results attained from each of the bond-slip models are illustrated and compared with the previous experimental results of the plain rebar specimen for both monotonic and cyclic loading scenarios. The reliability of the proposed bond-slip models is then discussed to provide further insight into the application of these models for better understanding the bond-slippage between concrete and plain reinforcement in the existing RC structures.

Keywords: *bondslip, concrete, beam-column, damage, BCJ*

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Exploring benthic and ichthyofaunaldiversity of black coral forests in santo antão, cabo verde

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Abstract. Mesophotic black coral forests (BCFs) are vital marine ecosystems that support diverse biological communities. Despite their ecological significance, BCFs remain understudied, particularly within the tropical Atlantic realm. The Cabo Verde archipelago, recognised as a marine biodiversity hotspot, offers a unique setting for exploration. This study presents the first assessment of benthic and ichthyofaunal diversity associated with BCFs along the coast of Santo Antão island, characterising community structure and spatial variability.

BCFs were dominated by three species: Antipathella wollastoni, Stichopathes luetkenii, and Tanacetipathes spinescens. Surveys were at eight locations, ranging from 30 to 68.7 meters depth. Image analyses revealed 42 benthic taxa and 52 confirmed fish species across all sites, with considerable spatial variation in community composition. Hanging Garden exhibited the highest benthic taxa richness (n = 25 taxa) and Shannons diversity (H'(loge) = 2.12), while Ponta do Tubarão showed the greatest ichthyofaunal richness (n = 36 taxa) and Janela the greatest Shannons diversity (H(loge) = 2.03). Benthic communities were characterised by high coverage of rhodoliths, other red algae, and encrusting sponges, while the endemic damselfish Chromis lubbocki was the dominant fish species across all sites. Diversity indices and rarefaction analyses indicated varying levels of community complexity, suggesting the influence of local environmental conditions and habitat characteristics.

This study provides the first comprehensive baseline of BCF-associated biodiversity in Cabo Verde, emphasizing their importance for marine conservation. The findings highlight the need for target conservation strategies to safeguard these vulnerable ecosystems.

Keywords: *Antipatharia, Biodiversity, Marine Animal Forests, Mesophotic Coral Ecosystems, Vulnerable Marine Ecosystems*

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Comprehensive analysis of water hyacinth biomass for use as an agricultural soil regenerator

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Abstract. This study aims to characterize water hyacinth (WH) biomass, an invasive aquatic species, to control its ecological and socioeconomic impacts and minimize removal costs, with the goal of repurposing it as an agricultural enhancer. This approach included: i) sample collection at six locations [Estação Experimental António Teixeira (EEAT), Praia de Coruche (PRAIA), Vila Valente (VV), São João de Loure (SJL), Estalagem da Pateira de Fermentelos (PF) and Observatório do Bico (Bico)], ii) plant biometric registry, iii) sugar and lipid quantification, iv) pigment extraction and quantification, v) characterization of aqueous extracts (conductivity and pH), vi) chemical composition through Fourier transform infrared spectroscopy (FTIR); and vii) metal and nutrient content. The biomass collected at different locations was found to correlate with environmental parameters. Plants at high agricultural activity-input locations had larger, smaller root extensions, while those at less urban locations had smaller, dense root systems, possibly due to nutrient availability. The water extracts of various biomasses showed distinct pH levels, ranging from 6.8 to 8.1, and conductivity values above 6 mS/cm. Acidic pH and low conductivity suggest less mineralized environments, while neutral pH and high conductivity suggest higher dissolved salt concentrations and potential contamination from other sources. FTIR analyses indicated the potential presence of aromatic compounds, like alcohols, N-H-containing amines or amides, or carboxylic acids. The aerial part of hyacinths (stalk and floater) has a higher nutrient content (phosphorus, calcium, potassium) than roots. But roots have higher metal content (aluminium, cadmium, arsenic) than floaters and leaves. This study explores the chemical and structural properties of WH in ecosystems, providing insights for bioindicators and sustainable solutions for controlling invasive species. It suggests WH's composition makes it a promising resource for agricultural applications, improving water retention and soil cover.

Keywords: *Eichhornia crassipes, circular economy, waste valorization, agricultural enhancer, sustainability*

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Salt marsh ecogeomorphic feedbacks at varying timescales

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Abstract. The successful restoration of salt marsh plant communities depends on both the availability of diaspores of target species and favourable abiotic conditions for seedling establishment and growth. Key pioneer species, such as Sporobolus maritimus (syn. Spartina maritima) and Sarcocornia perennis, play a critical role in the early stages of primary succession, with their establishment influenced by both biotic interactions and abiotic drivers. Their resistance and adaptation to changes in salinity and inundation periods, highlights the importance of local ecogeomorphic feedbacks and their influence on plant survival, zonation shifts, and long-term ecosystem adjustment. This study aims to comprehensively assess salt marsh pioneer colonization across varying spatial and temporal scales, from seed to mature habitats, while also considering the effects of climate change. Using the Ria Formosa and Ria de Aveiro coastal lagoons (Portugal) as natural laboratories, our specific objectives are: 1) to optimize halophyte propagation and restore salt marshes; 2) to provide a long-term track of colonization strategies using remote sensing and modelling techniques; 3) to identify state changes under climate change effects; and 4) integrate these findings into a conceptual model of salt marsh colonization and resilience. The results are innovative and contribute to knowledge on the predictive capacity for state changes in tidal marshes, covering various temporal scales, thereby making a significant contribution to scientific advancement. The multidisciplinary approach ensures that outcomes are transferable to other salt marsh systems globally, supporting the implementation of international biodiversity and climate commitments.

Keywords: *Halophyte restoration, Plant colonisation, Long-term strategies, Restoration, Remote sensing*

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Mine tailings valorizationsas as secondary raw materials for constructionmaterials: ceramics, supplementary cementitious materials & geopolymers

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Abstract. The extraction and processing of mineral ores generate significant amounts of waste, with mine tailings (MT) being one of the most environmentally challenging waste streams. Sulfidic tailings are particularly concerning due to their high potential to produce acid mine drainage (AMD), leading to serious environmental and health risks. Conventional tailings management strategies, such as dams and surface paste disposal (SPD), pose structural risks and long-term environmental liabilities.
This work is framed within the ERA-MIN3 TailingR32Green project, which aims to develop circular economy solutions for critical raw material recovery, mine tailing reuse, and geotechnical and environmental risk reduction. My PhD research explores the revalorization of mine tailings as alternative raw materials to produce sustainable construction materials by examining three potential valorization pathways: (a) MTs as alternative raw materials for ceramics, (b) MT as supplementary cementitious materials (SCMs) for low-clinker cements, and (c) MT as solid precursors in geopolymer formulations.
The research methodology includes the characterization of tailings of different origin and exploration sites based on their physical, mineralogical, and chemical properties. Sulfide content has been identified as a critical parameter, but preliminary results indicate that some of the MTs analyzed exhibit potential for partial substitution of clays in ceramic production and clinker in cement-based products, thus contributing to waste reduction and sustainable material production. Future work will focus on developing low-permeability geopolymer-based sealing layers to mitigate pollutant migration in inactive mining sites. This research aims to contribute to several sustainable development goals by transforming hazardous waste into value-added building materials, therefore aligned with responsible production and environmental protection principles.

Keywords: *Acid mine dreainage (AMD), supplementary cementitious materials (SCM), raw materials, geopolymers, ceramics.*

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Tourism and the environment: assessing sustainability through environmental indicators

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Abstract. Tourism is a major driver of global economic development [1], [2], contributing 3.3% to global Gross domestic product (GDP)and supporting over 330 million jobs in 2019 [3]. However, this economic growth often comes at the expense of environmental trade-offs. The tourism sector accounts for about 8% of global greenhouse gas emissions, primarily due to transportation [4]. Moreover, tourism activities can lead to habitat degradation, pollution, and increased strain on local water and energy resources [5].

This research aims to evaluate the environmental sustainability of tourism by analyzing the role and effectiveness of environmental indicators in assessing the ecological impact of tourism. The study employs a mixed-method approach that combines quantitative analysis of environmental indicators with qualitative case studies. The quantitative indicators include metrics such as air quality, carbon emissions, water consumption, waste generation, and biodiversity loss. The qualitative component explores challenges and best practices through case studies, focusing on policy implementation, stakeholder engagement, and community-led sustainability initiatives.

Preliminary findings indicate that, while tourism contributes significantly to local and national economies, it often exceeds environmental thresholds, especially in regions lacking sufficient regulation or infrastructure. However, several destinations are implementing innovative, data-driven strategies to alleviate these impacts, underscoring the importance of context-specific indicators aligned with the concepts of carrying capacity and limits of acceptable change.

This research highlights the necessity for strong environmental indicator monitoring systems to guide sustainable tourism policies. It also aids in promoting the United Nations Sustainable Development Goals (SDGs), especially SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life on Land), emphasizing tourisms potential not only as an economic driver but also as a force for environmental stewardship.

Keywords: *Sustainable Tourism; Regenerative Tourism; Environmental Indicators; Tourism Impact Assessment; Resilient Destinations; Tourism Planning and Management*

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Soil health and crop response to hermetia illucens frass from olive pomace: a greenhouse assessment

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Abstract. The agricultural sector increasingly seeks sustainable alternatives to conventional fertilizers while addressing the challenge of organic waste management. Olive pomace, a by-product of olive oil production, presents a valuable resource for valorisation within a circular bioeconomy. This study evaluates the application of Hermetia illucens Black Soldier Fly (BSF) frass, derived from olive pomace, as an entomofertilizer in crop production. A greenhouse experiment was conducted using cabbage plants (Brassica oleracea var. capitata), with varying application rates of BSF frass used as a soil amendment, as a potential replacement for mineral fertilizer or other organic fertilizers (e.g., manure). Five key parameters were assessed: crop productivity, decomposition rate (via the Tea Bag Index), microbial feeding activity (using Bait Lamina Strips), soil organism abundance (Macfadyen extractor), and plant physiological responses. Results showed that BSF frass had no negative effects on any measured parameter. It slightly increased crop productivity when compared to the conventional fertilizer, had no effect on decomposition rates, and stimulated microbial feeding activity. Notably, soil organism abundance increased significantly with higher frass application rates in comparison with the negative control and conventional fertilizer, indicating a positive impact on soil biological activity. No significant changes were observed in plant physiological parameters, confirming the agronomic safety of the frass. These findings validate previous laboratory results by Mostafaie et al. (2025) demonstrating the safety of olive pomace-based BSF frass for both target and non-target soil organisms under more realistic, field-relevant greenhouse conditions. The use of BSF frass derived from agro-industrial waste represents a viable, sustainable alternative or supplement to conventional fertilizers. It supports soil health, improves crop outcomes, and contributes to waste valorisation efforts aligned with the principles of a circular bioeconomy and sustainable agriculture.

Keywords: *Olive pomace, Hermetia illucens, Entomofertilizer, Circular bioeconomy, Waste valorisation, Sustainable agriculture*

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Conceptualizing nature-based solutions adoption in urban environments: insights from the doi theory

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Abstract. The implementation of Nature-Based Solutions (NBS) in urban areas presents significant potential for addressing challenges such as climate change, biodiversity loss, and urban resilience. However, their adoption is often limited by barriers that can be understood through the lens of the Diffusion of Innovation (DOI) theory (Rogers, 2003). DOI theory outlines the stages through which innovations are adopted within a social system, categorizing adopters into innovators, early adopters, early majority, late majority, and laggards. By examining these stages, we aim to understand the factors influencing the adoption of NBS, such as innovation characteristics, communication channels, time, and the social system involved.

Through DOI theory, we can relate NBS as innovations and point the stages for adoption: from initial awareness and understanding (knowledge stage) to forming attitudes and evaluations (persuasion stage), making decisions to adopt (decision stage), implementing NBS in urban settings (implementation stage), and reinforcing adoption decisions based on outcomes (confirmation stage). The theory's application can clarify factors influencing NBS adoption, including innovation characteristics (relative advantage, compatibility, complexity, trialability and observability of NBS), communication channels, and the socio-technical contexts of urban environments (López et al., 2023).

Empirical insights from previous studies, such as López-Maciel et al. (2025) on green roof adoption in Eindhoven, illustrate how a survey-based approach, the use of a tool like ADOPT (CSIRO, 2017; Kuehne et al., 2017) and DOI general concepts can reveal actual knowledge, information, and perceptions among potential adopters. Those findings underscore the importance of enhancing profit benefits, reducing risk, and improving ease and convenience of installation to significantly boost green roof adoption rates. These insights can be relevant for policymakers and urban planners aiming to promote sustainable urban development and urban resilience. Future research could explore alternative adoption frameworks to explore adoption dynamics of NBS complementary to the use of the DOI theory.

Keywords: *Nature-based solutions; Adoption; Diffusion; Innovations*

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Lights out: alan pushes the limits on zebrafish reproduction and offspring performance

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Abstract. Artificial light at night (ALAN) is increasingly recognized as a significant stressor in urban aquatic environments[1], often coinciding with chemical pollution. By interfering with natural circadian rhythms, ALAN has the potential to alter critical physiological functions such as hormonal balance, reproduction, and stress regulation in aquatic organisms[2]. Despite growing awareness, chronic and transgenerational consequences of exposure to ALAN remain inadequately explored. This study investigates how prolonged nocturnal exposure to low-intensity white light (0 or 10 lux) influences reproductive output and offspring development in zebrafish (Danio rerio). Adult fish were subjected to these light regimes for 10 weeks, with egg production and viability assessed biweekly. Following fertilization, embryos were monitored for 120 hours under matching light conditions to evaluate developmental parameters including survival, hatching, malformations, and heart rate at 48 hours post-fertilization. To further explore transgenerational effects, F1 offspring from both ALAN experimental treatments were acutely exposed to 3,4-dichloroaniline (3,4-DCA) across a concentration range (0.3756 mg/L) under control light conditions. Findings reveal that fish exposed to ALAN produced fewer and lower-quality eggs. Moreover, their offspring showed elevated heart rates and greater vulnerability to 3,4-DCA, particularly at 1.5 and 3 mg/L. These outcomes emphasize ALANs role in shaping reproductive success and chemical sensitivity across generations, reinforcing the need to incorporate light pollution into ecotoxicological frameworks aimed at safeguarding aquatic biodiversity.

Keywords: *Light Pollution; Danio rerio; Reproduction; Transgenerational Effects; Chemical Contaminants*

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Understanding the monetary value of water quality through ecosystem service valuation

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Abstract. Ecosystems are increasingly threatened by anthropic action in the forms of human interventions and climate change [1]. Estimating the monetary value of lost ecosystem services (ES) is an efficient way to transmit the importance of natural systems to stakeholders and policy makers who may lack an in-depth understanding of their function, services, and values. Despite this, ecosystem service valuation is a field of research where methodologies can be very diverse, and where not all topics are given the same amount of consideration [2]. This is especially the case when it comes to the study of water and its characteristics (chemical, ecological), which can have profound effects on ecosystem service provision, and are challenging to assess [3, 4]. The objective of this study was to compile and understand the different methodologies employed by the academic community to economically value water quality in the context of ecosystem services. To this end, a systematic literature review was performed using the SCOPUS database, expert-based review tools, and content analysis and synthesis. A total of 130 studies were selected for the review, and their content was analyzed with respect to their selected case studies, biomes, ecosystem services, and monetary valuation methods. It was found that water quality valuation literature is significantly diversified, but that there is ample space for further exploration. The geographical representation of study sites greatly favors regions in the northern hemisphere, and most studies assess ecosystem services related to water quality improvement functions or recreational values. In terms of valuation methodologies, stated preference approaches, as well as benefit transfer methods, are used most frequently. This research adds to the existing literature on the topic, and should prove useful to researchers and practitioners interested in assessing water quality in ecosystem service valuation studies.

Keywords: *Water quality, Ecosystem services, Monetary Valuation, Systematic review*

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Modeling the effects of dredging operations on salt transport in the aveiro lagoon

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Abstract. Estuarine environments have highly dynamic morphologies, driven by natural variability and human interventions. Both can lead to variations in tidal and salt propagation, potentially disrupting the ecological balance within these habitats. Changes in tidal flows and salt transport can be particularly concerning, as they may impact the development and survival of various species within the estuary. Known as one of the most important wetlands of Northern Portugal, Aveiro Lagoon is a prominent natural system with significant ecological value. Over the years, it has experienced several geomorphological changes, mostly resulting from dredging operations designed to improve channel navigability. In this framework, the principal objective of this work is to investigate how these changes have influenced the salinity structure and salt transport mechanisms in Aveiro Lagoon. A sophisticated open-source numerical model, DFlow-FM (Kernkamp, 2011), was implemented, calibrated and validated in a three-dimensional mode to study salt water intrusion under real bathymetric configurations. The model accurately simulates tidal dynamics and salt propagation in Aveiro Lagoon, with a coefficient of determination (r2) higher than 0.885 for water level and 0.665 for salinity. These results are consistent with those reported for similar systems (Conroy et. al., 2020), confirming that DFlow-FM is a feasible tool to study flow and transport phenomena in Aveiro Lagoon. Analysis of different scenarios during low freshwater inflow conditions revealed that the deepening of the lagoons branches shifted most isohalines further upstream. This trend was observed across all branches and over a wide range of tidal conditions covering the spring-neap cycle. The most significant change occurs in the São Jacinto branch, with an upstream shift of 8 km during spring tides when comparing pre-contemporary and contemporary conditions. Tidal dispersion emerged as a key mechanism driving salt transport, with its impact being most significant during spring tides.

Keywords: *Hydrodynamic model; Anthropogenic modifications; Complex bathymetry; Salt transport*

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Engineering biochar physicochemicalproperties: a pathway to enhance biogas production from anaerobic digestion ofindustrial waste

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Abstract. Modern societies face two converging challenges: the urgent need for sustainable energy sources and the escalating problem of waste management. Anaerobic digestion (AD) offers an environmentally sustainable method for transforming organic waste into biogas and nutrient-rich digestate for agricultural use. However, AD systems are prone to instability due to high organic loading, inhibitor accumulation, and poor buffering capacity. Recent research demonstrates that the addition of biochar (BC) can enhance methane production and process stability by improving microbial habitats, buffering pH, adsorbing inhibitors, and promoting direct interspecies electron transfer (Chiappero, Fiore, and Berruti 2022; Xiao et al. 2021). A growing number of studies have focused on modifying some specific properties of BC to effectively enhance the AD process and methane production (e.g., surface area, functional groups and redox properties) to further enhance the AD process.
Despite these advantages of AD, the effects of BC and its modifications on AD performance remain inconsistent, largely due to differences in feedstock, production methods, and substrate composition. Most recent reviews have focused on municipal and agricultural waste, with limited attention to industrial waste and liquid effluents, which present unique challenges and opportunities for BC applications. Meanwhile, industrial waste, generated in vast quantities due to population growth and manufacturing demands, represents underexplored substrates for AD (European Biogas Association. 2024). Given these findings, it is necessary to further investigate the underlying mechanisms by which both BC and modified BC influence AD systems, to clarify their respective roles and optimize their application. This review systematically compares the performance of biochar and modified biochar in the AD of diverse substrates, including industrial, municipal, and agricultural wastes. By analyzing the relationships between specific BC properties and methane yield across these systems, we aim to provide practical guidance for tailoring BC to optimize AD performance, particularly for challenging industrial waste streams.

Keywords: *engineered biochar, anaerobic digestion, methane production, biogas, physicochemical properties, industrial waste.*

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Designing buildings with a low carbon footprint

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Abstract. The building sector is a major contributor to global carbon emissions, with an increasing share attributed to embodied carbon, i.e emissions resulting from the extraction, production, transportation, and disposal of materials. As regulations evolve, particularly with the revised Energy Performance of Buildings Directive, starting in 2030 all new buildings in the European Union will be required to report whole-life carbon emissions. This makes carbon-aware design and development of buildings with a low carbon footprint (CF) essential (European Commission, 2024).

Designing low-carbon buildings requires the early integration of environmental data into the decision-making process. Environmental Product Declarations (EPD) are effective tools to support this (Santos et al., 2025). Standardized under ISO 14025 and EN 15804, EPDs provide verified information on the life cycle impacts of construction materials, enabling designers to compare materials and accurately quantify embodied CF (Santos et al., 2025).

To explore the potential of using EPDs as a source of environmental data for low-CF design decisions, a case study of a single-family residential building was performed. The buildings characteristics, including usable area and expected lifetime, were taken into account. By associating each building material with its corresponding EPD and scaling it to the actual quantities used in the project, the authors identified the main carbon contributors and investigated lower-impact alternatives. Replacing high-CF materials with lower-CF options using EPDs led to a nearly 40% reduction in the buildings embodied CF, demonstrating the effectiveness of EPDs as a data source in early design stages. This study shows how material selection, when guided by EPDs, becomes a strategic component of sustainable building design.

Therefore, the authors also highlighted that expanding EPD availability is essential to support accurate assessments and ensure regulatory compliance. Incorporating embodied carbon metrics through EPDs enables professionals to design buildings that move toward the goal of Zero Emission Buildings.

Keywords: *Embodied Carbon Footprint; Environmental Product Declaration; Low Carbon Buildings; EPBD; Biobased Materials; Decision-making.*

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Advanced materials (nanoagrochemicals):impacts of pollution and global warming on non-target species

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Abstract. Providing food via more sustainable methods, i.e., while minimizing environmental harm, remains a major challenge. Conventional pesticides enhance agricultural productivity but pose risks to human and environmental health. Additionally, current climate change scenarios create further challenges. Advanced materials (AdMa) like nanopesticides potentially provide safer and more environmentally sustainable alternatives, through increased effectiveness, controlled release, and more targeted delivery. There is an absence of environmental risk assessment regarding the impact of AdMa pollution and climate changes, in particular in important groups of soil-dwelling organisms.

This study assessed the ecotoxicological effects of Karate Zeonő, a commercial insecticide with reported nanofeatures, using the soil model invertebrate Enchytraeus crypticus (Oligochaeta) using LUFA 2.2 soil. This was compared to the active substance lambda-cyhalothrin. Temperature variations were tested beyond the standard 20žC: 16žC and 26žC. Testing covered a vast array of endpoints and life-stages, beyond the standard, from short- to long(er)-term exposures, including: avoidance behaviour(2 days), OECD standard reproduction test (28days): survival, reproduction, size, and its extension (56 days): total number organisms, and Full Life Cycle (FLC): hatching and juveniles' size (13 days), survival, reproduction and size (46 days). Toxicity of Karate Zeonő changed with the different temperatures. In terms of avoidance response, unlike at 20žC (for which no avoidance was observed), enchytraeids tend to avoid the spiked soil at both 16 and 26žC, with highest avoidance at 26žC. Regarding survival and reproduction (OECD standard plus extension, and FLC test), there was an overall increase in toxicity with temperature drop from 20 to 16žC, and a decrease in toxicity with heat, from 20 to 26žC. Both the temperature increase and decrease affected the environmental toxicity of Karate Zeonő in unpredictable ways; hence there is an urgent need to narrow the current information gap concerning the interplay between the three interlinked issues constituting the Triple Planetary Crisis.

Keywords: *climate change; Enchytraeus crypticus; nanopesticides; soil ecotoxicology; environmental risk assessment*

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Cytotoxicity of pm organic extracts from luanda: in vitro assessment using a549 and raw264.7 cell lines

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Abstract. Particulate matter (PM) pollution is a major public health concern. Given that PM10 can penetrate the respiratory system and PM2.5 can be inhaled deeply into the lungs, reaching the alveoli and potentially entering the bloodstream, understanding the mechanisms by which PM-bound constituents induce inflammation and contribute to respiratory illnesses is a priority [1]. Luanda, a highly polluted city, where the population is exposed to PM levels higher than the World Health Organisation's daily guidelines, faces a serious public health problem [2]. This study investigates the health impacts of airborne PM10 from Luanda, focusing on its cytotoxicity through in vitro assays. To investigate the toxic molecular and metabolic effects of PM10, two cell lines (A549 and RAW264.7) are used to assess toxicological endpoints, including cell viability, reactive oxygen species (ROS) production and cell cycle alterations. Results from A549 and RAW264.7 cell lines response suggest that PM10 organic extracts from Luanda induce cell-specific responses, with effects depending on the cell line. RAW264.7 displayed higher sensitivity to the extracts, resulting in much lower viability rates after shorter times of exposure when compared to the A549 cell line. In both cell lines, toxicity showed to be dose and time-dependent. Alterations in A549 cell cycle and ROS production were also registered after 72 hours of exposure to3 different concentrations, with the results varying between PM extracts, suggesting that PM composition also affects their toxicity. This research aims to provide a mechanistic understanding of PM toxicity in Luanda, offering insights to support public health interventions and pollution mitigation strategies.

Keywords: *Luanda; air quality; PM10; in vitro cytotoxicity*

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The use of endogenous insects to promote a more sustainable shrimp aquaculture

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Abstract. With the increase of global human population and food production under pressure, alternative and sustainable sources of animal protein are becoming increasingly important. Aquaculture has emerged as a promising alternative to traditional livestock, but its reliance on fish meal, a limited and costly resource, poses challenges (FAO, 2024). Insects have been proposed as a sustainable alternative for aquafeeds; however, terrestrial insects often lack essential omega-3 fatty acids and may pose ecological risks if introduced into non-native environments (Ameixa et al., 2020).

This work explores the use of native insects, particularly the seaweed fly Fucellia maritima, as a sustainable and nutritionally suitable ingredient for aquafeeds. Native to coastal ecosystems and recently recorded for the first time in continental Portugal, F. maritima was found to contain beneficial lipids, including essential fatty acids such as EPA and DHA, and showed low levels of pathogenic bacteria.

A rearing protocol was developed using native brown seaweed (Fucus sp.) as substrate. Nutritional trials assessed F. maritima reared on various marine and freshwater substrates, including invasive species. Results demonstrated that marine substrates supported larval development, while the freshwater macrophyte Eichhornia crassipes and the invasive brown seaweed Rugulopteryx okamurae negatively affected survival and nutritional quality. Flies reared on marine substrates showed promising protein and lipid profiles, including the presence of omega-3 fatty acids.

These findings highlight F. maritima as a promising candidate for aquafeed applications, offering a native and potentially more sustainable alternative to traditional feed ingredients. The study also emphasizes the value of bioprospecting native insect species to enhance the resilience and sustainability of the insect production industry.

Keywords: *Insect rearing, Sustainable aquaculture, PUFA, Insect meal, Aquafeeds*

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Development of strategies towards the sustainable degradation of e-waste: the role of penicillium brevicompactum for thebioprocessing of the plastic and metal fractions of a printed circuit board

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Abstract. Electronic waste (e-waste) represents the fastest-growing waste stream globally. Due to its complex composition, e-waste recycling/treatment often prioritizes valuable components (like metals) while neglecting hazardous fractions such as e-plastics, which underlines the need for integrated and sustainable approaches to address all e-waste components [1].
This study assessed the simultaneous biodegradation of the plastic fraction of a printed circuit board (1-2 mm plastic fragments, ~ 14.4 mg/vial) and the solubilization of the metal fraction (metal fragments, ~ 2.0 mg/vial) by the fungus Penicillium brevicompactum after 7 and 28 days, in liquid medium under stirring (120 rpm, 25 žC). Fungal biomass growth was not affected by the presence of PCB particles. Conversely, its presence increased PCB particle removal (up to 48% fewer particles and 58% reduction in mass) and induced chemical changes in PCB particles, consistent with oxidation and chain cleavage, indicated by changes in peaks attributed to C-H and C-C vibration bonds, as assessed through FTIR-ATR; additionally, metal solubilization, assessed by ICP-MS, increased compared to concurrent controls by the 28th day, particularly that of copper, up to 26 mg/L. These findings underline the promising role of fungi such as Penicillium brevicompactum in developing integrative and sustainable processes for the bioremediation and biomining of several different e-waste fractions.

Keywords: *E-waste; Microplastics; Metals; Microorganisms; Fungi*

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Impact of strain-specific lipid profiles on the digestibility and bioactive potential of chlorella lipids

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Abstract. Microalgae such as Chlorella vulgaris are gaining attention in food industry for their rich nutritional profile and high levels of bioactive lipids, particularly polyunsaturated fatty acids (PUFAs) like omega-3 and omega-6. Several edible strains, including C-Auto, C-Hetero, C-White, and C-Honey, are commercially available, each exhibiting distinct sensory traits and lipid profile (Maurício et al., 2023).

Lipids from C. vulgaris have shown anti-inflammatory, anti-obesity, and anti-diabetic properties (Ebrahimi-Mameghani et al., 2017), suggesting their potential in preventing metabolic syndrome (MetS), a multifactorial condition involving central obesity, dyslipidemia, hypertension, and insulin resistance (Jang ; Park, 2020; Yang et al., 2022). The growing prevalence of MetS, linked to diets rich in saturated and trans fats, poses a major public health challenge.

However, the digestibility and bioavailability of lipids from these strains remain poorly understood and may vary between strains due to differences in lipid composition.

This study aimed to assess the digestibility of lipids from four C. vulgaris strains using an in vitro intestinal digestion model (INFOGEST protocol). Lipid profiles before and after digestion were analyzed using liquid chromatographymass spectrometry (LC-MS) to assess the impact of digestion on different lipid classes. Additionally, digested and non-digested lipid extracts were tested in zebrafish larvae to evaluate their anti-obesity and anti-diabetic potential.

Digestion reduced polar diacyl lipids (phospholipids, glycolipids, and betaine lipids) and increased lysolipids. Lipids from C-Honey, rich in triglycerides, showed poor digestibility, likely due to low polar lipid content and consequent limited micelle formation.

Only digested C-Auto reduced lipid accumulation in zebrafish larvae. Nevertheless, C-Auto, C-Honey, and C-White (digested and non-digested), and digested C-Hetero, suppressed appetite, suggesting anti-obesity potential. No anti-diabetic effects were observed.

These findings emphasize the role of strain-specific lipid profiles in influencing digestion, bioaccessibility, and metabolic outcomes, supporting the strategic selecting of C. vulgaris strains for nutritional and therapeutic applications.

Keywords: *Omega-3 lipids; digestion; lipidomics; bioactivity*

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Testing the performance of ysu, myj, mynn, acm2, temf and qnse-emdf parameterisation schemes under 6 different weather types in portugal

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Abstract. This study investigates the performance of 6 Planetary Boundary Layer (PBL) parameterisation schemes within the WRF model across Portugal, using a classification of 6 representative Weather Types (WTs). The results reveal that optimal PBL scheme performance strongly depends on the prevailing weather type and local terrain features. Local schemes such as MYJ and QNSE typically excel under stable conditions (e.g., NAO+, Blocking). Conversely, under unstable regimes like NAO and the Summer Pattern, non-local (e.g., YSU) and hybrid schemes (e.g., ACM2, TEMF) deliver superior results. This research highlights the importance of tailoring PBL scheme selection not only to the synoptic regime but also to the geographic context. The findings support a dual recommendation: in large-domain simulations, parameterisations should align with dominant WTs, while in localised studiessuch as wind energy assessmentsscheme selection must be site-specific and empirically validated

Keywords: *nan*

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Application of saprophytic fungi for remediation of pesticide-contaminated soil

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Abstract. Pesticides are extensively used to enhance agricultural productivity but may contaminate soil and nearby environments. Thus, bioremediation could be a useful tool for reducing the pesticides environmental impact. Saprophytic fungi have been reported to have the potential for bioremediation because of their degradation capabilities and ease of survival in various environments. To test this possibility, a growth inhibition test was conducted in liquid growth media by exposing two saprophytic fungi, Pleurotus sajor-caju and Trametes versicolor, to tebuconazole (TEB). Four TEB treatments were tested (0.02, 0.2, 2, and 20 mg TEB/L), solvent, and negative control. The assay lasted for 20 days. Rot fungi dry weight was determined, in addition to the determination of alkaline and acid phosphatase activity and ammonia/nitrogen production in fungal exudates.
In both rot fungi species, biomass dry weight at 0.02 and 0.2 mg TEB/L was similar to that of the control, decreasing sharply at 2 mg TEB/L compared to the control. Acid phosphatase activity in both species was higher in the presence of TEB than that in the control, although these values were similar to those of the solvent control. Alkaline phosphatase in P. sajor-caju (20 mg/L) was lower than that in the other treatments. In T. versicolor, there were no major variations between the treatments. Ammonia-nitrogen levels were higher at 2 and 20 mg/L than at 0.02 and 0.2 mg/L in P. sajor-caju compared to the negative control. Notably, in both species, the enzymatic activities of the two phosphatases and ammonia-nitrogen production in treatments with TEB were always very similar to those of the solvent control, suggesting a possible solvent effect. Additional studies are needed to isolate this factor and to confirm the TEB degradation capacity of saprophytic fungi.

Keywords: *Bioremediation, saprophytic fungi, tebuconazole, pesticides, fungicides*

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The potential use of water hyacinth biomass as agricultural enhancer, evaluating its response to two hydric regimes

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Abstract. Water hyacinth (Eichhornia crassipes, WH) is a highly invasive aquatic plant that presents environmental and management challenges worldwide, including in Portugal (CAB International, 2023; Wei Feng et al., 2016). This study evaluated the direct incorporation of E. crassipes biomass into soil over 120 days and its effects on soil properties, enzymatic activity, and plant productivity, aiming to support its sustainable repurposing (Masto et al., 2023). Two amendment levels (2.5% and 5%) were tested under two water regimes (45% and 22.5% water holding capacity, WHC), using tomato (Solanum lycopersicum) as a bioindicator. Results showed that E. crassipes significantly modified soil conditions, lowering pH and increasing electrical conductivity (EC), particularly at 5% incorporation under well-watered conditions (up to 3000 ţS/cm) (Farias et al., 2013). Soil relative humidity increased in all WH treatments due to the plants hydrophilic properties (Bordoloi et al., 2018). Notably, acid phosphatase activity rose sharply by day 60 in WH-amended soils, especially under 45% WHC, indicating enhanced microbial activity and phosphorus cycling stimulated by organic matter decomposition (Eivazi ; Tabatabai, 1977). Despite reduced germination rates in the 5% WH treatment, surviving seedlings displayed increased shoot biomass, suggesting compensatory growth. In contrast, the 2.5% WH treatment balanced improvements in soil moisture and enzymatic activity without inducing salinity or acidity stress. These findings demonstrate that low-rate WH biomass incorporation can improve soil quality and support early plant development while contributing to circular economy goals and green waste management.

Keywords: *Eichhornia crassipes, waste valorization, agricultural enhancer, productivity, sustainability*

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through national funds for financing the project Ph-uel: meeting agricultural soil Phosphorous reqUirements by biomass transformation and valorization of the invasivE water hyacinth: a circuLar system-thinking (Ref. 2023.15713.PEX) and to the LabEx DRIIHMDispositif de Recherche Interdisciplinaire sur les Interactions Hommes-Milieux and OHMIObservatoire Hommes-Millieux International Estarreja for funding the project CHOICES - When CHallenges met Opportunities: water hyaCinth invasions as potential agricultural enhancers for EStarreja's agricultural soils.

High-resolution projections of non-exhaust road transport emissions in portugal usingbig data and climate scenarios

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Abstract. Air pollution, along with climate change, poses the biggest environmental threat to human health, causing seven million premature deaths worldwide each year (WHO, 2021). Accurate atmospheric emission inventories are critical in estimating air quality levels, especially under climate change scenarios (Sa et al., 2015). In recent years, the massive collection of big data has emerged as a solution to improve atmospheric emissions inventories (Apte et al., 2017; Xu et al., 2020).
This study develops a high-resolution road-transport emissions inventory for mainland Portugal for 2050 and 2100 (under the Shared Socioeconomic Pathway three (SSP3-7.0) scenario), following the 2050 Carbon Neutrality Roadmaps shift to an exclusively electric (EV) or hydrogen-powered (H2V) fleet, estimating only non-exhaust particulate emissions (PM and PM.). To achieve this, the historical number of vehicles by category and municipality (20202022) acquired by the BigAir project (Lopes et al., 2024) and vehicle stock projections from the Portuguese Environmental Agency (APA) were used to project the fleet for 2050. Historic Portuguese road network and average traffic volumes were used for spatial allocation. A machine learning (ML) algorithm incorporating socioeconomic proxy data (Gross Domestic Product (GDP), population, and urbanization) according to the Shared Socioeconomic Pathway 3 (SSP3-7.0) in a 1Œ1km2 grid is used to forecast the traffic flows on each road segment for 2050 and 2100. To generate hourly traffic profiles, another ML algorithm integrating socioeconomic proxy data, CMIP6 climate projections, daily activity profiles, and calendar variables was used. Non-exhaust emission factors (EF) from the EMEP guidebook were used and adapted to estimate the EFs of EVs and H2V for different categories (EMEP, 2024). Hourly emissions of PM and PM. account for road abrasion, brake wear, and resuspension, with WRF-derived precipitation inhibiting particulate resuspension. The results give insights for future air quality management, exposure and climate mitigation in Portugals long-term mobility transition.

Keywords: *SSP scenarios, machine-learning, non-exhaust emissions, mobility*

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Comfort nexus: an integrated spatialdynamics framework for urban environmental comfort complexity

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Abstract. Understanding the spatial dynamics of Urban Environmental Comfort Complexity (UECC) is essential for guiding sustainable and inclusive urban planning and design.

In this study, we present a novel, datadriven framework that integrates highresolution air quality measurements (Khan et al., 2019), outdoor soundscape assessments (Zhao et al., 2022), and socioeconomic components (Hashemi et al., 2023) to generate spatially explicit insights into UECC in Lisbon, Portugal. A systematic literature review underpins an adapted conceptual framework (Chen ; Ng, 2012), through which we define interdependent subsystems and identify key components. Each dataset undergoes rigorous accuracy assessment, cleaning, and geostatistical interpolation to produce validated Air Quality and Soundscape Comfort Indices alongside a Socioeconomic Comfort Cluster Matrix. These validated components feed into a system dynamics model that captures feedback within and between subsystems, enabling the construction of scenariobased simulations of policy interventions. Our spatial clustering approach uncovers nuanced patterns of environmental risk and resilience, thereby informing targeted strategies for pollution mitigation, noise management, and the promotion of social equity (Polyakova ; Tsurik, 2019).

By weaving together geostatistical validation, spatial analysis, and dynamic modeling, this research provides a robust and transferable blueprint for evidence-based decision-making in urban environments. The development of a scalable conceptual framework for flexible urban planning goals, the shift from a thermal view to a multidimensional perspective of UECC, and a better understanding between diverse subsystems are some of the major accomplishments. These goals are in line with Goal 3 (Good Health and Well-Being) and Goal 11 (Sustainable Cities and Communities) of the Sustainable Development Agenda. This approach offers a tangible route toward comfortable and resilient urban futures.

Keywords: *Urban Environmental Comfort Complexity, Spatial Analysis, Air Quality, Soundscape Assessment, System Dynamics Modeling*

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Simulating wildfire smoke in sardinia

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Abstract. Wildfires are a considerable source of atmospheric air pollutants, such as particulate matter, nitrogen oxides, and carbon monoxide. These components affect human health when present at high concentrations. Evidence for this can be found in increased hospital admissions after strong wildfire smoke events over cities or in health parameters of firefighters.
Sardinia is a Mediterranean island with several fire-prone ecosystems that are yearly affected by strong wildfires. To aid in preparedness and firefighting activities, the Sardinian Wildfire System (SWS), a wildfire-spread forecast system, was developed by the Italian Consiglio Nazionale delle Ricerche (CNR). The SWS uses the Rothermel equations for estimating several fire-spread parameters like fireline intensity and rate of spread. However, the effects of high concentrations of air pollutants due to wildfires are not yet forecasted in Sardinia.
The main purpose of this work was to link the DISPERFIRE, a lagrangean smoke forecast model developed at the University of Aveiro, with the SWS fire spread model, and to apply them to a particular wildfire in Sardinia. For this, the outputs of SWS simulations done for the case-study of a wildfire in Orrì in 2019 were analyzed and processed. Then the fire-progression results were used by the smoke dispersion model DISPERFIRE, which was run for different species. The dispersion results were then analyzed.
The fire-spread simulations provided the isochrones of fire-spread, while with the smoke simulations it was possible to obtain not only the emissions but also the concentrations of smoke at several heights . The average CO and NOx concentrations for the period of the event are presented, along with their total emissions within the wildfire perimeter. The simulation shows dangerous concentrations over the beaches that were located downwind of the fire, with certain regions evidencing more than 10 mg/m3 of CO.

Keywords: *widlfires, air quality, smoke, atmosphere, modeling*

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Valorizing seaweeds as source of value-added bioactive lipids for cosmeceutical innovation

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Abstract. Inflammatory skin diseases (ISD) are associated with pro-inflammatory cytokines and oxidative stress. Therapies and pharmacological agents frequently demonstrate limited therapeutic efficacy and may be associated with substantial side effects. Lipids and their derivatives are essential for skin health. Thus, cosmetics rely on lipid ingredients that can help preserve skin composition while mitigating the effects of external stressors such as radiation, microbes, or oxidant agents. Seaweeds are long been used in skin care, treatment and cosmetic applications. Seaweeds polar lipids, such as phospholipids and glycolipids bearing omega-3 polyunsaturated fatty acids (PUFA), exhibit antimicrobial, antioxidant and anti-inflammatory activities, highlighting their potential as novel therapeutic agents for the prevention or treatment ISD. Additionally, red seaweeds, such as Gelidium corneum and Gracilaria gracilis are used for agar extraction, which processes industrial waste. Although typically discarded as waste, this by-product has significant potential as a source of high-value lipids. Although highly promising, it remains largely unexplored. In this sense, the characterization and bioprospecting of the lipid profile of Gelidium corneum biomass and its industrial residue, after agar extraction, showed that both biomass and residue contained several classes of phospholipids, glycolipids, and sphingolipids, although a decrease of glycolipids was observed in G. corneum residue. A total of 9 fatty acids (FAs) were identified in biomass and residue. Arachidonic acid (FA 20:4 n-6) and eicosapentaenoic acid (FA 20:5 n-3) were more abundant in biomass, while linoleic acid (FA 18:2 n-6) was predominantly found in residue. In addition, both lipid extracts showed antioxidant activity and anti-inflammatory activity using in chemico assays. Therefore, these results support the valorization of biomass and industrially processed waste of G. corneum as sources of high-value ingredients, particularly bioactive lipids bearing omega-3 PUFA, for use in cosmetics and cosmeceuticals, fostering the development of innovative products.

Keywords: *Macroalgae; Bioactive lipids; Bioprospecting; Skin diseases; Lipidomics*

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"sustainable adsorption of reactive brilliant blue dye using ground eggshells: an eco-friendly approach to wastewater treatment"

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Abstract. Abstract
The contamination of textile industry wastewater due to synthetic dyes poses significant environmental risks, necessitating sustainable remediation strategies (Silva et al., 2019; Mahmood et al., 2005). This study explores the adsorption of Reactive Brilliant Blue dye using ground eggshells as a biosorbent. Through Response Surface Methodology (RSM) and Box-Behnken Design, optimal conditions were identified for maximum adsorption efficiency (Turyasingura et al., 2023). Key experimental variable-sincluding dye concentration, sorbent mass, ionic strength, and exposure timewere analyzed to understand their influence on removal rates.
Results demonstrated a strong correlation between ionic strength and dye adsorption, with higher salinity improving adsorption efficiency, especially during the first 24 hours (Giannakoudakis et al., 2016). Removal rates stabilized after 72 hours, highlighting the effectiveness of eggshells as a low-cost and environmentally friendly sorbent solution (Murcia-Salvador et al., 2020; Manyatshe ; Sibali, 2025). Statistical analyses confirmed that eggshells provide a promising alternative for wastewater treatment (Kousha et al., 2015).
This research reinforces the potential of agro-industrial residues in pollution mitigation, aligning with circular economy principles (Portugal-Pereira et al., 2015; Dey et al., 2021). The experimental design allowed predictive modeling, facilitating process optimization and scalability (Gorbounov et al., 2022). Future studies should focus on adsorption stability, desorption mechanisms, and practical implementation in real-world wastewater systems (Al-Zawahreh et al., 2022; Sunjuk et al., 2019).
These findings highlight the viability of eggshells for treating textile effluents and pave the way for innovative strategies in sustainable water remediation.

Keywords: *nan*

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Cfd assessment of atmospheric turbulence for fso link planning and optimization

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Abstract. Understanding the complexity of atmospheric flow in urban environments is key for various applications. In this work, which intends to support the development of reliable Free-Space Optical (FSO) Links, this analysis is particularly more relevant due to the direct consequence of air movement and temperature gradients on the signal quality.
To this end, a Computational Fluid Dynamics (CFD) model, OpenFOAM, was employed to simulate the microscale atmospheric conditions over the University of Aveiro campus. The simulations assess wind flow, thermal stratification, and turbulence generation, providing a detailed characterisation of the local atmospheric environment. Simulated outputs are post-processed to derive the refractive index structure parameter (C_nˆ2) which characterises optical turbulence in the atmosphere.
Due to the high sensitivity of FSO to atmospheric disturbances, an informed path selection is critical.
This turbulence data and refractive index are used to map and assess the optimal FSO link path that minimizes turbulence-induced signal degradation and supports the planning of Free-Space Optical (FSO) communication links. These systems are increasingly deployed in urban areas due to their high bandwidth and rapid deployment potential.
Moreover, this research aligns with the United Nations' Sustainable Development Goals (SDGs) by promoting sustainable and efficient communication solutions in urban environments. It contributes to the development of smarter, more resilient urban communication infrastructureaddressing SDG 9 (Industry, Innovation and Infrastructure), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action).

Keywords: *Free-Space Optical Communication; Computational Fluid Dynamics; Optical Turbulence*

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Insectvvalue - insects as tools for transforming valueless waste into valuable resources.

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Abstract. As the global population grows, so does the demand for sustainable food sources. Edible insects are emerging as a promising alternative to conventional livestock due to their low resource requirements and unique ability to convert organic waste into valuable products like protein, fat, and frass (a nutrient-rich fertilizer).
The house cricket (Acheta domesticus), one of four insect species approved for human consumption in the EU under Regulation (EU) 2015/2283, is especially promising. Crickets have a high protein content (2025%), an efficient feed conversion ratio (2.1), and can consume a wide range of feed types, including agricultural byproducts and post-consumer waste. However, this feeding flexibility raises concerns about food safety, as crickets may internalize harmful substances like metals, pesticides, or polycyclic aromatic hydrocarbons (PAHs). Despite their advantages, A. domesticus remains underrepresented in ecotoxicological literature, and the effects of such contaminants on their biology are not well understood. The quality and safety of insect frass also vary depending on species and feed, requiring further evaluation.
This project adopts a holistic ecotoxicological approach to assess the potential of A. domesticus in sustainable food and waste systems. Part one involves three tasks: (1) determining cricket tolerance to contaminants via sensitivity assays (using cypermethrin as a positive control); (2) assessing physiological (reproduction, growth, frass) and biochemical (genotoxicity, neurotoxicity, detoxification) endpoints; and (3) investigating bioaccumulation kinetics. Part two evaluates frass as a fertilizer using soil ecotoxicological assays with species like Folsomia candida and Enchytraeus crypticus, plant tests, and soil enzymatic activity assessments. Longer-term studies will examine plant safety. Part three ensures effective dissemination of results to scientific, industrial, and public audiences.
This work addresses key knowledge gaps in waste-based insect rearing and supports safe, sustainable, and circular agricultural systems.

Keywords: *Edible Insects; Acheta domesticus; Circularity; Frass; Sustainability; Zero Waste*

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From mother to embryo: lipid investment and utilization during homarus gammarus embryogenesis

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Abstract. The European lobster (<em style="background-color: initial;»Homarus gammarus) is a commercially valuable decapod crustacean, historically exploited by coastal fisheries and recently produced in aquaculture (Lund, 2025). While its life cycle is well documented, the biochemical processes underlying embryonic development remain poorly understood (Hinchcliffe et al., 2021). Lipids are essential biomolecules in early ontogeny, serving as the main energy source throughout embryogenesis (Rosa et al., 2005). Understanding lipid dynamics is essential for identifying the energy substrates used across developmental stages, which can guide nutritional strategies for broodstock and larvae (Gonçalves et al., 2022). This study characterized lipidomic changes during H. gammarus embryogenesis at two stages: Stage I (newly extruded embryos), reflecting maternal lipid provisioning, and Stage III (pre-hatching), representing metabolic consumption. Lipid profiling was conducted using C18 reverse-phase liquid chromatography coupled with tandem mass spectrometry (C18-RP-LC-MS ; MS/MS). Total lipid content decreased during embryogenesis, from 227.6 ś 44.8 ţg mgź dry weight (DW) at Stage I to 106.1 ś 22.2 ţg mgź DW at Stage III. Glycerophospholipids (GP) were the predominant lipid class, dropping from 91.2 ś 8.4 ţg mgź DW to 58.6 ś 10.9 ţg mgź DW. Triacylglycerols (TAG) declined from 29.8 ś 2.0 to 10.8 ś 1.6 ţg mgź DW. A total of 381 molecular lipid species were identified in the major lipid categories, including GP, glycerolipids (GL), sphingolipids (SP), sterols, and fatty acyls. Among the 191 GP species identified, phosphatidylcholines (PC) and phosphatidylethanolamines (PE) were the most diverse, comprising 113 and 43 species, respectively. TAG was the second most diverse lipid class (128 species) and along with diacylglycerols, were largely catabolized during development. Changes in SP and GP composition contributed to stage-specific lipidomic signatures. These findings highlight the role of lipid metabolism during <em style="background-color: initial;»H. gammarus embryogenesis and provide valuable insight for refining broodstock nutrition and larval performance in aquaculture.

Keywords: *European lobster; Embryogenesis; Glycerophospholipids; Triacylglycerols; Lipidomics; Mass spectrometry (LC-MS/MS)*

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Assessing the impact of bisphenol a on estuarine benthic invertebrates

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Abstract. Plastic additives (PAs), such as Bisphenol A (BPA), are emerging contaminants of concern due to their endocrine-disrupting properties and widespread presence in coastal environments(Corrales et al., 2015). These compounds can affect key benthic organisms, including polychaetes and bivalves, which play essential roles in sediment bioturbation and nutrient cycling(Fossi Tankoua et al., 2013; Moreira et al., 2005). This study assessed the effects of BPA exposure on two estuarine invertebrates: the polychaete Hediste diversicolor, an active predator and bioturbator, and the bivalve Scrobicularia plana, a sediment-dwelling deposit feeder.

Organisms were collected from Ria de Aveiro lagoon and exposed to BPA(0, 1.7, 5, 15, 45, 135 ţg/kg)under controlled conditions for 7 and 14 days. Biomarkers of antioxidant response (Superoxide dismutase(SOD) and Glutathione S-transferases(GSTs)), metabolism (Glycogen(GLY)), neurotoxicity (Acetylcholinesterase(AChE)), and oxidative damage (Lipid peroxidation(LPO)) were analyzed.

Responses varied by species and exposure duration. H. diversicolor showed increased SOD and GSTs activity after 14 days, while S. plana had higher antioxidant defenses at 7 days at lower concentrations. LPO levels were higher in H. diversicolor after 14 days (except at 45 ţg/kg), while in S. plana, LPO increased after 7 days at lower concentrations. GLY levels increased in both species after 7 days at intermediate concentrations and after 14 days at 135 ţg/kg. AChE activity increased at lower concentrations (1.7 and 5 ţg/kg) in S. plana (7 days), and at highest concentrations (15, 45, 135 ţg/kg) in H. diversicolor(14 days).

These results suggest that behavioral and trophic traits may influence species susceptibility, with the active predator H. diversicolor showing delayed but stronger responses to oxidative stress, while the deposit-feeder S. plana responded earlier at lower BPA concentrations.The contrasting responses highlight differing resilience levels and underline potential population-level impacts.BPA exposure may compromise the functional diversity of estuarine benthic communities, with implications for ecosystem balance and long-term sustainability.

Keywords: *Hediste diversicolor; Scrobicularia plana; Plastic Additives; Biochemical Markers*

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Autoendolithic coral symbionts are sheltered from uv radiation

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Abstract. Dinoflagellates of the family Symbiodiniaceae have been extensively studied for their role as symbionts of corals and other marine hosts, while their independent life is relatively less described. Free-living symbiodiniaceans inhabit both planktonic and benthic habitats in tropical reefs, where they are subject to extreme environmental conditions, above all to intense UV radiation (UVR). Benthic symbiodiniaceans can encase themselves inside aragonite deposits, called symbiolites, as viable endolithic cells (1): this process, discovered in culture, also happens naturally, and endolithic populations of Symbiodiniaceae were detected ubiquitously in tropical reef sands. As both symbiolites and sand grains absorb UVR, this phenomenon could represent an adaptation to the extreme light conditions of the reef (1). A better understanding of this endolithic lifestyle could be crucial to predict the future of free-living Symbiodiniaceae, especially in the context of the ongoing ocean acidification.
To test the hypothesis that symbiolites and reef sand grains partially protect endolithic symbiodiniaceans from the damages of UVR, firstly the internal light microenvironment of sand grains was measured under different UVR and photosynthetically active radiation (PAR). Scalar irradiance microsensors were inserted through holes acid-etched into the mineral, and their fluorescence, reflectance and scattering properties were characterized (2). This experiment led to a clearer understanding of the light conditions experienced by endolithic microalgae: incident radiation is strongly scattered by the mineral, creating a highly heterogeneous microenvironment, and UVR is partially converted to PAR through mineral fluorescence.
The photobiology of endolithic symbiodiniaceans was also characterized, using a microscopy imaging-PAM fluorometer modified to allow the simultaneous exposure to UVR and recording of photosynthetic performance in individual cells (3). Endolithic and non-endolithic cells were compared before, during and after UVR exposure, and the results strongly suggest that endolithic cells experience lower levels of photodamage, validating the hypothesis that symbiolites protect symbiodiniaceans from UV stress.

Keywords: *Symbiodiniaceae, Photobiology, UV radiation, Microenvironments*

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Large-scale evaluation of wrf-chem model and dry deposition schemes during a saharan dust event over the iberian peninsula

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Abstract. Atmospheric aerosols significantly influence global and regional climate by interacting with radiation and clouds. These interactions are difficult to represent in atmospheric chemistry models due to their dependence on aerosols' physicochemical properties associated with emission, aging, and removal processes. In the absence of precipitation, large uncertainties arise from the parameterization of aerosol dry deposition (ADD), which could lead to inaccuracies in the estimation of aerosol interactions.

In this study, the WRF-Chem model is validated and used to assess (1) its sensitivity to emission sources representation and to four ADD schemes coupled with the MOSAIC 8-bin aerosol model (i.e., ADD1 based on Binkowski and Shankar, 1995; ADD1E based on Emerson et al., 2020; ADD101 based on Peters and Eiden, 1992; and ADD301 based on Zhang et al., 2001); and (2) the impact of ADD on size-resolved dust aerosol load, number, and optical depth during a Saharan dust event that affected the Iberian Peninsula between 7 and August 12, 2010.

Results show that all simulation experiments using the different ADD schemes captured the observed horizontal and vertical aerosol layer's structure, concentration, and optical properties, with model skill significantly improving when all emission sources were considered. However, this agreement with observations results from compensating effects of different aerosol size distributions in all ADD schemes. In fact, only ADD1 could reproduce the observed coarse mode shape, with ADD1E and ADD301 largely overestimating the aerosol volume in the 510 m diameter range. Bin-dependent relative differences in dust number, load, and AOD show that of all the schemes, ADD1 offers the best balance between predicted aerosol number in 0.0781.25 m range and aerosol load in 5.010.0 m diameter range during the dust event.

Keywords: *nan*

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Effects of light pollution on the freshwater crustacean daphnia magna

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Abstract. Light pollution or Artificial Light at Night (ALAN) is an anthropogenic emergent pollutant that can negatively affect biodiversity. ALAN, especially blue light spectrum emissions, is known to alter the synthesis of melatonin, a hormone which conveys information about light/dark cycles and disrupts circadian rhythm patterns of many organisms, affecting their physiology, behavior, and life-history.
This work aimed to overcome knowledge gaps concerning the freshwater cladoceran Daphnia magnas responses to ALAN. In laboratory, we exposed D. magna to two ecologically relevant levels of ALAN (1 and 10 lux) emitted from white LED lights. To validate melatonins mediatory role, assays with exogenous melatonin added to the medium were also performed to hinder possible ALAN-induced endocrine disruption. Effects of ALAN on D. magna were assessed using fitness-related traits. Results show that exposure to ALAN reduced D. magnas reproductive output and longevity. ALAN also induced higher respiration rates and caused feeding inhibition. In treatments with added melatonin, these effects were ameliorated, indicating the hormones key role linking ALAN to biological fitness. Our results bring novel data and a physiological perspective to the growing body of research on the ecological effects of light pollution in urban aquatic ecosystems.

Keywords: *urbanization, artificial light at night, melatonin, physiology*

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Novel halophyte suaeda maritima cultivated in aquaponics as a sustainable source of health and functional lipids

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Abstract. Halophytes are increasingly recognized for their resilience and nutritional value, particularly as a source of essential fatty acids (FA) and bioactive compounds, positioning them as promising candidates for functional food development (Aschemann-Witzel et al., 2021; Grigore, 2021). While Salicornia has been extensively studied, other genera such as Suaeda remain underexplored, despite their traditional uses in food in some Mediterranean countries. To address this gap, in this study we analysed the detailed lipid composition of Suaeda maritima collected from wild, as well as cultivated under aquaponic conditions, as a sustainable, soil-free agricultural method known to enhance biomass production. The fresh biomass of S. maritima increased significantly, from 0.74g to 216mg after 8-weeks of aquaponic cultivation., Demonstrating the compatibility of this halophyte with aquaponic cultivation, while also promoting increased biomass production. Lipid analysis was done using GC-MS for FA profiling, and LC-MS for the total lipidome identification. Also, lipid quality indexes were calculated as a proxy to estimate the add value for diet and disease prevention. Results gathered in this work allowed the identification of 17 FA in both samples, including the essential FA 18:2n-6 and FA 18:3n-3, but interestingly with higher content in aquaponic samples. A total of 443 lipid species were identified, comprising glycerophospholipids, glycolipids, acylglycerols, sphingolipids, sterol lipids, and prenol lipids. Aquaponic cultivation resulted in higher levels of PUFA-rich glycolipids, previously report with anti-inflammatory activities, while wild plants had higher levels of sphingolipids and acylglycerols. Glycerophospholipid composition varied between 4- and 8-weeks of cultivation, with aquaponic plants exhibiting a more stable lipid profile. This study was the first to profile in detail the lipidome of S. maritima under controlled aquaponic conditions, highlighting this species as a promising source of nutritional and bioactive lipids useful for be used in healthy and sustainable diets.

Keywords: *Lipidomics; halophytes; aquaponic cultivation; lipids; forgotten crops*

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Ultrasound-driven recovery and nanoencapsulation of functional lipids from algae

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Abstract. Ultrasound technology has gained increasing attention in the food sector due to its ability to enhance extraction efficiency and enable the development of stable nanoscale delivery systems.
In this study, ultrasound-assisted extraction (UAE) using food-grade ethyl acetate was employed to obtain a lipid-rich extract from a commercial algae blend (Algaessencel'). For comparison, conventional solvent extraction (CSE) was also performed. The extract was characterized in terms of total lipid content, esterified fatty acid (FA) profile, and antioxidant properties. The algal extract was subsequently encapsulated in nanoemulsions (NE), for potential food enrichment applications. Two formulations containing 1% and 5% (w/w) lipid phase were developed using medium-chain triglyceride (MTC) oil as carrier and rhamnolipids (0.05 wt%) as a biosurfactant. The emulsification process included pre-homogenization followed by high-energy ultrasonication. NE physicochemical properties, including particle size (PS), polydispersity index (PDI), and zeta potential, were assessed. Additionally, the in vitro digestibility of omega-3 FAs, specifically C18:3 n-3, was evaluated through the standardized INFOGEST protocol.
UAE with ethyl acetate significantly improved lipid yield (2.3ś0.1 vs. 1.8ś0.2 g/100g biomass) and extract purity (100% vs. 93.9%) compared to CSE. The major FAs identified were C18:1 n-9 (47.4ś1.8mg/g), C18:3 n-3 (37.5ś3.2mg/g), and C18:2 n-6 (29.6ś3.0mg/g). Moreover, the extract demonstrated antioxidant activity, highlighting its potential as a bioactive ingredient. NE1% and NE5% showed small initial PS of 137.4ś2.2nm and 187.2ś0.6nm, low PDI of 0.205ś0.026 and 0.201ś0.015, and zeta potentials of 70.9ś3.2mV and 66.9ś1.9mV, respectively, indicating good colloidal stability. The in vitro digestion studies showed that NE5% led to the highest extent of C18:3 n-3 hydrolysis (77.2ś1.1%), followed by NE1% (73.2ś1.5%), and lastly the non-emulsified algal extract mixed with MCT oil (62.4ś5.0%).
This work highlights the versatility of ultrasound as a green extraction technique and as a structuring nanocarrier tool, offering an integrated strategy to valorize marine bioresources in functional food systems.

Keywords: *ultrasounds; algal lipids; nanoemulsions; omega-3 fatty acids; in vitro lipid digestion*

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Structural features and atherogenic effects of water-soluble organic matter from atmospheric fine air particulates

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Abstract. Fine atmospheric particulate matter (PM2.5</sub>) exposure has been recognized as a key public health issue (Murray et al., 2020). Exposure to atmospheric aerosols has been linked with increased risks of lung cancer, cardiovascular, and respiratory diseases. Additionally, PM exposure affects the immune system, leading to an increased susceptibility to infections and pathogens, or exacerbating other pre-existent lung diseases (Buonfiglio et al., 2020). The main mechanisms through which PM2.5</sub> can affect the human health, include the induction of reactive oxygen species (ROS), the triggering or exacerbation of an inflammatory response, and PM-related direct cytotoxicity (Feng et al., 2016). These toxicological effects have been associated with PM2.5</sub> concentration, and its composition in metals and solvent-extractable organics (MohseniBandpi et al., 2017). Although not receiving much attention, the ubiquitous water-soluble organic matter (WSOM) present in PM2.5</sub> has also been linked with these adverse effects (Almeida et al., 2024). Hence, it is important to better understand the impacts of this PM2.5</sub> fraction.
In this work, the structural features of daytime and nighttime PM2.5</sub> WSOM samples from an urban and a rural location were analysed by means of advanced 2D spectroscopic techniques. Additionally, the potential pro-atherogenic effects were addressed using a human monocytic cell line (THP-1). The impact of these WSOM samples on the transcription of inflammatory mediators and expression of co-stimulatory and adhesion molecules on human monocytes was evaluated through qPCR and flow cytometry, respectively. Overall, these carbonaceous fractions enhance the activation of THP-1 monocytes and increase their expression of adhesion molecules. This cellular response suggests that certain WSOM components may promote atherosclerotic plaque formation, potentially increasing the risk of cardiovascular diseases.

Keywords: *Water-soluble organic aerosols; Cytotoxicity; Structural characterization; Atherosclerosis; Monocyte activation.*

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Source identification of pm in a school environment: insights from mass closure and factor analysis

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Abstract. Air pollution represents the main environmental risk to children's health in Europe [1]. However, scientific research has historically prioritized the study of outdoor air, relegating indoor spaces to a secondary role, although these have begun to receive increasing attention in the 21st century [2]. While some research has explored the contribution of particulate matter (PM) sources in Portuguese schools (e.g., [3,4]), few studies have focused on identifying both indoor and outdoor sources in educational settings. This study aims to provide a full snapshot of air quality related to PM10 in a school located near the industrial complex of Estarreja. The daily PM10 concentrations at the school ranged from 9.85 to 51.7 ţg mş over two seasons. A good correlation was observed between the PM10 concentration measured by gravimetry and the concentration calculated through mass closure, where the total sum of the major compounds accounted for more than 80% of the PM10 mass indoors and 67% outdoors. Organic matter was the largest component of indoor PM10 in both seasons, accounting for ~39% of the mass, while the total element concentration increased in spring, with higher levels in classrooms (1.43 times) and schoolyard (1.82 times) compared to winter. Six sources were identified in both the classrooms and the schoolyard. Common sources identified at both sites included combustion (from biomass burning, traffic emissions, and industrial activities), resuspended mineral dust, sea salt, and traffic-related emissions. Additionally, the resuspension of indoor dust, particularly associated with calcium, was a distinct contributor to PM concentrations in classrooms. In contrast, secondary aerosol formation played a more prominent role in the schoolyard.

Keywords: *nan*

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A hydrodynamic model linked to watershed models for hydrodynamic simulations in a sensible hypersaline coastal lagoon affected by extreme weather events

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Abstract. Reproduction of hydrodynamic processes in complex coastal lagoons requires development and calibration of coupled numerical model implementations, accurate even in extreme scenarios (Gonenc ; Wolflin, 2004). To achieve that, a wide variety of parameters are needed to validate the model (Warner et al., 2005). This study aimed to develop and validate a hydrodynamic model for a hypersaline coastal lagoon located in the southeastern coast of Spain, the Mar Menor as well as to simulate the stratification occurring after a flash flood event. For validation, the model was linked to atmospheric (Calvo Sánchez et al., 2018), groundwater (Alcolea et al., 2019), and watershed models (Francés et al., 2007). Then, the vertical dimension of the model was validated against data collected during the event. For a more precise estimation of the parameters during the extreme event, freshwater runoff was estimated based on the sea level increase that occurred inside the lagoon due to the flash flood instead of the watershed model. The model revealed great accuracy in representing the lagoons dynamics in normal conditions. The flash flood scenario resulted in a stratification event that lasted for more than 1 month, with two independent layers flowing in opposite directions, and a stable interface layer between. This was responsible for marine species mass mortality, due to nutrient input from the watershed that resulted in an algal bloom and anoxic conditions below 3-4 meters deep, while calm winds inhibited vertical mixing and water renewal (Ruiz, J. M. et al., 2020). Although underestimation of water temperature stratification occurred, the model accurately reproduced the vertical structure of the lagoon. Coupling of the hydrodynamic implementation with a biogeochemical model should address the water temperature issue by reproducing water turbidity due to the algal bloom and flood debris, which reduces light penetration into the water column (Kjerfve, 1994).

Keywords: *Mar Menor; Hydrodynamic model; cut-off low; groundwater; watershed; stratification*

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Valuation of deep-sea ecosystem services an overview

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Abstract. Global change and direct anthropogenic activities are impacting and shaping most marine habitats at a global scale. The deep-sea is the largest ecosystem on the planet and provides countless ecosystem services that are essential for life on Earth. However, due to its environmental complexity, and to the high costs associated with exploring, conserving or restoring it, very few studies on deep-sea ecosystem valuation have been conducted to date. The main objective of this work, integrated into the REDRESS EU Project, is to assess the socio-economic impacts of deep-sea ecosystem restoration programs in specific sites and contribute to elucidate models and governance arrangements for decision-making. To progress on this goal, a systematic literature review was developed using different search engines (Scopus and Web of Science) and a set of predefined keywords to compile information on the reported valuation studies, including costs, benefits and willingness-to-pay (WTP) for ecosystem services of marine ecosystems. This was followed by the establishment of a database on deep-sea ecosystem valuation and payment (WTP) models studies. This search allowed to better understand the existing gap associated to deep-sea ecosystem valuation studies. A total of 18 valuation studies were found on deep-sea ecosystems. From these studies, bibliometric data was retrieved, and data regarding the different parameters for each valuation study, such as ocean basins, study site, country of the respondents, deep-sea habitat, jurisdiction, economy type, valuation method and technique, or the type of costs and benefits were analysed. As a result, a new scientific publication is under preparation to disseminate the conclusions reached on the type of deep-sea ecosystems that are most valued and the valued benefits that they provide. Other relevant information like the countries that are investing the most in this type of studies and which valuation methods are most commonly applied will also be shared.

Keywords: *Ecosystem services; Economic valuation; Anthropogenic pressures; Systematic review; Marine ecosystem restoration; Economic impacts.*

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Benchmarking bicycle industry's sustainability reports for the developmentof a sustainability framework

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Abstract. This research contributes to the development of a sustainability framework for the two-wheels industry. Building on the identification of a research gap specifically, the limited assessment of sustainability performance in bicycle manufacturing - this phase of the study conducted a benchmarking analysis of international practices. The benchmarking methodology involved a review of sustainability reports from 23 leading companies in the bicycle industry. This analysis mapped key sustainability topics, strategies, and sector-specific trends, while identifying best practices.
The obtained results highlighted that the adoption of the GreenHouse Gas (GHG) Protocol emerges as the most widely used framework (82%), with companies primarily focusing on environmental indicators related to carbon emissions, waste management, and energy consumption. Materiality assessments allowed the identification of occupational health (n=7), diversity (n=5), and supply chains (n=4) as key social-economic concerns. Sustainable Development Goals (SDG) focused on Goals 8 Decent Work and Economic Growth (86%), 12 Responsible Consumption and Production(73%), and 13 Climate Action (66%), though 35% of companies disclosed no SDG integration. While circular economy practices (e.g., recycled materials, take-back programs) and third-party certifications (ISO 14001, B Corp) are emerging, gaps persist in governance transparency (e.g., anti-corruption policies) and supply chain monitoring, highlighting disparities between large firms and small and medium-sized enterprises.
The identification of the most relevant points for the bicycle industry will enable the development of a sustainability framework that incorporates the most relevant aspects of the sector while recognising sustainability maturity disparities among companies of different sizes.

Keywords: *Bicycle industry, sustainability framework, benchmarking, indicators*

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Unveiling the ecotoxicological impact of polymersurfactant interactions in aquatic ecosystems

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Abstract. The demand for sustainable and safe materials is driving the development of environmentally friendly alternatives, especially for widely used chemicals, such as personal care products (PCPs). They may accumulate in aquatic environments as pseudo-persistent pollutants because of their continuous use and discharge. Regulatory assessments typically focus on individual compounds, however, commercial formulations comprise complex mixtures, and interactions among components remain poorly understood.

This study, conducted through an industry-academia partnership, assessed the ecotoxicity of two quaternized hydroxyethyl cellulose polymers, SoftCAT SK-M and SK-MH, alone and combined with three PCP surfactants: Sodium Lauryl Ether Sulfate (SLE2</sub>S), Alkyl Amido Propyl Betaine (APB), and Tallow Ester Quat (EQ). A battery of assays was carried out using freshwater organisms representative of different trophic levels: Brachionus calyciflorus (48-hour reproduction inhibition), Daphnia magna (24-h feeding inhibition and 72-h growth), and Danio rerio (96-h fish embryo toxicity). Assays were conducted using freshly prepared solutions, and 1-month aged solutions were additionally tested for D. rerio to compare toxicity over time and potential degradation. Polymer concentrations were tested at pre-established HC5 values (Hazardous Concentration for 5% of the population) of 0.00354 mg/L (SK-M) and 0.00127 mg/L (SK-MH) determined by Simões et al. (2022). Surfactants were set at 33-fold higher concentrations, maintaining a 1:33 polymer-surfactant ratio, reflecting commercial formulations.

In fresh exposures, Daphnia growth was impaired by SK-M + APB and by SK-MH mixtures, particularly SK-MH + SLE2</sub>S. Danio rerio heartbeat was significantly reduced by SK-M, APB, EQ, and SK-M + SLE2</sub>S, though body length was mostly unaffected except in the SK-MH + APB mixture. One-month aged exposures showed opposite trends: heartbeat was unaffected by SK-M, APB, and EQ but significantly increased in SK-MH-based treatments.

The results highlight the importance of assessing chemical interactions and ageing effects. Even environmentally relevant concentrations can alter key physiological functions in aquatic organisms.

Keywords: *Polymer-surfactant Interactions, Cationic Polymer, Environmental Risk, Mixture Toxicity, Aquatic Biota*

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Breaking up is hard to do? describing the life cycle of lumbriculus variegatus by using the dynamic energy budget model

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Abstract. Environmental risk assessment (ERA) of chemicals often relies on acute toxicity tests using high concentrations, focusing mainly on lethal effects. This substantially differs from the long-term, low-level exposures that can occur in the field and may lead to sublethal effects over time (Malaj et al., 2014; Schäfer et al., 2011). Dynamic Energy Budget (DEB) models provide a framework to bridge this gap by modelling energy allocation throughout an organisms lifecycle, allowing for more realistic exposure assessments (Jager et al., 2006). Although DEB models have recently gained attention for ERA practices (Ockleford et al., 2018), they are underused for sediment-dwelling organisms like Lumbriculus variegatus, a species recommended for ERA (OECD, 2007). L. variegatus has an unusual reproduction by fragmentation (Leppänen ; Kukkonen, 1998), a dynamic currently not captured in conventional DEB models, which mainly describe sexual reproduction. This fragmentation can potentially increase the transfer of toxicants from mother to offspring. In this study, we describe the life cycle of L. variegatus and propose a mechanistic DEB approach to incorporate fragmentation. We aim to improve predictions of chemical impacts on model species with non-conventional reproduction types.

Keywords: *Dynamic Energy Budget; Lumbriculus variegatus; sediment-dwelling worm; fragmentation*

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Coastal and marine ecosystem services in the pemba district, mozambique: ecological, socioeconomic and conservation perspectives

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Abstract. Coastal and marine ecosystems are essential for human well-being and the global ecological balance, providing essential services such as erosion protection, climate regulation, food provision, and biodiversity support (Millennium Ecosystem Assessment, 2005). However, they have been increasingly degraded due to growing human pressure and intensified economic activities (UNESCO-IOC, 2020). Pemba District, located in Cabo Delgado, Mozambique, is characterized by high biodiversity and geodiversity (Chichango et al., 2022; Biofund, 2025). Pemba Bay serves as a critical coastal-marine ecosystem that provides essential services such as coastal protection, food provision, and climate regulation (Ghermandi et al., 2019). However, the region is increasingly affected by pressures including natural resource exploitation, unplanned urban development, armed conflict, and climate change (Instituto Nacional de Estatística - Delegação Provincial de Cabo Delgado, 2020) all of which threaten both environmental sustainability and socioeconomic stability. This study aims to map, quantify, and evaluate the value of marine ecosystem services in Pemba, with the goal of integrating this information into spatial planning and promoting sustainable coastal management. The research incorporates literature review, participatory community-based surveys and GIS-based analyses using ArcGIS 10.1 to develop a Geographic Information System (GIS) focused on the regions coastal and marine ecosystems. Georeferenced aerial photographs will be updated through retrospective photo-interpretation, supplemented with data from Google Earth and ENVISAT satellite imagery. Furthermore, a participatory GIS approach will be implemented to support integrated coastal ecosystem management, assess ecosystem services and associated threats, and model future scenarios (Burkhard e Maes, 2017; Bosso et al., 2025). Expected outcomes include strengthened local governance, improved environmental conservation, and enhanced socioeconomic resilience. The project seeks to integrate scientific and traditional knowledge to support the transition toward a sustainable blue economy.

Keywords: *Ecosystem services; Coastal; Marine; Pemba; Mozambique*

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Revealing the red blood cells lipid plasticity in medium-chain acyl-coa dehydrogenase deficiency through a lipidomics analysis

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Abstract. Mitochondria fatty acid -oxidation disorders (FAOD) are a group of inherited metabolic disorders. Medium-chain acyl-CoA dehydrogenase deficiency (MCADD) is the most common FAOD, marked by toxic accumulation of medium-chain acylcarnitines (CAR) and fatty acids (FA) that can cause severe outcomes like hypoglycemia and encephalopathy [1]. While early diagnosis and dietary management can be effective to prevent most of those complications, alterations in plasma lipid profile, such as reduced plasmalogens, and increase triacylglycerols and phosphatidylcholines containing saturated and monounsaturated fatty acids suggest ongoing metabolic disruption with potential long-term consequences [1].
Although plasma lipidomics showed disrupted lipid profiles in MCADD patients [2], red blood cells (RBC) lipidome is less influenced by dietary changes reflecting long-term metabolic alterations. This study employed untargeted C18-RP-LC-MS/MS to assess RBC lipidomic plasticity in MCADD patients and age-matched controls.
Univariate analysis revealed significant alterations in 240 lipid species. Notably, sphingolipids (sphingomyelins and ceramides), as well as lysophospholipids (lysophosphatidylcholines and lysophosphatidylethanolamines), together with lysophosphatidylcholines/phosphatidylcholines ratio, were upregulated in MCADD. Conversely, a downregulation of polyunsaturated fatty acid-containing phospholipids (notably phosphatidylcholines and phosphatidylethanolamines) and plasmalogens was observed, potentially compromising antioxidant defences. Altered lipid ratios (PC/PE, PC+SM/PE+PS) suggest disruptions in membrane asymmetry and fluidity, with possible implications for cellular stability and function.
Overall, the lipidomic changes suggested a compromised antioxidant defences, enhanced oxidative stress and inflammatory state, along with potential alterations in RBC membrane fluidity and asymmetry. Collectively, this study reinforces RBC as promising biological matrix to be used in the clinical lipidomics field for understanding the pathophysiology of MCADD, and monitoring disease progression.

Keywords: *Inborn errors of metabolism; MCADD; lipid changes; erythrocytes; lipidomics; mass spectrometry*

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Maximizing sustainable production in forest nurseries through the induction of plant defenses by uv radiation

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Abstract. Forests are pivotal to sustainable development, particularly within the framework of the European Green Deal, which emphasizes ecologically responsible forest management. Therefore, production of high-quality seedlings is essential. However, the production in pine nursery systems is affected by fungal pathogens. This demands the development of innovative, sustainable solutions since European Union imposes agrochemical reduction (Directive 2009/128/EC) [1].
This ongoing project presents a novel approach to improve forest resilience by inducing plant resistance through controlled ultraviolet (UV) radiation application. When applied in hormetic doses, UV can be an abiotic elicitor that primes the plants innate immune system, triggering physiological and biochemical adaptations that enhance resistance to future (a)biotic stressors [2,3].
The project focuses on Pinus pinaster Aiton., Portugals most propagated forest species, ecologically and socio-economically important. By optimizing UV treatment during the nursery stage, we aim to strengthen natural plant defenses, reduce chemical inputs, and elevate seedling quality under operational nursery conditions.
A comprehensive "idea to application"workflow guides the projectfrom elucidating the mechanisms of UV-induced resistance (UV-IR) in controlled environments to testing its efficacy against nursery-relevant pathogens such as Botrytis cinerea and Fusarium circinatum. The direct germicidal action of UV on infected plants is also explored as a potential curative strategy [4].
We combine physiological assessments, metabolomic profiling, and microbiome analysis to answer the following questions:
Is UV an effective priming agent against major fungal pathogens?
What molecular and metabolic pathways are involved in UV-IR?
Does UV reshape the seedling microbiome toward a more protective community?
Can UV be used to mitigate active infections in nursery settings?
Here we outline the conceptual framework, experimental design, and preliminary strategies of an ongoing research project, which aims to deliver a sustainable and scalable strategy to enhance forest production systemspromoting sustainable production of more plants and more resilient plants by UV-radiation.

Keywords: *UV-induced resistance; Forest nurseries; Plant priming; Sustainable plant protection*

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Investigating the influence of biostimulants on soil microbiota to enhance plant growth-promoting abilities

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Abstract. A plant biostimulant is a material containing substances and/or microorganisms capable of stimulating natural processes and improving crop performance, independently of nutrient content (Ricci et al., 2019). A wide variety of products (e.g., plant and seaweed extracts, humic and fulvic substances, protein hydrolysates, plant-growth promoting microorganisms) can be considered biostimulants (Cardarelli et al., 2022). These products are a promising alternative to chemical fertilizers as a way of promoting plant growth and increasing crop yield. Despite the advantages of using biostimulants and the market growth of these products in the last years, there is a lack of information on their impact on the soil native microbial communities (Liu et al., 2022). These microbes are in close contact with the plant. Their health, functionality, and diversity, profoundly influence crops by affecting nutrient mineralization for plant uptake, manipulating root growth and helping withstand abiotic stresses, among other benefits (Bernal et al., 2021).
This work aims at unveiling evidence to help understand the impacts of frequently used commercial biostimulants and guide the development of new products able that stimulate the quantity and activity of beneficial microbes. Microbiome-based technologies such as metabarcoding, metabolomics, and network analysis, will be employed in an integrated approach to study increasingly complex communities (synthetic communities, synthetic communities in contact with a plant system, and native soil microbiota in contact with a plant system). These methodologies will be supported by the measurement of key soil enzymes, and plant physiological and biochemical changes. The plants studied will be maize and lettuce, due to their high importance as food crops. Considering the importance of biostimulants in agriculture to reduce the quantity of applied chemical fertilizers, we hope to bring an understanding of how microbe-microbe and plant-microbe interactions are affected by biostimulants, and how to more usefully utilize the potential of these substances.

Keywords: *Sustainable agriculture, Soil bacterial communities, Biostimulants, Metabarcoding, Metabolomics*

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Amphipods responses to ocean warming:sex-specific thermal tolerance, reproductive output and metabolomic profiles in males and females

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Abstract. Ocean warming is a major threat to shallow water marine communities, particularly their invertebrate species, whose biological rates are temperature dependent. Accurately predicting their fate in the face of ongoing warming will require to account for biological variation, particularly between males and females, of which we currently have little understanding. We experimentally evaluated the physiological and metabolomic responses, as well as reproductive output, of the marine amphipod Gammarus locusta exposed to a temperature gradient. Females and males were collected from a coastal lagoon subjected to four acclimation temperatures (16, 21, 26 and 31 žC) for 21 days. Specimens were individually sampled for metabolomics profiling. Additionally, Critical Thermal Maximum (CTMax), thermal safety margins and acclimation response ratio were assessed in different specimens at day 21. Higher exposure temperatures led to higher CTMax, confirming that G. locusta is capable to adjust its CTMax via physiological plasticity. A positive thermal safety margin was found, and females displayed higher CTMax than males, suggesting that thermal tolerance is sex dependent. Additionally, offsprings number was significantly reduced at higher temperatures, suggesting negative impacts of OW on fecundity. Further metabolomics analysis will be performed to assess test the hypothesis that warming causes females to enhance energy production via TCA cycle and amino acid metabolism more than males to support heat stress and reproductive costs. We conclude that G. locusta is physiologically plastic, females being more plastic than males, but that population viability may still be at risk due to reduced reproductive output under OW.

Keywords: *Temperature; Offspring; Metabolism; Upper thermal limits; Ectotherms*

Ai-powered optimization of tio-assisted dye removal process

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Abstract. Methylene Blue (MB) is a synthetic dye that is widely used in various industries but is considered harmful to both the environment and living organisms due to its toxicity and resistance to biodegradation[1]. In this study, a photocatalytic treatment method using titanium dioxide (TiO) under visible light from a 60 W LED lamp was tested to remove MB from water. To find the best operating conditions, two different optimization methods were compared: the Taguchi statistical design and an artificial intelligence (AI)-based approach. The Taguchi L9 orthogonal array was used to optimize three main parameters: TiO dosage, MB concentration, and pH. This method helped reduce the number of required experiments, [2,3]but it did not include reaction time. Adding time as a fourth factor would have required at least 18 experimental runs to maintain statistical balance. To avoid this, a hybrid AI model combining Extreme Gradient Boosting (XGBoost) and a Genetic Algorithm (GA) was used. This model analyzed the same nine-run dataset and included reaction time as an additional variable. The AI-based model achieved a removal efficiency of approximately 99%, while also showing that the reaction time could be reduced from 60 minutes to nearly 14 minutes. Moreover, the required amount of TiO was reduced by 25% compared to the Taguchi-based recommendation. These results demonstrate that machine learning can offer a more efficient and practical way to optimize photocatalytic water treatment processes by saving both time and materials without compromising performance.

Keywords: *Methylene Blue; Titanium Dioxide; Artificial Intelligence; Photocatalysis Treatment; Extreme Gradient Boosting Algorithm; Genetic Algorithm.*

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Integrated synthesis of microbial strategies to enhance drought tolerance in maize

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Abstract. Drought is a significant constraint on maize productivity, prompting the exploration of sustainable, microbe-based solutions to enhance crop resilience (Du et al., 2018). A series of studies by Lopes et al. present a comprehensive strategy, from identifying stress-tolerant bacteria to deploying them through innovative technologies that modulate plant responses under water scarcity. The initial study (Lopes et al., 2024a) concentrated on soil bacteria isolated from the Namib Desert, a hyper-arid environment. Among the 89 identified strains, many exhibited strong osmotolerance and multiple plant growth-promoting (PGP) traits, including indole-3-acetic acid production, phosphate and potassium solubilisation, and siderophore synthesis. These findings indicate the potential of these bacteria as bioinoculants, which could enhance plant growth under conditions of drought stress.

Building upon this foundation, the second study (Lopes et al., 2025) investigated the impact of encapsulating selected PGP strains in starchalginate capsules. The encapsulation of bacteria resulted in a substantial enhancement of maize drought tolerance, manifesting in increased root and shoot biomass, elevated photosynthetic pigment concentration, and enhanced osmolite accumulation. The encapsulation technology provided a protective matrix, ensuring bacterial viability and sustained release, which facilitated more consistent plantmicrobe interactions under stress conditions. A third study (Lopes et al., 2024b) explored an alternative, contactless strategy of plant growth promotion: namely, bacterial volatile organic compounds (BVOCs). Two strains are capable to emit BVOCs, which enhanced maize growth and induction of biochemical responses under drought conditions. These included enhanced root length, antioxidant activity, and reduced oxidative damage, demonstrating that microbial metabolites can trigger beneficial plant adaptations.

These studies show that a synergistic microbial approach using extremophilic bacteria and BVOC encapsulation can significantly enhance plant drought tolerance by activating key physiological and molecular plant responses. This integrated, eco-friendly strategy offers a scalable and sustainable solution to improve crop performance amid increasing drought frequency and growing climate instability.

Keywords: *Rhizobacteria; Bacterial Volatile Organic Compounds (VOCs); Plant Tolerance to Drought; Alginate Microcapsules*

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Climate justice in coastal hydrologicalrisk adaptation in transitional waters areas the ovar municipality case study

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Abstract. The Portuguese coast, a strategically important area under increasing pressure, faces heightened risks from climate change, specifically coastal erosion and sea-level rise. Coastal populations are particularly vulnerable (1). While climate justice has emerged as a relevant academic theme in Portugal, especially concerning coastal zones and their social justice and energy transition dimensions, its explicit integration into public policies is relatively recent, gaining traction only from 2018-2019 due to social movements. Significant gaps persist in linking climate justice with coastal risk management and protecting vulnerable groups. Public participation in environmental risk decision-making is often limited, indicating a deficit of transparency and trust. Local community knowledge and perceptions of coastal risks are frequently undervalued compared to technical perspectives, hindering effective measure implementation (2).

Despite the predominance of structural risk management measures in Portugal, there's a growing need for non-structural and preventive approaches. Over-reliance on technical solutions can lead to disorderly occupation of highly vulnerable areas. (4) Climate change impacts are unequally distributed, disproportionately affecting vulnerable coastal populations with less adaptive capacity. Climate justice does not yet hold a central position in national adaptation plans (5).

This research plans to analyse coastal hydrological risks in the Aveiro region, focusing on Ovar, through the lens of climate justice components (distributive, procedural, recognition), to foster resilience and social equity against climate change impacts (7). The project aims to understand how climate change unequally impacts coastal communities, exacerbating existing vulnerabilities (8). The global objective is to evaluate if climate change leads to an unjust distribution of coastal hydrological risks (erosion and coastal flooding) in Ovar (2). Promoting effective public participation, valuing local knowledge, and developing risk management approaches that consider specific inequalities are crucial (11,12).

Keywords: *Climate Justice, Coastal Risks, Ovar, Adaptation, Vulnerability, Public Participation.*

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Unpredictable chronic stress induces lipidomic modulation in zebrafish brain and muscle as a model of depression

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Abstract. Major depressive disorder (MDD) is a highly prevalent and multifactorial condition [1], increasingly recognized for its systemic effects. Brain lipid dysregulation is associated with the pathophysiology of MDD and seems to play a role in neuroinflammation and neuronal dysfunction [2]. However, the specific alterations in the brain lipidome associated with this disease remain unclear. In this study, a multidimensional approach was applied using zebrafish (Danio rerio) exposed to unpredictable chronic stress (UCS) as a model of depression. The impact on behavior, cortisol levels, and lipidome modulation in both brain and peripheral organs was assessed. Behavioral assays confirmed depressive-like phenotypes, characterized by reduced sociability and locomotor activity, accompanied by elevated cortisol levels. Fatty acid (FA) profiling revealed depletion of docosahexaenoic acid (DHA) and increased levels of the pro-inflammatory fatty acids arachidonic acid (AA) and linoleic acid (LA). Lipidomic analysis of the brain showed downregulation of DHA-containing lipids, suggesting neuroinflammation, as well as alterations in lipid species involved in neurotransmission. In contrast, upregulation of plasmalogens indicated activation of antioxidant defense molecules, probably to counteract a state of oxidative stress, usually associated with MDD. In muscle, elevated carnitines suggested altered energy metabolism, while increased ceramide levels pointed to inflammation and apoptosis. These findings demonstrate that chronic stress induces plasticity of both central and peripheral levels, with distinct lipidomic signatures consistent with MDD pathology. Overall, this study supports the value of multidimensional analysis and highlights lipidomics as a promising tool for identifying novel targets in depression research and treatment.

Keywords: *Lipidomics; lipids; depression; brain; muscle; zebrafish*

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Solar-driven photocatalytic removal of antibiotics from wastewater using carbonaceous magnetic nanocomposites

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Abstract. One of the major public health risks of the 21st century is the spread of bacterial resistance, to which the presence of antibiotics in aquatic environments contribute significantly. The development of efficient treatments for the removal of antibiotics from wastewater is essential to reduce their entrance in natural waters. Among the most used antibiotics, and therefore commonly present in wastewater, are amoxicillin (AMX), sulfamethoxazole (SMX) and trimethoprim (TMP), which have been added to the watch list of priority substances in the context of the Water Framework Directive (WFD, Directive 2000/60/EC; Decision 2018/840; Decision 2020/1161; Decision 2022/1307). A sustainable way to effectively remove these antibiotics from wastewater is using sunlight-induced degradation. However, such a treatment lacks the efficiency required for widespread implementation and its application has been mainly laboratory-based. To overcome this limitation, this work aims to develop efficient photocatalysts under sunlight by incorporating carbon quantum dots into titanium dioxide and coupling with magnetic iron oxides, thereby imparting them magnetic properties that will allow for their easy recovery and reuse. The photocatalysts were synthetized by a co-precipitation methodology and optimized using a full factorial design of 2 factors at 3 levels. Five different responses were evaluated, namely AMX, SMX and TMP photodegradation, magnetization saturation and synthesis yield. After the determination of the optimum synthesis conditions by the desirability function, the photocatalyst performance was evaluated. The photocatalyst dosage, pH, dissolved organic matter and reactive oxygen species determination was performed. The proposed strategy is allied with green chemistry principles and materials circularity, with special focus on the photocatalysts magnetic after-use recuperation and subsequent reutilization.

Keywords: *Emerging Organic Microcontaminants; Photodegradation; Photocatalysts; Carbon dots; Antimicrobial resistance; Water treatment*

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Oxidative potential and ecotoxicity of pm from heating appliances using different biomass fuels in two dwellings

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Abstract. The European Union has implemented policies to promote renewable energy, emphasising biomass for heat generation. However, residential biomass combustion is a major source of particulate matter (PM10), which has been widely related to serious health outcomes. Between 2007 and 2017, renewable energy production in the EU increased by 64%, with solid biomass accounting for 34% of primary production [1]. Consequently, residential wood combustion has emerged as one of the main sources of air pollution across Europe [2,3]. Given limited data on residential microenvironments, this study provides insights into PM10 oxidative potential (OP) and ecotoxicity from two heating appliances: a modern automatically-fed stove and a traditional manually-fed device. Samples were collected indoors and outdoors weekly for four biofuels (pellets, olive stone, briquettes, and firewood), and analysed for ionic, elemental, and carbonaceous composition. PM10 ecotoxicity was assessed using the Aliivibrio fischeri bioluminescence inhibition assay, and OP was measured using acellular methods (dithiothreitol and ascorbic acid). PM10 concentrations were higher in the room with the traditional system when burning briquettes (95.9 ś 74.9 ţg mş) and firewood (50.1 ś 25.6 ţg mş), compared to the modern stove using pellets (27.1 ś 11.8 ţg mş) and olive stone (23.0 ś 4.5 ţg mş). Significant correlations between OP and polycyclic aromatic hydrocarbons, quinones, and phenolics were found in the wood stove room, with indoor/outdoor (I/O) ratios >1. In contrast, I/O ratios <1 were observed during pellet stove operation. Ecotoxicity assays using Aliivibrio fischeri classified indoor PM10 from the wood stove as 'very toxic', whereas samples from the pellet stove exhibited lower toxicity and OP levels. These findings highlight the need to reconcile renewable energy goals with air quality and public health. As the EU continues to pursue decarbonisation, it is crucial to align energy strategies with public health and environmental protection.

Keywords: *nan*

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Long-term cohabitation fosters positive attitudes toward the presence of brown bears in the iberian peninsula

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Abstract. The brown bear (Ursus arctos) populations are expanding in the Iberian Peninsula, particularly in the Cantabrian Mountains. However, a lack of sustainable coexistence strategies could jeopardize this ongoing expansion and the species' return to Portugal (Azevedo et al., 2024). To shed light on how experiences with bears can shape human perceptions and attitudes toward this species (Dressel et al., 2012; Glikman et al., 2023), online questionnaires (n = 441) were distributed across Portugal and Spain. In addition, we evaluated differences in attitudes and perceptions among regions with varying levels of exposure to bears: those with (BAS) or without (NBAS) bear presence in Spain and those with (BAP) or without (NBAP) the potential to sustain bears in Portugal. Despite observing overall positive attitudes toward bears, Spanish respondents showed stronger attachment and receptiveness toward the species. Respondents from BAS, having more interactions with wild bears, were also more favourable toward sharing territory with them (Piédallu et al., 2016). Conversely, Portuguese respondents showed more neutral attitudes toward bear presence, as well as higher perception of risk and lower perception of benefit than previously reported (Azevedo et al., 2024). Our findings highlight the importance of understanding the social landscape in the bears expansion range (Piédallu et al., 2016). As human-bear interactions increase, this knowledge is key to developing proactive and targeted socio-ecological programs to address the local communitys concerns.

Keywords: *Ursus arctos, human-wildlife coexistence, human-wildlife conflict, expansion, exposure, attitudes*

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Air pollution in an african megacity: chemical composition and ecotoxicological risks

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Abstract. Rapid urbanisation in African cities, combined with limited air quality monitoring infrastructure, presents major challenges for pollution control and public health management [1]. This study assessed the air quality in Luanda, Angola, by conducting novel, continuous ground-level measurements between June and November 2023, covering the wet and dry (cacimbo) seasons. Continuous monitoring of CO, NO, NO<sub style="vertical-align: sub;»2</sub> and </sub><sub style="vertical-align: sub;»</sub>O3</sub> were made using automatic analysers. Daily sampling of particulate matter (PM2.5</sub> and PM10</sub>) on filters was performed by gravimetric instruments. The ecotoxicity of PM10</sub> was assessed using a bioluminescent bacterium (Aliivibrio fischeri) through the Microtox^ő bioassay. The study site, located in the Faculty of Engineering of the University Agostinho Neto, represented a traffic-impacted urban environment. The mean concentrations were 0.90 ś 0.28 ppm for CO, 33.9 ś 15.1 ppb for NO, 17.7 ś 5.8 ppb for NO2</sub>, and 14.0 ś 4.4 ppb for O3</sub>. NO2</sub> concentrations exceeded the WHO daily guideline on ~78% of the monitoring days. PM2.5</sub> and PM10</sub> averaged 29 ś 9.4 ţg m⁻³ and 60 ś 16 ţg m⁻³, respectively. PM2.5</sub> levels frequently exceeded WHO and EU limits on 99% and 52% of the campaign, respectively, while PM10</sub> thresholds were surpassed on ~75%. These levels are in line with those observed in other major cities worldwide [2]. PM10</sub> was composed of element oxides (38%), organic matter (26%), elemental carbon (16%), and water-soluble ions (6.5%). Moderate toxicity, with occasional high peaks (toxic units >5), was observed in August and September, and was strongly associated with metals like Pb and Sn. The results underscore significant air quality concerns in Luanda, revealing frequent exceedances of international guidelines for NO2</sub>, PM2.5</sub> and PM10</sub>. Episodes of moderate to high ecotoxicity stress the urgent need for continuous monitoring and effective pollution mitigation strategies.

Keywords: *nan*

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The potential hazards of per- and polyfluoroalkyl substances (pfas) to marine ecosystems and human health: how can predicted climatic scenarios influence pfas impacts?

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Abstract. Per- and polyfluoroalkyl substances (PFAS), often called forever chemicals, are a large class of over 15,000 synthetic compounds valued for their exceptional thermal stability, water and oil repellency, and resistance to degradation (Li et al., 2023). Since their introduction in the 1940s, PFAS have become integral to a wide range of industrial and consumer products, including firefighting foams, non-stick cookware, food packaging, electronics, and textiles. The strong carbon-fluorine bonds make them highly resistant to biodegradation, contributing to their environmental persistence and widespread global distribution (Sharma et al., 2024).

Currently, over 6,500 PFAS compounds are on the market, many of which lack sufficient toxicological data (Kumar et al., 2023). These substances have been widely detected in marine environments, including aquaculture zones and shellfish harvesting areas, where they bioaccumulate and biomagnify in organisms such as mussels and fish (Sinclair et al., 2020). Moreover, it is crucial to assess the potential effects of these compounds under projected climate change scenarios. By 2100, increased salinization and ocean warming are anticipated (IPCC, 2023). These environmental changes might influence pollutant behavior and organism sensitivity, potentially enhancing PFAS bioavailability, accumulation, and toxicity.

Given the growing investment in bivalve aquaculture in Portugal, this project aims to investigate the ecotoxicological effects of emerging PFAS compounds under climate change scenarios on marine species, as well as the associated human health risks. The mussel Mytilus galloprovincialis and the crab Carcinus maenas will be used as model organisms for physiological, biochemical, histopathological, and metabolomic assessments in both field and laboratory settings.

In parallel, human exposure will be evaluated by measuring PFAS concentrations in the blood of individuals with high shellfish consumption. Untargeted NMR metabolomics will be applied to detect PFAS-induced metabolic alterations and to identify early biomarkers of exposure in humans.

Keywords: *Bivalves; Climate Change; Forever Chemicals; Human Health; Biomagnification*

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[CICECO] Digitization

Photonic-digital artificial intelligence architectures for optical neuromorphic computing

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Abstract. Nowadays, Artificial Intelligence (AI) has an irrefutable impact in data processing and computing. Conventional digital hardware architectures are reaching challenges in power consumption, scalability and speed (Garisto, 2024). As an alternative, the exploitation of light for computing has emerging as a promising area of research for efficient high-speed processing of large amounts of data (Kibebe et al., 2024). Within optical computing, several approaches have been proposed such as artificial neural networks (Bandyopadhyay et al., 2024; Silva et al., 2025; Xiang et al., 2024). However, the practical application and scalability of these systems is often limited due to high complexity and energy-consuming components (Kudithipudi et al., 2025). We propose the convergence of optical and digital computing into photonic-digital hybrid AI architectures. The photonic layer is based on carbon dots with complex emission features under excitation with light-emitting diodes (LEDs). This layer converts numerical inputs into complex emission-based responses, then used as inputs for the selected machine learning (ML) model paving the way for low-power hybrid photonicdigital AI architectures that combine a physical photonic layer with an advanced digital ML model (Dias et al.).

Keywords: *Optics, Neuromorphic, Computing, Carbon dots, Photonic layer, Machine learning*

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Igy-based biosensor for detecting microorganisms

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Abstract. Pathogen-related diseases, primarily Salmonella spp. and Legionella spp., pose a significant threat to global public health, causing millions of infections, deaths, and economic losses annually [1]. The rise in antimicrobial resistance (AMR) exacerbates this issue, requiring rapid and effective detection methods for these pathogens, which are responsible for outbreaks from contaminated food and water systems. Fibre optic-based biosensors, particularly those using surface plasmon resonance (SPR), offer fast, portable, and sensitive solutions, overcoming traditional limitations. These biosensors usually apply mammal or monoclonal antibodies, such as immunoglobulin G (IgG). However, avian-specific antibodies, particularly immunoglobulin Y (IgY), can be considered as novel bioreceptors, providing higher specificity and lower production costs [2]. This PhD aims to create SPR biosensors using specific IgY to detect Salmonella spp. and Legionella spp. in water samples, demonstrating the potential of SPR biosensors in food safety and environmental monitoring while contributing to global public health mitigation.

Keywords: *Immunoglobulin Y antibodies, Salmonella spp., Legionella spp., Optical fibre sensor, SPR, Water monitoring*

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Valorization of agricultural waste:extraction of silica nanoparticles from rice husk to produce reinforced starch-based blends for alternativepackaging solutions

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Abstract. Despite global initiatives to reduce consumption and carbon emissions, the use of plastics for food packaging has been increasing and remains dependent on fossil resources, increasing pollution and greenhouse gas emissions [1]. The plastic industry must decarbonize to reach zero-carbon emissions by 2050, so using natural feedstocks with comparable performance and processability to fossil plastics is a viable strategy to meet current environmental demands. Starch-based blends are being developed due to starchs availability, low cost, non-toxicity, and biocompatibility [2]. However, starch has drawbacks mainly related to water permeability and lower mechanical performance, compromising its processability by injection molding.
Rice is the world's most consumed cereal, and its processing generates tons of rice husk (RH). Cellulose is the major organic component (33%), with approximately 20%wt of inorganic content, mostly (94%) silica [3]. It possesses high thermal and mechanical stability, is non-toxic, and has a high level of wettability. Silica nanoparticles (SiNPs) can be extracted from RH ashes and have proven to reinforce thermoplastic composites. By the end of this PhD project, packaging solutions using starch-based blends as the polymeric matrix, SiNPs as reinforcement, and essential oils as compatibilizing agents are expected.
Currently, the experimental work is focused on silica extraction from RH using sol-gel method [4]. Extraction used HCl as solvent at 10% concentration. RH was burned at various temperatures (500800řC) and retention times (2, 4 and 6 h). Calcination temperature and time significantly affected the silica's purity and structure. X-ray diffraction (XRD) showed that 600700řC for 46 hours produced predominantly amorphous silica. Lower temperatures caused incomplete combustion; 800řC led to crystallization.

Keywords: *Rigid Packaging; Bio-nanocomposites; Rice husk; Silica Nanoparticles; Starch-based Blends.*

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Optical coherence tomography imaging in non-destructive testing applications

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Abstract. The simplest methods to evaluate the properties of materials often cause their destruction. However, there are many instances where it is desirable to maintain the integrity of the testing subjects to allow further use and evaluation, which led to the development of the non-destructive testing (NDT) field, whose end-goal is analyzing the properties of a material, structure or component without causing any damage.
Numerous NDT approaches have emerged, but techniques that allow a fast, contactless, non-invasive, and high-resolution imaging of subsurface features at a level of only a few micrometers are still lacking.
Optical coherence tomography (OCT), which employs low-coherence light to capture 2- and 3-D depth-resolved images with micrometric resolution, has the power to fulfill these needs. OCT is a well-established technology, predominantly in the field of ophthalmology, but its full potential outside biomedical applications is still untapped. OCT may provide both qualitative and quantitative data about a sample. Visual inspection of images may reveal cracks or impurities, while a more thorough analysis allows the measurement of layer thickness and defect size/distribution. As many materials undergo structural changes during production or use (e.g., hardening, thermal shifts, mechanical stress), OCT may serve as a fast, contactless, non-destructive method for monitoring. Its ability to distinguish layers is especially useful when critical information lies at specific depths, such as in counterfeit detection. Although previous works have begun demonstrating the usefulness of OCT for NDT applications in aerospace engineering (Liu et al., 2016) and forensic sciences (Marques et al., 2021), some challenges, namely when it comes to imaging depth and scanned area size, still need solving. Thus, in our work, we intend to build a customized portable OCT system operating at 1.6 m for NDT applications, to evaluate the structural integrity of aerospace materials and the features of genuine vs counterfeit documents.

Keywords: *Aerospace engineering, Composite materials, Forensic sciences, Optics, Questioned documents*

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Next-generation piezoelectric scaffolds for integrated bone cancer therapy and regeneration

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Abstract. Bone cancer remains a devastating disease with a high mortality rate (~32%) and severe side effects from conventional treatments [1]. This project proposes a groundbreaking approach to simultaneously eliminate residual tumor cells and regenerate bone tissue through the design of next generation piezoelectric scaffolds [2]. A chitosan-based biocomposite will be engineered incorporating barium titanate (BT) nanoparticles grown in situ on boron nitride nanosheets (BNNs) via a novel hydrothermal method. This BT-BNN hybrid will deliver enhanced piezoelectricity to stimulate bone healing and generate reactive oxygen species for localized tumor ablation [2]. The scaffolds performance will be further boosted by integrating electrically conductive, graphene-like biochar [3] derived from agro-waste and osteoconductive hydroxyapatite, creating a multifunctional and sustainable platform. Fabricated via ice-templating, the scaffolds will feature aligned porosity tailored for cell infiltration [4].
A broad characterization protocol will assess morphology (SEM/TEM), structural features (XRD, Raman, FTIR), textural properties, piezoelectric response (PFM, Berlincourt), mechanical stability, and electrical performance. Initial biological testing will be carried out in 2D cultures using osteoblasts and osteosarcoma cells to evaluate biocompatibility, osteogenic potential, and antitumoral activity. Advanced validation will be performed in a bone-on-chip platform, where scaffolds will be dynamically stimulated with ultrasound to mimic physiological conditions [5]. This interdisciplinary strategy sets a bold path toward smart, dual-function implants for integrated cancer therapy and bone regeneration.

Keywords: *Dual-functionality Scaffolds; Cancer mitigation; Bone-on-chip models; Ice-templating; Chitosan-based composite; Reactive oxygen species*

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Metal-organic frameworks (mofs) based on lanthanides for molecular electronics

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Abstract. In the early 1990s, de Silva et al. described the first general approach to information processing and computing based on molecules able to perform logical operations, mimicking electronic logic gates. The first AND molecular logic gate was based on organic molecules, applying cations as the logical inputs and a change in the emission intensity as the logical output. However, the characteristic broadband emission and fast decay times of organic compounds, conjugated to the photobleaching, making difficult its implementation in applications other than proof-of-concept molecular logic devices.The use of trivalent lanthanide ions (Ln3+) as luminescent optical active centers in molecular logic is particularly attractive as these ions emit in a wide wavelength range (UVvisNIR regions), with characteristic line-like emission bands (<10 nm) and long-lived excited state lifetimes (>1 ţs). Up to now, all the logical gates based on Ln3+ ions respond to chemical inputs, operating in wet conditions. If all both logical inputs and logical outputs are of physical nature (i.e., light, pressure, temperature), it will render advantages in the input-output homogeneity when the integration of distinct logical functions, no-contamination, and reuse of the device are demanded (Andréasson et al. 2011, Brites et al. 2025).Here, we report Ln3+-based Metal-organic Frameworks (MOFs) which consist of Ln3+ ions coordinated with organic ligands for molecular logic applications. Some of Eu3+/Tb3+ mixed MOFs are proven to exhibit thermometric properties, as their emission strongly depends on temperature. Moreover, the rigid and well-defined MOF crystal structure can protect the luminescent properties of Ln3+ ions from environmental influences, preserving their optical characteristics. Lastly, the tuneability of MOFs enables precise control over the local environment surrounding Ln3+ ions, influencing their luminescent behavior and responsiveness to external stimuli. Consequently, Eu3+/Tb3+ mixed MOFs are very attractive to develop molecular logic gates, exploiting temperature as logical input.

Keywords: *Molecular electronics, Metal-organic Frameworks, Lanthanides, Thermometry*

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Design and tolerance of tpp lens for 2 ţm circular waveguide and smf coupling

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Abstract. The manufacturing tolerance determines the performance of the devices built, with the optical packaging of photonic integrated circuits (PICs) requiring precise alignment between different components. This work presents a case study for a Single Mode Fiber (SMF) coupling with a 2 ţm Mode Field Diameter (MFD) laser, employing v-grooves for passive alignment of pick-and-placed laser dies. The mode mismatch between waveguides introduces a theoretical coupling loss around 8.6 dB. The laser is centered using its waveguide and the v-groove axis with ś 1 ţm, fabrication errors in the v-groove introduce vertical misalignment, increasing optical loss (theoretical extra 0.92 dB) (Gradkowski, 2024). A custom two-photon polymerization (TPP) aspheric lens is designed on the laser facet, to improve coupling efficiency due to mode mismatch and tolerate such misalignments during manufacturing (Skacel, 2024). Results show that the TPP lens enables insertion losses below 1 dB for fiber facet displacements up to ś 2.2 ţm and under 0.7 dB insertion loss considering the pick-and-place and v-grooves tolerances, demonstrating the feasibility of passive alignment in mass-producible PIC packaging. Comparing to initial theoretical losses, the TPP lens allows for an improvement of 8.85 dB when considering the case without corrective optics, greatly improving the power budget of the manufactured devices.

Keywords: *Photonic Integrated Circuit; two-photon polymerization; aspheric lens; optical coupling.*

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Better utilization of truck and railway resources through the integration of innovative technologies and artificial intelligence

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Abstract. Rising costs and the requirements of the Green Deal are forcing the transport industry to make better use of available resources. In addition to these challenges, millions of truck kilometers are covered worldwide with unused capacity [Statista, 2021], [Holguín-Veras ; Thorson, 2003]. The situation regarding the utilization of resources in the railway sector is similar [Poehle, 2016]. As ticket inspections are removed on many routes, rail operators are losing the crucial data required to evaluate the actual usage of individual rail lines. As a result, once train lengths are set, they remain fixed, often causing significant overcapacity or undercapacity in seating availability on rail routes [Grosse, 2003]. The original focus of the research work was on transport logistics. It was only in a subsequent seminar that students proposed the innovative idea of applying the technology to train capacity utilization as well [DHBW, 2025].
The focus of the initial project work was to analyze and understand the complex dependencies of utilization behaviour based on logistics data in real-world traffic conditions. In this context, technologies have been developed that are capable of determining the weight-based load of trucks from the drive unit. This weight estimator innovation requires no additional sensor installation and can be easily retrofitted to provide weight-based tour evaluations. In the next step, a method was developed to predict weight-based load for consistent geo segments and routes using AI methods (ML-based demand forecasting methods like ARIMA, SARIMA and LSTM) with a forecasting horizon of 12 weeks. This solution is capable of estimating the number of passengers traveling on a train without additional sensor data and in compliance with data protection regulations. The approach described is also very interesting in this respect, as a leading rail operator in Europe is currently being sued for recording and storing passenger data [Tagesschau, 2025].

Keywords: *nan*

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A new fiber optic-based sagnac sensor for acoustic detection in the oil & gas sector

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Abstract. Structures, such as pipelines, deliver energy to the world, drive the economy, and power our industries and houses. They transport hazardous products in the most challenging conditions, being prone to structural degradation (e.g., cracking, corrosion). If left unchecked, these issues give rise to ruptures/failures of the structure. As a cause/effect, human casualties and environmental disasters can occur, leading to massive service disruptions and billions in losses and unexpected repair costs.
To address these issues, companies are adopting monitoring solutions based on non-destructive techniques to identify and evaluate degradation mechanisms early, to avoid catastrophes and plan interventions. The three most used approaches are based on guided waves (GW), acoustic emission (AE), and distributed fiber optic sensing (DFS). The GW consists of emitting acoustic waves through a structure, detecting defects based on reflected echoes. Conversely, the AE is a passive technique that detects acoustic perturbations originating from a discontinuity. The DFS detects such events by the refractive index modulation due to the acoustic perturbation. However, these techniques present some limitations, namely in their high cost, complexity and difficulties in implementation.
To overcome these issues, new sensors in the fiber optic have emerged (e.g., interferometric sensors), namely the fiber optic-based Sagnac interferometer (FOSI) (Jin et al., 2024). This type of sensor has as a working principle the splitting of the light into two beams that propagate in opposite directions inside the same fiber loop (reference and sensor arm share the same optical path). Due to this property, the sensor is unaffected by floor noise, making it an effective system to implement in the field. With this in mind, the main goal of this proposal is to develop an FOSI for the detection of acoustic waves in challenging and complex field environments.

Keywords: *Corrosion, Leaks, Ultrasonic waves, Interferometry, Waveguide, Fiber optic sensors.*

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[CICECO] Energy

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Theoretical and experimental comparison analysis of pdms-composites aiming energy harvesting

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Abstract. The global energy transition demands the development of efficient materials for mechanical energy harvesting. Potassium-sodium niobate (KNN) is a lead-free material that can increase the electrical output in polydimethylsiloxane (PDMS)-based films (Sumang et al., 2024) due to its piezoelectric coefficient (d33) of 160 pC/N (Jaeger et al., 1962; Rafiq et al., 2014), besides having a stable perovskite structure to sustain piezoelectric properties under mechanical stress (Cen et al., 2018). This study investigates PDMS films mixed with 30 wt.% KNN (PDMS/30KNN). Also, 2 wt.% of graphite (G) is added to the mixture to create a conductive path (PDMS/30KNN/2G). We evaluated the effects of KNN and G on the surface morphology. Besides, we compared experimental and theoretical models for density, mechanical behavior, and dielectric properties, aiming for energy harvesting applications. PDMS and fillers are mixed using an ultrasonic tip and cured at 80 žC. The theoretical density of PDMS/30KNN/2G was higher than the experimental, revealing possible agglomeration and voids in its structure, confirmed by optical microscopy. Tensile tests showed an increase in Young modulus for PDMS/30KNN/2G, comparable with the Halpin-Tsai model. Dielectric measurements using different forces (2-50 N) show an enhancement in the dielectric constant for the PDMS/30KNN/2G compared to the other samples (PDMS, PDMS/2G, and PDMS/30KNN). This sample's experimental dielectric measurements at 10 kHz demonstrate increased capacitance at 50 N, comparable to the Logarithm Mixture Rule model result. A universal testing machine coupled with an oscilloscope performs the contact-separation tests with a cyclic load. This test results in an electrical response above 1 V of maximum peak for all the films. This work evaluates the PDMS composites, and the KNN and G improve the PDMS performance. PDMS/30KNN/2G combines mechanical robustness, improved dielectric behavior, and measurable electrical response for future sensors and energy-harvesting devices.

Keywords: *energy harvesting; KNN; PDMS; theoretical models; dieletric.*

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Non-conventional sintering processes for dielectric ceramic manufacturing

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Abstract. Barium Strontium Titanate (BST, Ba1-x</sub>Srx</sub>TiO3</sub>) is a widely studied ferroelectric material due to its high dielectric tunability, making it suitable for tunable electronic devices. As modern technologies evolve, the demand for dielectric ceramics with enhanced performance and more sustainable processing methods continues to grow. Conventional sintering of BST typically requires high temperatures (1250-1500žC), which hinders integration with temperature-sensitive materials and increases energy consumption. This work investigates non-conventional sintering techniques to produce high-density BST ceramics at lower temperatures, aiming to reduce processing costs and enable compatibility with polymers and metals. Four alternative sintering methods were explored: Flash Sintering (FS), Spark Plasma Sintering (SPS), Spark Plasma Texturing (SPT), and Cold Sintering Process (CSP). These techniques use electric fields, pressure, or hydrothermal conditions to enhance densification and control the microstructure. Flash Sintering enabled rapid densification of BST by addressing challenges related to electrical conductivity. SPS and SPT produced nearly fully dense ceramics with fine grains, allowing detailed investigation of the relationship between microstructure and electrical properties. Cold Sintering significantly reduced the sintering temperature (from 1350žC to 350žC), enabling co-sintering with polymers and the development of a tunable capacitor prototype processed at low temperatures. Overall, this work demonstrates that non-conventional sintering techniques are promising alternatives to traditional methods, contributing to more energy-efficient ceramic processing and offering valuable insights for other ferroelectric systems.

Keywords: *BST; dielectric; sintering; non-conventional sintering*

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Processing strontium titanate-based ceramics for thermoelectric energy harvesting byultrafast high-temperature sintering

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Abstract. The current energetic scenario calls for innovative solutions for both large- and small-scale energy consumption, where thermoelectric devices have played a critical role for micro energy-harvesting and heat-recovery systems [1]. Most thermoelectric materials currently contain hazardous and rare chemical elements, such as Pb, Bi, or Te [2], which create an obstacle to their adoption as a technology. One possible strategy is to find inert and non-hazardous thermoelectric materials composed of relatively abundant elements at small processing costs. Strontium titanate (SrTiO3) is a lead-free oxide perovskite that becomes semiconducting when donor-doped, displaying thermoelectric properties at high temperatures [3]. This work presents initial attempts to produce donor-doped SrTiO3 by ultrafast high-temperature sintering (UHS), a less energy-intensive technique that can reduce the sintering time of the ceramics from over 12 h to 3 min. This technique allows for the production of SrTiO3 ceramics to be done in highly reducing atmospheres, promoting the formation of oxygen vacancies that can enhance electric conductivity [4]. SrTiO3 ceramics produced by UHS exhibit high relative densities of ~95 %, comparable with their conventional counterparts. Changes in structure, microstructure, and electrical properties caused by the application of both sintering methods can be observed and characterized for their influence on the thermoelectric properties.

Keywords: *Ultrafast high-temperature sintering; Strontium titanate; Thermoelectric; Alternative sintering*

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Tailoring redox-active covalent organic frameworks for metal-ion battery electrodes

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Abstract. The development of next-generation batteries is crucial in our increasingly electricity-driven society. To overcome the limitations of current technologies and improve performance while ensuring more ethical and sustainable storage systems, it is essential to explore alternative electrode materials, such as redox-active Covalent Organic Frameworks (COFs), crystalline and porous organic polymers composed of light elements and linked by strong covalent bonds.(Dantas et al., 2024)
This communication addresses the challenge of optimizing COF-based electrodes for several metal-ion batteries, focusing on the -ketoenamine-linked anthraquinone-based DAAQ-TFP-COF as cathode material. The materials performance is evaluated in lithium, magnesium, and aluminum batteries, highlighting the critical influence of the electrolyte and binder on the electrochemical performance.
In lithium cells, the selection of lithium bis(trifluoromethanesulfonyl)imide (LiTFSI) in tetraethylene glycol dimethyl ether (TEGDME) as the electrolyte, combined with poly(tetrafluoroethylene) (PTFE) as the binder, delivered near-theoretical specific capacities with high redox-site utilization. For magnesium cells, DAAQ-TFP-COF was tested with two different electrolytes: one based on chloride species (0.6 M MgTFSI2</sub> 1.2 M MgCl2</sub> in DME) and another incorporating weakly coordinating anions (0.2 M Mg(B(hfip)4</sub>)2</sub> in DME). The performance differences in terms of capacity and voltage profiles highlighted the critical role of electrolyte choice on ion transport and reversibility.(Luanin et al., 2023)
The study was extended to aluminum batteries, where DAAQ-TFP-COF showed stable performance within an optimized voltage window (0.52.0 V), delivering 113.9 mAh gź at 50 mA gź in an ionic liquid electrolyte. Lastly, the compatibility of the COF with more sustainable deep eutectic solvents was assessed, including butyramide-based electrolytes, which maintained high Coulombic efficiency.[3]
This work highlights that, in addition to molecular design, system optimization such as electrolyte and binder selection, is crucial in tuning COFs electrochemical performance and unlocking its full potential as a next-generation active material for several metal-ion battery systems.

Keywords: *Covalent Organic Frameworks (COFs), Organic batteries, Metal-ion batteries*

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Investigating the effect of cooling rate on microstructure and mechanical properties of cold sintered zno

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Abstract. Due to the necessity of alternative sintering techniques, capable of saving energy and time, the scientific community has developed new methods such as microwave sintering (MW), flash sintering (FS), spark plasma sintering (SPS) and cold sintering process (CSP) [1] [2]. CSP is one method that has captured attention due to its low processing temperatures (<350 řC), inexpensive equipment, and simple steps. Since its inception in 2016 [3], CSP has been used to process various materials and study the effects of parameters such as pressure, transient solvents, temperatures, and heating rates [4]. However, the cooling stage and its impact on the final properties of the material remain unexplored. For this reason, this study examines the impact of two cooling rates on the microstructure and mechanical properties of ZnO ceramics. The following procedure was used for this study: First, ZnO powder was mixed with 13 wt% acetic acid (2 M). Then, the powder was pressed at 337 MPa and heated at 5 řC/min. The sintering temperature was 350 řC for one hour. One sample was cooled naturally, while the other was cooled at a rate of 0.2řC/min while maintaining constant pressure. Two more samples were prepared in the same way, but the pressure was released during the cooling stages for both natural and slow cooling. The mechanical properties, microstructure, and electromechanical values of the samples processed by CSP and conventional sintering were studied and compared.

Keywords: *cold sintering, slow cooling, ZnO, microstructure*

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Flexible piezoelectric films doped with lanthanide complexes

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Abstract. Mechanoluminescence refers to the emission of light from a material as a direct result of mechanical stimulation, such as compression, tension, friction, or fracture (Hirai, 2024). Despite extensive empirical reports, the microscopic mechanisms underlying mechanoluminescence remain incompletely understood, largely due to the diversity of material systems and the complex interplay between structural, electronic, and mechanical factors (Wang et al., 2019). We report a composite film of Poly(vinylidene fluoride-trifluoroethylene) matrix doped with Eu3+-based complex. Optical and structural characterization was made to the samples, varying the concentration of Eu3+-based complex. We recorded repeatable light emissions during the composite film's mechanical detachment from a glass substrate. The photoluminescence of the samples remained constant before and after mechanoluminescence.

Keywords: *Photoluminescence, Mechanoluminescence, Piezoelectricity, Europium.*

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Process design and optimization of biogas-derived hydrogen production using advanced numerical modeling

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Abstract. The transition toward sustainable energy systems necessitates efficient and scalable hydrogen production technologies. This study presents a detailed simulation and performance analysis of a biogas-based hydrogen production process via steam methane reforming (SMR), developed using Aspen Pluső. The process flowsheet integrates key unit operations including biogas pre-treatment, steam generation, catalytic reforming, high- and low-temperature water-gas shift (HTS/LTS) reactors, and hydrogen purification via pressure swing adsorption (PSA). A supplementary combustion unit provides the thermal energy required for the endothermic reforming reactions, ensuring process energy integration. The reformer and WGS reactors are modeled using a combination of kinetic and equilibrium reactor modules, calibrated to capture the complex thermochemical behavior of the reforming pathway. Sensitivity analyses were performed to investigate the influence of critical operating parameters such as steam-to-carbon ratio, reformer temperature, pressure, and PSA efficiency on key performance indicatorsnamely, hydrogen purity, methane conversion, and energy utilization. The simulation results demonstrate the viability of decentralized hydrogen production from biogas, with high hydrogen yield and effective thermal integration.
This study demonstrates the critical importance of process simulation in enhancing the efficiency and sustainability of hydrogen production pathways, while showcasing the capability of Aspen Pluső to accurately model and optimize integrated thermochemical systems for renewable energy applications.

Keywords: *Biogas, Hydrogen production, Steam methane reforming (SMR), model, Aspen Pluső.*

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Cooked olive oil as a sustainable pcm: a comparative thermophysical study

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Abstract. The search for sustainable Phase Change Materials (PCMs) is essential to minimize the environmental impact associated with petroleum-derived organic PCMs. Vegetable oils have garnered significant attention as potential PCMs due to their applicability in thermal energy storage. This study focuses on the use of cooked olive oil (COO) as a PCM and compares it with natural olive oil (NOO). The thermal properties and chemical profiles of both COO and NOO were analysed through calorimetry, thermogravimetry, and Fourier-transform infrared spectroscopy (FTIR). The results showed that NOO had a latent heat of fusion of 59.83 J/g and a melting temperature of -21.5 řC. In comparison, COO exhibited a slightly lower latent heat of fusion at 58.30 J/g, with a melting temperature of -30.1 řC. COO also demonstrated a higher degree of subcooling at 24.8 řC, compared to 9.3 řC for NOO; however, this property could be enhanced by the use of nucleating agents. Despite these differences, both oils showed comparable FTIR profiles and maintained significant thermal stability up to 300 řC. The results suggest that COO can serve as bioPCM, a viable and environmentally friendly alternative due to its promising thermal properties. This promotes the valorisation of COO instead of its disposal, contributing to energy efficiency and sustainability in low-temperature thermal applications.
Keywords: Olive oil, PCM, TES, Sustainability

Keywords: *nan*

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Fabrication of zrbinconel 718 cermets using freeze casting and pressureless spark plasma sintering

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Abstract. Zirconium diboride (ZrB) is an ultra-high temperature ceramic (UHTC) known for its high melting points and excellent thermal stability [1], making it promising for use in extreme environments [2-3]. However, conventional sintering methods often limit their densification and require high temperatures or sintering aids [4]. In this study, Inconel 718 a nickel-based superalloy renowned for its mechanical properties and high-temperature resistance [5] was introduced as a metallic phase in ZrB-based composites, enhancing both sintering behaviour and toughness.
Aqueous suspensions containing ZrB and Inconel 718 mixed powders were prepared and shaped using a fast, unidirectional freeze casting process. This approach was chosen to overcome the challenge of sedimentation during casting posed by the high density of the powder mixture. Following shaping, the green bodies were sintered via pressureless spark plasma sintering (SPS) at temperatures ranging from 1200řC to 1350řC. The sintered samples were characterised in terms of density and porosity using the Archimedean method, phase composition using X-ray diffraction and microstructure using scanning electron microscopy with energy-dispersive X-ray spectroscopy. Mechanical properties, including hardness and toughness, were measured using Vickers microindentation.
The results demonstrate that Inconel 718 promotes densification and positively contributes to the mechanical performance of the composites. Combining freeze casting with pressureless SPS provides a viable method for fabricating cermet materials that incorporate ZrB and metallic reinforcements.
Keywords: ZrB; Inconel 718; Ultra-high temperature ceramics; Freeze casting; Spark plasma sintering; Cermet composites

Keywords: *nan*

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Mgo-pillared rgo anode active material for high-performance li/na-ion rechargeable batteries

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Abstract. Introduction:
Graphite, the most widely used anode in lithium-ion batteries (LIBs) [1,2], provides a theoretical capacity of only 372 mAh/g and faces safety concerns due to lithium dendrite formation. In sodium-ion batteries (SIBs), the situation is further constrained, with graphite offering only ~35 mAh/g owing to the larger Na ionic radius, which hinders intercalation. To address these challenges, we developed a MgOreduced graphene oxide (rGO) hybrid structure using a scalable mechano-thermo-chemical synthesis method.
Experimental:
The MgOrGO hybrid was prepared by ball milling graphene oxide with 10 wt.% MgH under an argon atmosphere at 200 rpm for 5 hours (BPR 1:70) using a Retsch PM200 planetary mill. The resulting powder was heat-treated at 300řC under vacuum for 5 hours. Electrodes were prepared using the active material, PVDF binder, and Super P in an 8:1:1 ratio. CR2032-type coin half-cells were assembled with lithium or sodium metal as counter electrodes and Celgard 3501 as separator. The electrolytes used were 1M LiPF in EC/DMC (1:1 v/v) for LIBs and 0.5M NaPF in EC/PC (1:1 v/v) for SIBs. Electrochemical measurements included cyclic voltammetry (0.13V, 0.2mV/s), electrochemical impedance spec-troscopy (1MHz10šHz), and galvanostatic charge-discharge cycling from 100mA/g to 2A/g.
Results:
The LIB and SIB systems provided reversible capacities of 447 mAh/g and 217 mAh/g, re-spectively, at 100mA/g. LIBs showed ~21% higher charge mobility than NIB. Post-cycling analyses revealed pronounced structural distortion for the anode of LIB as compared to that of SIB. Cyclic test revealed >90% coulombic efficiency for both LIB and SIB.
Conclusion:
The MgOrGO hybrid anode offers a practical and efficient solution for high-performance LIBs and SIBs through a simple, scalable synthesis route. The mechano-chemically activat-ed structural tailoring can be accomplished in 300řC. LIBs and SIBs exhibits capacities, respectively, 447mAh/g and 217mAh/g at 100mA/g with a capacity retention >90%.

Keywords: *nan*

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Ultra fast high-temperature sintering ofporcelain ceramics towards industrial applications

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Abstract. Traditional ceramics, including porcelain, are widely used in industry for the fabrication of durable components such as insulators, tiles, and sanitaryware. However, their large-scale production relies on high-temperature furnaces operating for several hours, resulting in significant energy consumption.
To address this issue, this work explores an alternative sintering method known as Ultra-fast High-temperature Sintering (UHS), with potential to sinter materials in a few seconds due to heating rates estimated above 103 řC/min. The goal is to assess the applicability of UHS to industrial porcelain compositions, aiming to drastically reduce energy use and processing time in the process.
Porcelain pellets were prepared from a spray-dried powder supplied by Costa Verde, an industrial manufacturer. The green compacts were first calcined to ensure complete organic burnout and facilitate sintering. The pellets were then sintered in a UHS system, composed of a carbon felt heater, kept in inert atmosphere, and connected to a DC power. Different parameters of the process, such as the electrical power and the sintering time, were conjugated to optimize the process.
The results reveal that significant densification can be achieved in less than 60 seconds, with relative densities exceeding 90%. The structural and microstructural properties of these ceramics were characterized and compared with those of conventionally sintered porcelain. These findings demonstrate that UHS enables rapid consolidation of porcelain without compromising the necessary properties of the material.
This approach shows strong potential for transforming conventional ceramic processes into faster, more cost-effective, and energy-saving methods.

Keywords: *nan*

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Tuning redox species solubility to maximize energy density in redox flow systems

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Abstract. Renewable energy sources like solar and wind face intermittency issues, necessitating Energy Storage Systems (ESS) to store excess energy during peak generation and release it during low power periods. While lithium-ion batteries have seen advancements, their widespread use is constrained by metal scarcity and high costs. Redox-Flow Batteries (RFBs) offer a more cost-effective alternative, particularly for extended storage durations. RFBs use liquid-state species dissolved in electrolyte solutions, providing longer operational life and cost benefits. However, Vanadium RFBs, though widely used, are expensive and vulnerable to corrosion. Organic redox compounds present a promising, cost-effective alternative due to their structural diversity and availability.

Aqueous RFBs are advantageous due to their non-flammable nature and superior ionic conductivity, but improving the solubility of redox-active species is key to enhancing energy density and preventing precipitate formation. Organic redox species often face solubility challenges that require complex synthesis. A novel, greener approach involves the use of battery additives, which improve performance without affecting battery reactions. Solubilizing additives link the aqueous solution and redox compound, enhancing solubility without requiring intricate molecular modifications, and also serving as supporting electrolytes.

This study proposes the incorporation of additives to boost the solubility of redox-active species such as Hydroquinone, Anthraquinone, Anthraquinone-2-sulfonic, Potassium ferrocyanide, Ferrocene, and TEMPO. Experimental evaluations combined with Gaussian Processes modeling will be used to identify the most effective additives for enhancing solubility and energy density. By integrating experimental studies and artificial intelligence techniques, this approach aims to develop scalable, sustainable energy storage solutions, supporting the integration of renewable energy into the power grid.

Keywords: *nan*

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Colour-tuned nanolaminate structures for flexible cigs building integrated photovoltaic

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Abstract. The rising demand for sustainable energy solutions and the integration of photovoltaics (PV) into everyday environments have highlighted the potential of thin-film technologies. Among them, Cu(In,Ga)Se (CIGS) solar cells stand out for building-integrated photovoltaics (BIPV) due to their high efficiency, stability, and compatibility with lightweight, flexible substrates. However, their typical dark blue colour limits the appeal in architecturally sensitive applications. To address this, recent efforts have focused on developing a variety of coloured CIGS solar cells that suffer minimal performance loss. In this study, nanolaminates-low-dimensional multilayer systems were designed to colour CIGS cells via reflection interference, tuning reflected wavelength values by adjusting layer thicknesses. Optical simulations using OpenFilters guided the design of SiO/SiN nanolaminate coatings to achieve spectrally selective red (R), green (G), and blue (B) appearances with minimal optical losses. These coatings were first deposited on soda-lime glass via plasma-enhanced chemical vapor deposition to ensure precise spectral control, then implemented on flexible CIGS devices. R, G, and B flexible solar cells were fabricated and assessed using UV-Vis-NIR spectrophotometry and current-density-voltage (J-V) measurements. While R and G variants showed some performance trade-offs, the B variant slightly improved efficiency due to anti-reflective effects. Recognizing that plain colours are more commonly used in buildings, a novel pseudo-white appearance was developed using a design inspired by RGB pixel arrangements in micro-LED technology. This approach used microfabrication to deposit and pattern R, G, and B coatings sequentially, allowing uniform visual blending while minimizing optical losses typical in uniformly white-tinted cells. The pseudo-white CIGS prototypes showed minimal efficiency loss and reduced angular colour dependence at incident angles below 40ř, supporting their suitability for BIPV applications.

Keywords: *nan*

Electric field assisted am for improved crystal structure control of polymers

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Abstract. Electric Polarization Assisted Additive Manufacturing (EPAM) has been used to enhance piezoelectric properties of Polyvinylidene Fluoride (PVDF) through electrical polarization and by increasing the stretching of the polymer during printing. The combination of electric polarization with the fused filament fabrication (FFF) has also enabled printing in unconventional orientations, such as sideways and upside down, demonstrating that the electric field exerts significant stress on the printed material. This additional stress can be used to control the crystal structure of polymers, particularly those that require recrystallization under mechanical stress to achieve functional properties like Poly L-Lactic Acid (PLLA).
PLLA is a polymer of great importance in the biomedical field due to its excellent mechanical properties, biocompatibility, biodegradability, and piezoelectric behavior. Its ability to convert mechanical stimulus into electric signals makes it suitable for applications such as sensors, energy harvesters, and tissue engineering. Among the various crystalline forms of PLLA, , , , and , the electromechanical properties are maximized in the phase, which is obtained by tensile stretching of the phase.
This work aims to modify a FFF equipment to apply an electric field during the printing of PLLA and evaluate the effects on phase formation and on the piezoelectric properties of the material. Furthermore, a study on how to modify the printer to enhance the formation of phase during EPAM of PLLA will also be presented. The phase is accessed using a combination of Fourier-transform infrared spectroscopy; differential scanning calorimetry analysis; and X-ray diffraction. EPAM enhances -phase formation throughout the samples.

Keywords: *nan*

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[CICECO] Health

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Characterization of the stool bacteriome of portuguese colorectal cancer patients

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Abstract. Colorectal cancer (CRC) is the second most incident type of cancer in Portugal, while rectal cancer comes in sixth. Gut microbiota dysbiosis has been increasingly associated with CRC risk, development, and progression. Despite this, to the best of our knowledge, the stool microbiota of Portuguese CRC patients has not yet been described. Thus, in this study, the stool microbiota composition of a Portuguese cross-sectional cohort (n = 50) of healthy individuals, adenoma-presenting, and CRC patients was analysed for the first time, using 16S rRNA gene amplicon sequencing and bioinformatics tools.
Alpha diversity indices (Observed, Pielou, Shannon, Simpson) showed no significant differences according to clinical group (p > 0.05). On the other hand, beta diversity (Bray-Curtis dissimilarity) revealed that the microbial community composition of healthy, adenoma-presenting, and CRC patients differed significantly. Microbiome community structure of all clinical groups, assessed by relative abundance, showed that, at the phylum level, Bacteroidota and Firmicutes were predominant in all clinical groups. Meanwhile, Proteobacteria increased in Adenoma and CRC groups, comparatively to the Healthy controls, while Actinobacteria showed the opposite trend. Bacteroides and Faecalibacterium were the most abundant genera across all clinical groups, however, genera such as Bifidobacterium were decreased along the adenoma-carcinoma sequence.
The present study brought new insights on the stool microbiome structure of Healthy individuals vs. Adenoma- and CRC-diagnosed patients, and a first step has been taken to identify possible diagnosis biomarkers of gut health. It is essential to study the CRC-associated microbiome in cohorts that have so far been overlooked. The characterisation of cohorts, such as a Portuguese cohort, may help with the future identification of microbial signatures for the early diagnosis of CRC carcinogenesis.

Keywords: *Gut microbiota, colorectal cancer, bacteriome, Dysbiosis, microbial community characterization*

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Engineered siv nanodiamonds: teos-based in situ doping during hfcvd for biomedical applications

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Abstract. Nanodiamonds (NDs) stand out among inorganic nanoparticles, such as quantum dots, gold nanoparticles, and iron oxide nanoparticles, due to their unique biocompatibility, chemical stability, and surface functionalization versatility (Dahman, 2017). Their exceptional hardness, non-toxicity, and resistance to photobleaching further enhance their potential for biomedical applications, including drug delivery, imaging, and biosensing (Leung et al., 2023). While nitrogen-vacancy (NV) centres in NDs enable long-term bioimaging, their broad emission spectra overlap with cellular autofluorescence and optical markers, limiting contrast and sensitivity in complex biological environments (Becker ; Becher, 2017). Silicon-vacancy (SiV) centres address these limitations with narrow near-infrared (NIR) emission (zero-phonon line at 738 nm), high photostability, and deeper tissue penetration, making them superior for diverse theranostic applications (Becker ; Becher, 2017). However, significant challenges remain in producing SiV-NDs with controlled size distribution, high SiV centre concentration, and scalable manufacturing processes suitable for clinical translation (Chen et al., 2024).

This work introduces a proof-of-concept method to fabricate SiV-NDs by fragmenting hot-filament chemical vapor deposition (HFCVD)-grown polycrystalline diamond films on silicon substrates. In situ doping with tetraethyl orthosilicate (TEOS) enables controlled SiV incorporation during film growth, bypassing complex post-processing steps and reducing contamination risks. The HFCVD process operates at moderate temperatures (700-900řC) and pressures, making it more economical than high-pressure high-temperature methods. This approach offers an alternative to NV-NDs with tunable opto-magnetic properties. The resulting SiV-NDs have potential applications in advanced biomedical sensing, real-time temperature monitoring in living cells, and magnetically guided targeted therapies with simultaneous imaging capabilities.

Keywords: *HFCVD, silicon-vacancy centres, nanodiamonds, theranostics*

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Enhancing chemotherapy: curcumin boosts vinblastine efficacy in pancreatic cancer treatment

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Abstract. Pancreatic cancer (PC) remains one of the deadliest malignancies, with a five-year survival rate under 10%, due to limited treatment options, poor therapeutic response, and drug resistance¹. Vinblastine (VBL), a microtubule inhibitor derived from natural alkaloids, is effective but highly cytotoxic². Curcumin (CUR), a flavonoid known for enhancing drug efficacy in various cancers, has been suggested as a P-glycoprotein inhibitor, a key player in drug resistance³. This study investigated whether CUR could enhance VBLs cytotoxicity in Panc-1 PC cells. Cells were treated with VBL (0.0510 nM) or CUR (1100 M) for 24, 48, and 72 hours. Viability was assessed via MTT assay, and IC50 values were calculated. Cells were then exposed to doses ranging from 1/16 to twice the IC50 of each drug, alone or combined, for 48 and 72 hours. Synergistic effects were analyzed and the most effective combinations were further examined for effects on cell cycle progression, reactive oxygen species (ROS), and apoptosis via flow cytometry. Both compounds reduced cell viability in a time- and dose-dependent manner, with VBL showing lower IC50 values. Synergistic interactions and increased cytotoxicity were observed at ¡ and 1 time the IC50 after 48 hours, and at 1 time the IC50 after 72 hours. Combined treatment induced G2/M cell cycle arrest at these concentrations. VBL alone at its IC50 concentration after 48 h caused G2/M arrest in 31.9% of cells, while the combined treatment increased this value to 70%. CUR alone increased ROS production at its IC50 concentration after 72 h, whereas the combined treatment increased the effect at both 48 and 72 h. CUR alone at the highest concentration also promoted early apoptosis, with stronger effects observed in combination treatments, particularly at 72 hours. These results suggest that CUR can potentiate VBLs anti-cancer activity in PC cells, requiring further investigation.

Keywords: *Panc-1 cells, flavonoids, vinblastine, synergy*

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Effect of polarization on the bone regeneration potential of plla-coated 316l stainless steel devices

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Abstract. Treatment of large bone lesions, including defects or fractures, often requires metallic implants. Currently most of those orthopedic implants are made from either titanium, cobalt-chromium, and 316L stainless steel alloys. Implants made from 316L stainless steel exhibit outstanding load bearing properties but lack in properties that stimulate the biological response. Those properties can be conferred to steel implants by using a coating that mimics the bone natural properties (Branquinho et al., 2021). The piezoelectric response present in bone is crucial role in its' regeneration and vascularization, making this property an excellent candidate to improve metallic implants (D'alessandro et al., 2021). In this work, continuing our studies towards the role of piezoelectricity in bone regeneration (Branquinho et al., 2021;Mageuta et al.,2021), a 316L stainless steel prosthetic device was coated with a thin film of the piezoelectric and biocompatible polymer Poly (L-lactic acid) (PLLA). The metallic substrate was submitted to a previous silanization treatment to ensure adhesion between the metal and coating. Following the results of our previous works (Barroca el al., 2011) which demonstrated that charges resulting from polarization promote the adhesion of proteins, the device was polarized through corona discharge. The produced devices presented a smooth surface, in which it was possible to indicate spherulites, which indicate of the presence of crystalline phases of PLLA. This crystalline was confirmed by X-Ray Diffraction (XRD), indicating that the samples contained -phase PLLA. The devices were evaluated in vitro regarding their biological performance, i.e. cytocompatibility and osteogenic differentiation potential. Following the in-vitro tests the device then was tested in-vivo by implanting them in Sprague Dawley rats. The in-vitro and in-vivo results demonstrated that the functionalization of PLLA coating with polarization is an effective method for stimulating bone tissue regeneration and beneficial for cytocompatibility, biocompatibility, and osteogenic differentiation when compared to their non-polarized counterparts.

Keywords: *Piezoelectricity, Polarization, Bone regeneration, PLLA, 316L Stainless Steel*

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Environmental exposures in perinatal care: awareness, practices, and barriers among portuguese healthcare professionals

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Abstract. Environmental exposure during the periconceptional period can significantly impact reproductive and fetal health (ACOG,2021). This study aimed to evaluate the knowledge, practices, and attitudes of perinatal healthcare professionals in Portugal regarding environmental exposures, a topic seldom addressed in clinical practice.
A cross-sectional survey was conducted among gynecologists/obstetricians, obstetric nurses, and nutritionists, using a structured questionnaire distributed through national professional organizations (Grindler et al., 2018). Data were collected anonymously via Google Forms between September and December 2024. Statistical analysis was performed using SPSS v30.
A total of 126 responses were collected. While smoking and alcohol were commonly addressed (91.3% and 90.5%), environmental chemical exposure and plastic use were rarely discussed (14.3% and 8.7%). Lack of time (49.2%) and insufficient knowledge (61.5%) were the main barriers. Only 9.5% were familiar with ACOG and FIGO guidelines (Di Renzo et al., 2015). Gender, age, profession, and years of experience significantly influenced clinical practices. The majority expressed interest in further training, especially through webinars.
This is the first national study exploring the awareness of environmental exposures in perinatal care among Portuguese professionals. The findings reveal critical gaps in knowledge and routine practice, highlighting the need for enhanced education and guideline dissemination to promote safer reproductive healthcare (Marie et al., 2026).

Keywords: *Environmental exposures; Perinatal care; Reproductive health; Health professional education*

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Redesigning monoclonal antibody manufacturing: the power of ionic liquids

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Abstract. During the past decades, significant advances have been achieved in the biopharmaceutical arena, including the use of novel monoclonal antibodies (mAbs). The complexity and instability of these biological products make their production, purification, and preservation more challenging, driving up costs and extended timelines (Gooch et al., 2017). Biopharmaceuticals are generally 12x more expensive than chemical drugs, mainly due to their manufacturing process, encompassing the mAbs production (upstream) and the several subsequent stages (downstream) (Gooch et al., 2017). Therefore, the demand for cost-effective and sustainable downstream processing of mAbs is leading to the development of innovative single-step, biocompatible, and continuous purification approaches. Ionic liquids (ILs) offer a promising solution in their manufacturing process, due to their chemical structure diversity, which allows for precise tailoring of their biological, chemical, and physical properties (Ventura et al., 2017). In one hand, they can be used as phase-forming compounds in Aqueous Biphasic Systems (ABS) or they can be immobilized onto a solid matrix as Supported Ionic Liquids (SILs). Their use in the downstream process significantly improves separation performance and selectivity, making it easier and cost-effective. This study investigated the extraction and purification of mAbs from cell culture supernatants containing anti-hepatitis C virus (anti-HCV) mAbs, using IL-based ABSs and SILs. It was found that ABS using 1-butyl-3-methylimidazolium bromide ([C4mim]Br) allowed a recovery yield of 85.4% and a purity level of 92.4%. Also, by using two SIL chromatographic columns with [SSi][C3mim]Cl and [SSi][N3888]Cl, it was possible to selectively purify anti-HCV mAbs in two distinct approaches: (i) in flowthrough mode and (ii) in a bind-and-elute mode. Afterwards, the protein profile and integrity of mAbs were confirmed by SDS-PAGE. In conclusion, this study demonstrates that ILs, both in ABSs or SILs, allowed the development of a promising, simpler, and more cost-effective single-step purification strategy for mAbs, ultimately improving their accessibility.

Keywords: *Biopharmaceuticals; Downstream processing; Supported Ionic Liquids; Aqueous Biphasic Systems; Purification*

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Before going intracellular: exploring the temperature-dependent emission behaviour and stability of a genetically encoded probe in intracellular-mimicking buffers

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Abstract. Temperature is more than just a number; within living cells, its a dynamic biophysical parameter vital for regulating cellular function. Yet accurately estimating local heat production at subcellular resolution remains a considerable challenge. Luminescence thermometry provides a promising solution due to its remote nature, high thermal sensitivity and spatial resolution (Brites et al., 2023). These luminescent thermometers can detect minor temperature variations by turning them into changes in fluorescence properties. Among the several luminescent probes reported, fluorescent protein-based thermometers have demonstrated excellent intracellular targeting capability (Okabe et al., 2018).

This work explores the potential of ELP-TEMP, a genetically encoded fluorescent thermometer, for detecting intracellular temperature variations. ELP-TEMP is composed of an elastin-like peptide fused with two fluorescent proteins (mVenus and mTurquoise2), which reached a maximum temperature sensitivity reported of 45.1% per řC (Vu et al., 2021). When coupled with the appropriate localisation sequences, this fluorescent protein can target specific organelles.

Our focus is on characterising the temperature-dependent emission behaviour and thermal stability of ELP-TEMP to calculate the melting temperature (Tm</sub>), defined as the point at which 50% of the protein is in its unfolded state. Controlled heating and cooling cycles are performed at a rate of 0.5řC/min. Emission spectra are acquired upon excitation at 405nm over a 2095řC range. The data is used to generate calibration curves in aqueous buffers such as PBS, phosphate-buffered saline. These tests will be extended to environments that mimic intracellular conditions to investigate the impact of media composition on the accuracy of thermal readout.

Although still in progress, this work aims to create highly sensitive probes suitable for biological use. Ultimately, this research will contribute to the development of accurate intracellular thermometry techniques, with an emphasis on monitoring mitochondrial temperature. Mitochondria are particularly interesting organelles due to their involvement in metabolism, thermogenesis, and disease.

Keywords: *Genetically Encoded Fluorescent Probe; Temperature-Dependent Emission; Thermal Stability; Aqueous Buffers; Luminescence Thermometry*

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Avian immunoglobulin (igy) antibodies as a biopharmaceutical countermeasure to disrupt antimicrobial resistance (amr)

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Abstract. Methicillin-resistant Staphylococcus aureus (MRSA) is one of the most deleterious pathogens within Antimicrobial Resistance (AMR), a critical worldwide health threat mostly driven by antibiotic misuse (Ahmed et al., 2024; Ali Alghamdi et al., 2023). Avian Immunoglobulin Y (IgY) antibodies offer a promising countermeasure, leveraging their polyclonal character to detect several epitopes on an antigen and minimize the resistance likelihood (El-Kafrawy et al., 2023). This work investigates the potential of IgY targeting MRSAs Penicillin-Binding Protein 2a (PBP2a), isolated from the egg yolk of hyperimmunized hens resorting to a patented purification process based on selective precipitation with a biopolymer, as a biopharmaceutical for MRSA infections. IgY formulations- lyophilized or not, with or without excipients- were prepared and stored under different conditions. The IgY aggregation and structural integrity were assessed by Size Exclusion-High Performance Liquid Chromatography (SE-HPLC) and Circular Dichroism (CD), respectively. Antigen recognition was evaluated by dot-blot and Enzyme-Linked Immunosorbent (ELISA) assays, while toxicity was examined in human colorectal adenocarcinoma cell lines and rodent models. Excipients reduced protein aggregation, the antigen recognition was maintained over time, and no toxicity was confirmed. Moreover, non-specific IgY were covalently immobilized on cellulose-based materials through glutaraldehyde cross-linking and periodate oxidation methods, envisioning their use as diagnostic platforms for pathogens. These materials were characterized by Attenuated Total Reflectance Fourier-Transformed Infrared (ATR-FTIR) and Scanning Electron Microscopy (SEM), and IgY immobilization was confirmed by dot-blot. Furthermore, a novel and sustainable IgY purification methodology using graphene aerogels (GA) from pear pulp as adsorbents was explored. GA was characterized through Raman, ATR-FTIR, elemental analysis, and zeta potential measurements, while IgY purity and aggregation before and after adsorption were assessed by SE-HPLC. These findings support IgY as a safe and effective biopharmaceutical towards MRSA infections, addressing AMR challenges.

Keywords: *Antimicrobial Resistance; Methicillin-resistant Staphylococcus aureus; Biopharmaceuticals; Avian Immunoglobulin Y*

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Dissolvable single-polysaccharide microneedles for transdermal delivery of lidocaine

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Abstract. Traditional administration methods for local anesthetics are often accompanied by some discomfort or pain in the case of hypodermal injections or a slow skin diffusion when using creams and ointments. Recently, microneedles (MNs) gained relevance as innovative drug administration systems that can overcome the barrier of the stratum corneum and swiftly deliver drugs in a minimally invasive manner.(Bauleth-Ramos et al., 2023) In this work, dissolvable pullulan microneedles (PL-Lid MNs) were produced by micromolding and thoroughly characterized to gauge their potential for the non-invasive administration of the local anesthetic, lidocaine. These MNs displayed excellent mechanical strength, enduring up to 1.5 N per needle without breakage. The ability to pierce the stratum corneum was validated by insertion in excised human abdominal skin where the MNs successfully reached the dermis. The dissolution capabilities of the produced MNs were assessed in an agarose hydrogel model as well as in a porcine skin model and showed complete dissolution of the MN tips after 10 min. The release profile of lidocaine in PBS displayed a lidocaine release of 79% after 10 min. The resazurin assay was used to verify the safety of PL-Lid MNs, including three skin cell lines (HaCaT, 3T3, and RAW 264.7), with all showcasing cell viabilities over 80% after being exposed to the MNs. In addition, real-time fluorescence imaging by confocal microscopy was employed to study the effect of the released lidocaine on a sensory neuron cell line, revealing that the lidocaine released from PL-Lid MNs had a similar effect as a lidocaine solution (14 mM). In sum, our results demonstrate that PL-Lid MNs are an efficient system for the administration of lidocaine, with a low on-set time (<10 mins) owing to its swift dissolution and potent drug release, contrasting the conventional methods for local anesthetic administration.

Keywords: *Microneedles, pullulan, lidocaine, local anesthesia, drug delivery*

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Global changes associated with sacroiliac dysfunction and their normalization by manipulation: a pilot study

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Abstract. Background: Anatomically, sacroiliac joints are classified as diarthroses, being the strongest and most stable joints within this group, crucial for supporting bodyweight, as all body weight above the pelvis is transmitted from the sacrum to the iliac bones through the SIJ and through the acetabulum to the lower limbs(Cohen et al., 2013; Kapandji, 2000; Szadek et al., 2024). Sacroiliac joint dysfunction (SIJD) is a disruption in the joint's normal biomechanics, resulting in either hypomobility or hypermobility(Camelo ; Zão, 2018).
Objective: To map the symptomatic changes, in terms of pain and muscle tone, in presence of SIJD.
Methods: A sample composed of 41 students from the University of Aveiro, were recruited voluntarily. Twenty-one participants presented SIJD. These 21 participants were randomized into three groups of 7 (experimental - EG, sham - SG and control - CG). The sample was randomly allocated into three groups (EG; SG; CG) by block randomization (1:1:1 allocation ratio). All participants responded to the visual analogue pain scale (VAS), were tested with a Pressure Algometer and the MyotonPro, device to assess muscle tone. Differences were calculated as post - pre values.
Results:
Pre-post differences showed a significant difference for the internal gastrocnemius between the EG and the SG, the left epicondyle between the EG and CG, the left epitrochlea between the EG and CG, the right short portion of biceps between the EG and SG, the left occipital insertion of the upper trapezius muscle between the EG and CG and the EG and SG and the left posterior superior iliac spine between the EG and CG.
No significant differences were found for myotonometer measurements.
Conclusions:
Sacroiliac manipulation significantly changed pain pressure tolerance in several locations of the body, namely the internal gastrocnemius, epicondyle, epitrochlear, short portion of biceps, occipital insertion of the upper trapezius muscle and the posterior superior iliac spine.

Keywords: *Sacroiliac dysfunction symptoms, Sacroiliac dysfunction signs, Sacroiliac joint Manipulation*

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Amino acid-based ils as new excipients for small rnas stabilization

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Abstract. It is increasingly evident the revolutionary impact of RNA in the development of innovative medicines for a wide range of hard-to-treat diseases. However, several obstacles persist in conventional RNA bioprocessing technologies, hindering the clinical progress of RNA-based therapeutics. A current major challenge is related to the high tendency of RNA to degradation, presenting a labile nature and intrinsic low stability that significantly difficult the long-term storage of this biomolecule while maintaining its biological activity (Pedro et al., 2018).
In this context, amino-acid-based ILs (AA-ILs) may play a significant role in overcoming these challenges. By virtue of their tunable and biocompatible character, and the ability to establish preferential interactions with RNA bases, AA-ILs represent important candidates to preserve the structural stability of RNA (Quental et al., 2019).
This work aims to investigate AA-ILs as excipients to maintain and/or enhance the structural stability of RNA, and the impact of their chemical structure in the creation of competitive and cost-effective RNA stabilization platforms. A new set of AA-ILs comprising cholinium, L-arginine, L-lysine and L-histidine as cations combined with chloride, DL-aspartate, L-tyrosine, or L-phenylalanine as anions were synthesized and characterized. Several AA-ILs in concentrations from 0.1 to 10 mM were tested, and their effect in preserving RNA structure during long-term storage of RNA at room temperature was evaluated. Circular dichroism (CD) spectroscopic measurements were performed and amongst the studied AA-ILs, [Ch][Asp], [His][Asp], [Arg][Asp] and [Lys][Asp] arise as the most promising ones by maintaining RNA structural stability. Cell viability studies performed onto two different human cell lines further confirmed the non-cytotoxic nature of the synthesized AA-ILs.
Overall, the AA-ILs herein exploited represent effective RNA stabilizers, capable of meet the critical demand of RNA with high integrity, structural stability and biological activity, with potential use as excipients in RNA-based biotherapeutics.

Keywords: *RNA-biopharmaceuticals, Amino acid ionic liquid, Excipients, Long-term storage, Stabilization*

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Development of an innovative biomaterial for in situ application in the context of spinal cord injury

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Abstract. Spinal Cord Injury is a challenging neurological disorder, due to the lack of methods for regeneration and function restoration (Ashammakhi et al., 2019). Patient recovery depends on axonal regeneration and current treatments cannot significantly induce regeneration. The objective of the study is the development of a controlled drug release biomaterial to be implanted in situ, promoting targeted axon regeneration after injury.
Two natural polymers, chitosan and alginate, were tested, due to their biocompatibility and biodegradability. Membranes were produced through solvent casting technique. A plasticizer and cross-linkers were employed to enhance mechanical performance and control degradation rate. A pro-regenerative drug that promotes axonal regeneration and functional recovery was encapsulated as a nanoparticle and incorporated in the biomaterial. Zinc oxide nanoparticles were also explored to assess anti-inflammatory and antioxidant properties. The materials have proved to be easy to manipulate, by adding the nanoparticles, presenting several interesting characteristics such as their mechanical performance and their biocompatible and non-toxic behaviour, tested in vitro. Drug-encapsulated nanoparticles were found to aggregate in one of the membranes, which can be a good way to allow regulated, gradual drug release. Nanoparticles were also tested in injury models, showing favourable results on neurite outgrowth, decrease of lesion extension, and the expression of pro-regenerative proteins.
This study has produced and optimised a novel prototype drug delivery system, showing promising results in improving the pharmacological regeneration capabilities of already-approved drugs.

Keywords: *Spinal cord injury, Neural regeneration, Drug delivery system, Biopolymers, Chitosan, Alginate*

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Exploring aqueous two-phase systems to fabricate microscale architecture

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Abstract. Bulk hydrogels are comprised of nanoporous polymer networks, and thus restrict cell motility, cell-cell interactions, and nutrient diffusion in bioengineered tissues. To overcome these challenges, interest has shifted toward the fabrication of interconnected microporous hydrogels, which improve nutrient transport, facilitate cell migration, and promote tissue ingrowth. Current fabrication methods, however, often rely on cytotoxic porogenic agents, limiting scalability and biocompatibility. [1-3] This work presents a tunable and bioprintable microporous hydrogel bioink composed of extracellular matrix mimicking polymers, exploiting aqueous two-phase systems (ATPS) to imbue interconnected porosity. By leveraging the immiscibility between the proteins in the pre-gel phase and aqueous porogen solutions, we developed a simple, yet robust method to generate porous networks. Crucially, this approach allows for cell inclusion, minimizing washing steps and allowing favorable cell proliferation and function. This platform offers a scalable, biocompatible route to fabricate functional porous scaffolds in physiological conditions that uphold cellular activity, being highly advantageous for biomedical applications.

Keywords: *ATPS; Porous Hydrogels; anisotropy; 3D Bioprinting*

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Development of a quantification method for p53-minicircle dna

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Abstract. p53-minicircle DNA (mcDNA) is a promising biopharmaceutical candidate for cancer gene therapy. Although much attention has been given to purification strategies for mcDNA, a dedicated and robust quantification method is still lackinglimiting process development, quality control, and broader application (Almeida, 2020; Diamantino, 2016; Valente, 2021).
In this work, we present the successful development of a chromatographic method for the quantification of p53-mcDNA using ion exchange chromatography. The mcDNA was produced via the culture of transformed Escherichia coli and extracted using a commercial kit. The extracted samples were then used to develop and optimize the quantification method, focusing on resolution, reproducibility, and specificity toward mcDNA in complex mixtures.
This new analytical approach allows accurate and reliable quantification of mcDNA, contributing a valuable tool for the development and standardization of mcDNA-based therapeutics.

Keywords: *Biopharmaceutical, Minicircle DNA, Analytical method development, minicircle DNA quantification*

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Development of a new oxygen flowmeter and its applicability in healthcare

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Abstract. For decades, hospitals have relied on traditional oxygen flowmeters to control oxygen delivery to patients. However, these flowmeters often exhibit low accuracy, with the actual flows ranging from 48% to 185% of the nominal values displayed on the device (1). There is a growing need for more accurate equipment with automation capabilities to improve oxygen management efficiency.
Develop a new digital oxygen flowmeter that can accurately monitor and adjust the oxygen flow based on predefined parameters.
A digital flowmeter using thermal mass flow technology was developed to operate within hospital oxygen networks and comply with ISO 15002:2023 standards. In addition, a software for controlling the flowmeter was created according to the IEC 62304:2006 standard.
A measurement system analysis was conducted by comparing the digital flowmeter with conventional flowmeters using a calibrated flow analyzer (TSIő 5203) and the same protocol used for both devices. The digital flowmeter was also subjected to a performance test to assess its autonomous response using a patient simulator (Riegelő 370A930).
A digital flowmeter suitable for hospital use was successfully developed. This flowmeter demonstrated an accuracy of ś1%, compared to ś58% for conventional flowmeters. In addition to direct control via the devices screen, the digital flowmeter can be controlled through medical prescriptions and interfaces with a central system that receives various biosignals, including peripheral oxygen saturation, heart rate, and respiratory cycle. The digital flowmeter was able to adjust the flow within 1 second, enabling synchronization with inspiration for pulsed flow.
The digital flowmeter offers precise control and automation, addressing the limitations of traditional flowmeters and providing a more efficient solution for managing oxygen delivery. Further research is required to assess the long-term performance of the proposed model in real-world clinical environments.

Keywords: *Medical Device; Oxygen; Oxygen flowmeter; Respiratory Rehabilitation*

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Zn(ii)-flavonoid/bacterial nanocellulose membranes for wound healing applications

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Abstract. Chronic, deep and infected wounds - often associated with multidrug-resistant bacteria - continue to be a significant clinical challenge worldwide. An ideal wound dressing should be biocompatible, flexible, non-adherent and capable of absorbing exudates while maintaining a moist environment conducive to healing. Additionally, it should offer biological functionalities such as antioxidant and antimicrobial activities [1]. Bacterial nanocellulose (BNC), a nanostructured polysaccharide synthesized by non-pathogenic bacteria, has emerged as a promising material due to its biocompatibility, high water-retention capacity, gas permeability and suitability for the incorporation of bioactive agents [2]. Among the various bioactive agents, flavonoid-based metal complexes stand out for their structural versatility and enhanced biological activity, often resulting from synergistic interactions between the metal and the flavonoid ligand. These interactions can give rise to mechanisms of action that are not achievable with purely organic compounds [3,4].

In this work, two new zinc(II) complexes comprising either quercetin or morin along with the N-donor ligand 1,10-phenanthroline - were synthesized in situ in the presence of BNC membranes, ensuring their effective incorporation into the biopolymer matrix. The resulting membranes were thoroughly characterized using X-ray diffraction (XRD), attenuated total reflectance - Fourier transform infrared spectroscopy (ATR-FTIR), thermogravimetric analysis (TGA) and scanning electron microscopy with energy dispersive spectroscopy (SEM-EDS). Tensile testing was also conducted to access the impact of metal complex incorporation on the mechanical performance of BNC, while antioxidant and antibacterial assays were performed to evaluate the biological potential of the resulting materials. Overall, the incorporation of flavonoid-based zinc(II) complexes enhanced the biological performance of BNC, highlighting its applicability as a multifunctional wound dressing.

Keywords: *Flavonoid-based metal complexes, Bacterial nanocellulose, Antioxidant activity, Antimicrobial activity, Wound healing*

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Photo and chemo-therapy with upconversion nanoparticles for multimodal therapy of melanoma skin cancer

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Abstract. Upconversion nanoparticles (UCNPs) exhibit several remarkable optical properties, including excitation by near-infrared (NIR) light, which enables deep tissue penetration, multiple distinct emission bands across a wide range of wavelengths, long luminescence lifetimes, and high photostability. These features make them particularly attractive for various biomedical applications. Mesoporous silica nanoparticles (MSNs), functionalized with nanovalves or specific coatings, have been explored for controlled and targeted drug delivery, where therapeutic agents are encapsulated within the nanopores, allowing spatiotemporal release[1]. Among the promising approaches, photoactivated drug delivery systems have drawn considerable interest due to their versatility and potential. One relevant application is in the treatment of melanoma, an aggressive form of skin cancer[2] with a rising global incidence[3]. In advanced stages, conventional therapies often fail to achieve complete tumour eradication, resulting in poor prognoses[4, 5].

This work aimed to produce UCNPs that were coated with a mesoporous silica shell to form coreshell nanoparticles, which were further functionalized with thermos-responsive retro-DielsAlder nanovalves and loaded with doxorubicin (DOX), a chemotherapeutic drug used in melanoma treatment. Upon exposure to 980 nm near-infrared (NIR) excitation, DOX release was successfully triggered in the culture medium.

Exposure to functionalized UCNPs decreased the viability of the tested melanoma cell lines. Subsequently, the toxicity mechanisms were evaluated and showed that while individual treatments with either the functionalized UCNPs or NIR irradiation alone had no effect on reactive oxygen species (ROS) production, their combination significantly increased ROS levels in two of the three tested cell lines. This combined treatment also led to notable increases in apoptotic, necrotic or both type of cells death percentages on all cell lines. Overall, these findings highlight the potential of these nanoparticles with thermos-responsive gating mechanisms as effective platforms for targeted drug delivery in melanoma therapy.

Keywords: *melanoma, upconversion nanoparticles, chemotherapy, ROS production, cell death*

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Ionic liquid mediated recovery of recombinant nucleic-acid biopharmaceuticals.

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Abstract. Due to fast development times and efficient immune responses, messenger RNA(mRNA) vaccines were vital to combat the COVID-19 pandemic. Since then, research into mRNA therapies has progressed, with applications in the treatment of cancer, autoimmune diseases, regenerative medicine and replacement therapies(Shi et al., 2024). However, the widespread use of mRNA therapeutics is challenged by high production costs. The current gold standard method for mRNA production is in vitro transcription, followed by several purification steps. This process is complex, expensive and dependent on reagents with limited availability(Rosa et al., 2021).

To overcome this, a novel bioproduction method using yeast is underway. This work focuses on the downstream processing of bioproduced mRNA, namely on the development of an integrated and cost-effective method to extract mRNA from yeast intracellular compartments. To achieve this, a set of bio-based ionic liquids(IL) was synthesized and characterized, and mRNA produced in a modified yeast strain according to standard protocols.

After production, the yeast cells were incubated in an aqueous solution of ILs. After centrifugation, the integrity of the recovered mRNA was evaluated using agarose gel electrophoresis, with its purity being evaluated with UV spectroscopy. Initial results revealed that ILs comprising carboxylic acids as anions were effective at yeast cell disruption and the consequent release of the target biopharmaceutical. Through electrophoresis, it was possible to see that the integrity of the recovered mRNA is maintained. However, trough UV spectroscopy, it was clear that the amount recovered of this molecule was lower than the control, using glass beads. Therefore, ongoing work focuses on the optimization of Il mediated lysis to improve the recovery yield of mRNA, and the subsequent integration of the extraction step with initial clarification using aqueous biphasic systems.

Overall, this study highlights the potential of ILs as lysing agents to recover biopharmaceuticals from yeast.

Keywords: *mRNA vaccine; Ionic Liquid; Bioproduction; Cell disruption*

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Strategies to enhance the antidiabetic effect of chrysin: metal complexation and nanoencapsulation

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Abstract. Diabetes mellitus remains a significant global health problem, underscoring the urgent need for novel and effective therapeutic strategies (Xiao, 2022). Chrysin, a natural flavonoid with demonstrated antidiabetic and antioxidant properties, is hindered by poor bioavailability and limited potency (Lin et al., 2020). To overcome these limitations, this study explores two complementary strategies: (i) the coordination of chrysin with Cu(II) and Co(II) ions to generate bioactive metal complexes, and (ii) the encapsulation of these complexes within mesoporous silica nanoparticles (MSNs) to enhance their delivery and therapeutic efficacy. Two chrysinmetal complexes were synthesized using both conventional solvothermal and microwave-assisted synthesis, and fully characterized by X-ray diffraction (XRD), thermogravimetric analysis (TGA), infrared spectroscopy (FTIR), and UVVis spectroscopy. Their in vitro biological activity was evaluated in intestinal (Caco-2), hepatic (HepG2), and adipocyte (3T3-L1) cell models. The complexes enhanced glucose uptake in HepG2 and 3T3-L1 cells, while reducing glucose absorption in Caco-2 cells. Moreover, gene expression analysis revealed modulation of key metabolic regulators, SREBP-1c and ChREBP. These results support the use of metal complexation as a strategy to potentiate the antidiabetic activity of chrysin and highlight its potential as a scaffold for developing metal-based antidiabetic agents. Ongoing studies are focused on assessing MSN-encapsulated complexes to further optimize their therapeutic performance.

Keywords: *Diabetes; chrysin; metal complexes; mesoporous silica nanoparticles.*

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Ru-hkust analogue: a possible candidate for osteoarthritis drug delivery

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Abstract. Osteoarthritis (OA) is a degenerative joint disease that causes pain and stiffness, consequently reducing the patients quality of life. Current medications include corticosteroids, non-steroidal anti-inflammatory drugs (NSAIDs), and hyaluronic acid, which focus on alleviating inflammation. Of all the alternative techniques, intra-articular injections are considered the most effective for treating AO (Richard et al, 2023), but it is difficult to ensure the controlled release of the drug and its long-term effectiveness. For that reason, it is urgent to find new approaches to enhance the delivery of drugs and improve patients lifestyles. Metal-organic frameworks (MOFs), crystalline compounds made of metal ions and organic linkers, offer promising features for drug delivery (Ding et al, 2022). Their highly tunable porosity allows high drug loading and controlled release, helping drugs reach chondrocytes deep within the cartilages extracellular matrix (ECM). MOFs can also be engineered to respond to internal stimuli such as pH (Xiong et al, 2020), enabling site-specific drug release. These features, combined with chemical and thermal stability, make MOFs strong candidates for OA treatment.

In this study, ruthenium-based MOFs (Ru-MOFs), structurally analogous to MOF-199, were synthesised via microwave-assisted methods, producing particles of various sizes. One Ru-MOF was found to be safe for macrophages and chondrocytes up to 50 ţg/mL, with no pro-inflammatory response.

To explore practical application, this MOF was incorporated into polyvinyl alcohol (PVA) gels at three concentrations. Rheological testing revealed concentration-dependent changes, indicating that MOF inclusion alters the hydrogels network architecture, potentially improving performance under physiological conditions. However, mechanical and tribological tests (e.g., compressive strength, friction) showed no significant differences compared to control samples. While these preliminary findings suggest limited impact on certain parameters, further analysis is ongoing and may reveal subtler or long-term effects under more complex conditions.

Keywords: *MOFs, osteoarthritis, nanoscale, ruthenium, drug delivery*

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Bioorthogonal engineering of immune cella ssemblies: creating a new generation of smart living materials

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Abstract. This study integrates immune cell surface engineering to create living building blocks while addressing the challenges of current immunotherapies, particularly systemic delivery. The focus involves using immune cells as platforms for covalent ligation with a bioorthogonal polymer through the Strain-Promoted Azide-Alkyne Cycloaddition (SPAAC) reaction. (Han, 2018; Nagahama, 2018) In this approach, NK-92 MI cells, a natural killer cell line with enhanced cytotoxicity, are employed as the biological units for assembly and the objects of metabolic glycoengineering (MGE). By introducing exogenous sugar analogs into cellular metabolic pathways, the foundation for covalent ligation is provided, as the immune cells then take control of the system, forming high cell density self-regulating living materials. (Kim, 2021) Emphasizing the precise click chemistry demonstration, the study delves into the chemical intricacies of immune cell modification, highlighting the interplay between MGE and SPAAC reactions. (Kim, 2021; Lavrador, 2024) By integrating NK-92 MI cells into this framework, the study not only tailors cellular interactions but also demonstrates enhanced functional outcomes, particularly the ability to target and eliminate cancer cells. This work provides insights into developing biofunctional living materials with potential applications in immunotherapy, offering innovative biomedical solutions by leveraging the autonomy, cytotoxic potential, and dynamic responsiveness of this new class of immune living materials.

Keywords: *immunotherapy; metabolic glycoengineering; bioorthogonal click-chemistry; living materials*

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Alginatelysozyme amyloid nanofibrils hydrogels as carriers for a novel chrysin-based chemotherapeutic metallodrug

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Abstract. Cisplatin, a platinum-based chemotherapeutic, represented a major breakthrough in cancer treatment (Ghosh, 2019), but its clinical use is often limited by dose-dependent toxicity (Elmorsy et al., 2024). In the search for safer and more effective alternatives, flavonoid-based compounds have gained increasing attention due to their ability to modulate oxidative stress, induce apoptosis, and inhibit cancer cell proliferation (Kopustinskiene, Jakstas, Savickas, ; Bernatoniene, 2020). In our previous work, we reported the synthesis, physicochemical characterization and biological evaluation of a novel one-dimensional coordination polymer (CP) based on chrysin, 1,10-phenanthroline and Cu(II). Herein, we report the incorporation of the CP into an alginate-lysozyme amyloid nanofibrils hydrogel and the assessment of its potential for cancer therapy. The hydrogels were characterized in terms of their structural and functional properties. Characterization techniques included DRX, FTIR, TGA, SEM, rheological analysis, and compression testing. In vitro release and biological studies were also conducted to evaluate the therapeutic performance and safety of the system. The CP loaded hydrogels exhibited antiproliferative activity against A375 and HepG2 cancer cell lines, induced cell cycle arrest and promoted ROS production, supporting their potential as an effective and target platform for cancer conquering.

Keywords: *Cancer therapy; Chrysin-based coordination polymer; Alginate-lysozyme amyloid nanofibrils hydrogel; Drug delivery system; Antiproliferative activity; ROS production; Cell cycle arrest*

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Additive manufacturing of lithium disilicate glass-ceramics using high solid-loaded water-based feedstocks

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Abstract. Lithium disilicate (LiSiO) glass-ceramics are widely used in dental prosthetics due to their excellent mechanical and aesthetic properties. However, current processing methods are limited to conventional techniques such as CAD/CAM milling or lost-wax casting. Exploring additive manufacturing (AM) alternatives could enable the production of highly customized prostheses with complex geometries and personalized colour gradients.
This work focuses on developing water-based feedstocks, and processing strategies, for the additive manufacturing of lithium disilicate glass-ceramics to be used in dental applications. For it, a non-stoichiometric lithium disilicate glass (SiOLiOKOPOAlOZnO) was synthesized via melt-quenching, and subsequently milled using alumina-based media. The resulting powder (20 ţm) was characterized by X-ray diffraction, scanning electron microscopy, differential thermal analysis, and hot-stage microscopy. The powder Zeta potential and chemical stability in aqueous media were evaluated before and after it surface functionalization with polyethylenimine (PEI), a cationic polyelectrolyte.
Two feedstocks were developed: i) a hydrogel-based (Pluronic F-127) ink comprehending high solid load (50 vol%) for Direct Ink Writing (DIW), and ii) a water-based photocurable suspension of low viscosity (4 Paůs at 10 sź) and high solid load (45 vol%) suitable for Digital Light Processing (DLP). Models were successfully fabricated using both AM techniques and subsequently sintered. Post-sintering analysis revealed lithium disilicate as the primary crystalline phase, with needle-like crystals embedded in a residual glassy matrix. The microstructure contributed to high densification and flexural strengths close to 300 MPa, meeting ISO 6872 requirements for Class 3 dental prostheses. These findings demonstrate that the developed water-based systems provide an eco-friendly, user-friendly, and thermally efficient route for fabricating high-performance, customized dental prostheses with excellent shape fidelity and surface quality.

Keywords: *nan*

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Extraction and clarification of mrna from yeast using aqueous biphasic systems

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Abstract. In recent years, messenger RNA (mRNA)-based vaccines have demonstrated their improved safety and efficacy in providing protection against infectious diseases (Rosa et al., 2021). Although traditional vaccines such as those utilizing live attenuated, subunit, or inactivated pathogens remain effective, mRNA vaccines offer several advantages, including streamlined manufacturing processes, elimination genomic integration risks, rapid development times, and flexibility to be adapted to other targets. Current strategies for mRNA vaccine development rely on in vitro transcription (IVT), requiring materials not easily accessible and complex protocols (Zhang et al., 2019).

With the demand for robust production methods, this work aims to develop efficient and cost-effective strategies for mRNA extraction from yeast cells. Aqueous biphasic systems (ABS) were tailored to extract and preserve mRNA bioproduced from yeast while removing other cellular contaminants, providing a biocompatible and non-toxic platform for mRNA clarification.

Bioproduced genetic material was extracted through a mechanical lysis process using glass beads with vigorous stirring. Samples were applied in ABS composed of polyethylene glycol 8000 g/mol (PEG 8000) and dextran 70000 g/mol envisaging to purify the target mRNA. Results revealed that RNA is preferentially partitioned to the dextran-rich phase, which provides a more hydrophilic environment, while proteins and other hydrophobic components remain in the PEG-rich phase. RNA integrity was evaluated through gel eletrophoresis while quantification and relative purity was determined through A260/A280 nm ratio from spectrometric measurements. Typically, ratios of approximately 2.0 are indicative of pure RNA formulations (Poovakka et al., 2019), and the results demonstrated an improvement towards achieving this ratio, with the outcome being influenced by the polymer concentrations. Future work focuses on the determination of the obtained purification factors and optimization of ABS compositions to improve partitioning.

Overall, the current results have demonstrated the potential of ABS to develop improved strategies for the clarification of mRNA bioproduced from yeast.

Keywords: *mRNA; aqueous biphasic systems; clarification; yeast*

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Improving meningoencephalic tuberculosis treatment: assessing rifampicin solubility and stability using deep eutectic systems approach

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Abstract. Tuberculosis is caused by Mycobacterium tuberculosis and remains a globally prevalent disease of significant epidemiological importance (WHO, 2024). One of the major challenges is treatment failure, particularly in meningoencephalic form affecting children under 10. This issue is influenced by the properties of one of the key active pharmaceutical ingredients (API), Rifampicin - specifically its poor water solubility, limited permeability across the blood-brain-barrier (BBB), and its palatability, which is especially critical in pediatric treatments (Daniel et al., 2019). Therefore, enhancing Rifampicins water solubility, bioavailability, pharmacotechnical properties, palatability and BBB transposition could significantly improve treatment adherence and increase the likelihood of treatment success. Deep eutectic solvents (DES) have demonstrated considerable potential in pharmaceutical development. Studies have shown that DES can increase drug solubility by several orders of magnitude compared to water, as reported for other drugs in the literature, improving biocompatibility and, consequently, enhancing bioavailability (Pedro et al., 2021). This study investigated the potential of a series of DES to enhance the solubility and stability of Rifampicin in solution. A set of DES were tested with the goal of developing a robust solvent system suitable for human use, prioritizing components with Generally Recognized as Safe (GRAS) status. Given rifampicins pH sensitivity in solution, particular focus was placed on systems with pH values near neutrality. Among the tested systems, those composed of betaine and 1,3-propanediol in varying molar ratios demonstrated pH levels closest to neutral. Based on the data obtained so far, these DES formulations have shown the capacity to significantly improve Rifampicin solubility compared to both literature reports and experimental controls. Future work focus on evaluating stability, palatability, and pharmacotecnical parameters for rifampicins formulations suitability for additive manufacturing (pharmaceutical 3D printing). This personalized approach, tailored to individual patient needs, offers a promising proof of concept that may help improve treatment outcomes.

Keywords: *Mycobacterium tuberculosis, blood-brain-barrier, pediatric treatments, neoteric solvents, 3D printing*

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Deep eutectic solvents as a novel class of excipients for messenger rna-based formulations toward enhanced stability

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Abstract. The stability of in vitro transcribed (IVT) mRNA remains a major bottleneck in the development of effective and robust mRNA-based therapeutics and vaccines (Rosa et al., 2021). Traditional formulation approaches often prove insufficient in preserving mRNA integrity under stress conditions, thus requiring the search for novel excipients and improved stabilization strategies. Deep eutectic solvents (DES), particularly those composed of biocompatible and low-toxicity components, have gained attention for their ability to stabilize labile biomolecules due to their unique solvation properties (Yadav ; Venkatesu, 2022). This study addresses the challenge of mRNA instability by investigating the use of DES as stabilizing agents for IVT mRNA. Using a model mRNA encoding green fluorescent protein (GFP), several DES systems were evaluated, focusing on formulations based on natural and safe constituents. The main objective was to assess the protective effect of these solvents under adverse conditions, including elevated temperatures (up to 60ŕC) and exposure to nucleases (RNase A). To monitor the structural integrity and degradation kinetics, a combination of analytical techniques was applied, including agarose gel electrophoresis, circular dichroism (CD), and UV/Vis spectroscopy. In addition, in vitro translation assays were performed to evaluate the functional integrity of DES-stabilized mRNA, with GFP expression detected by Western blot as an indicator of translational competence. The results demonstrated that specific DES formulations effectively preserved both the structural and functional integrity of IVT mRNA, providing resistance to hydrolytic and enzymatic degradation. Overall, this work highlights DES as promising excipient candidates for enhancing the thermal and enzymatic stability of IVT mRNA, paving the way for improved formulation strategies in mRNA-based biopharmaceuticals.

Keywords: *mRNA stability, deep eutectic solvents, biopharmaceutical formulations*

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Improving the manufacturing of mrna with thermoreversible aqueous biphasic systems and ionic liquids

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Abstract. Despite the potential of messenger RNA (mRNA) vaccines in the prophylaxis and therapeutics of human diseases, mRNA nanomedicine production is still a complex and expensive process that requires improved technologies to produce more stable and widely accessible products, meeting a timely and sufficient manufacturing capacity (Pardi et al., 2018).
Aqueous biphasic systems (ABS) are liquid-liquid systems formed upon mixing two aqueous solutions of different components above given concentrations and have been widely used in the purification of biomolecules (Pereira et al., 2020). Ionic liquids (ILs), molten salts comprising organic cations with a remarkable structural diversity, can enhance the stability of RNA (Quental et al., 2019) and contribute to improving the selectivity of ABS for mRNA clarification (Ventura et al., 2017). This work aims to integrate the production and initial clarification steps of mRNA manufacturing, using IL-based thermoreversible ABS, simplifying subsequent purification steps.
During the integration of mRNA production, an in vitro transcription reaction was performed in the presence of the chosen ABS components (dextran with an average molecular weight of 450.000-650.000 g/mol and polyethylene glycol 3350 g/mol), resulting in mRNA synthesis, with good yield and stability. Then, ILs with different hydrophilic characters were added (2% w/w), as adjuvants to the system, to investigate their effect on mRNA selectivity. Preliminary mRNA extraction experiments using the developed IL-ABS indicate that, in the presence of ILs, the partition profile of mRNA is altered. Promising systems for mRNA purification have been identified. Current work focuses on improving mRNA clarification, in the presence of ILs, by removing major contaminants.
In conclusion, the development of a new integrated production-clarification platform, resorting to thermoreversible ABS comprising ILs, may be considered an effective alternative approach for mRNA manufacturing.

Keywords: *mRNA; ionic liquids; thermoreversible aqueous biphasic systems; in vitro transcription*

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Exploring bobath practices in neurological physiotherapy: preliminary findings of an exploratory qualitative study.

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Abstract. Physiotherapy plays a critical role in reducing the burden of functional disability associated with the rising global prevalence of stroke (Feigin et al., 2022). Despite its importance, limited insight exists into what physiotherapists actually do in clinical practice (Kwakkel et al., 2023). This lack of descriptive data contributes to the gap between research and clinical implementation, hindering effective evidence translation (Kwakkel et al., 2023). This study aimed to analyse therapeutic interventions used by neurological physiotherapists with postgraduate Bobath education, using the Rehabilitation Treatment Specification System (RTSS) framework (Tessa et al., 2018; Van Stan et al., 2019).

Thirty-two experienced neurological physiotherapists were purposively selected from rehabilitation centres, hospitals, and private clinics. A qualitative descriptive design was employed, involving video-recorded treatment sessions with stimulated recall, followed by semi-structured interviews. Intervention data were extracted from videos, session notes, and interview transcripts. All therapist actions were analysed and categorized using the RTSS framework, focusing on specific treatment ingredients intended to drive change.

Analysis revealed consistent use of multiple RTSS treatment ingredient categories. Therapists commonly conducted subjective examinations exploring clinical history, daily functioning, and psychosocial context. Communication strategies, including verbal cueing, patient education, and interaction, were used to enhance engagement. Sitting and standing postures were frequently observed, with manual facilitation and mobilization techniques employed to guide movement, transfers, and postural alignment. Sensory stimulation, postural orientation, and task-specific activities, such as walking and balance exercises, were also prevalent. Environmental structuring was used to optimize performance and safety.

In conclusion, Bobath therapists implemented a diverse range of treatment ingredients targeting sensory-motor function, postural control, task performance, and patient engagement. The RTSS framework enabled clearer specification of therapist actions and highlighted the comprehensive, multidimensional nature of Bobath-based practice.

Keywords: *Bobath concept, clinical practice, intervention, RTSS framework*

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[CICECO] Sustainability

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Flash sintering of ti(c,n)-alo composites

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Abstract. Ceramic based hard materials, such as hardmetals and cermets, are typically produced by powder metallurgy, a process that usually requires temperatures higher than 1400 žC and application of pressure through different sintering techniques (i.e. Hot Pressing, Hot Isostatic Pressing, or SinterHIP) to achieve full densification. In recent decades, the development of alternative sintering techniques has opened new possibilities for producing such materials with a much lower energy input and towards the needed decarbonization route. One such technique is Flash Sintering (FS) in the Electric Current Assisted/Activated Sintering (ECAS) group which takes advantage of an electric field that is forced to pass through the sample, in a phenomenon known as a Flash event. However, this technique is strongly dependent on the intrinsic materialt's properties, namely its electrical conductivity, since the Joule effect will play a crucial role in heat generation. Therefore, densifying conditions need to be adjusted on a material-by-material basis. In this work, the feasibility of densifying Ti(C,N)-Al2</sub>O3</sub> composites was studied by characterizing the effect of FS sintering parameters (composition, temperature, electric field, electric current, etc.) in sintering and densifying these materials.

Keywords: *Ti(C,N), Al2O3, Composites, Flash Sintering, Hard materials*

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Characterization of chitosan based films through electrical impedance spectroscopy

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Abstract. This study investigates the impact of neutralization on the electrical and electromechanical properties of chitosan films, aiming to assess their suitability for green electronic applications [1]. Neutralized and non-neutralized films were characterized, with a focus on their dielectric behaviour and electromechanical force sensitivity. Nuclear magnetic resonance (NMR) confirmed the impact of neutralization, as evidenced by changes in amine and carboxylic functional groups. UV-Vis spectroscopy revealed a band gap of approximately 5.1 eV, consistent with chitosan [2]. Electrical impedance spectroscopy (EIS) demonstrated that neutralization stabilized the dielectric response of the films, effectively reducing the influence of surface-free charges. Equivalent circuit modelling of the EIS data provided impedance parameters that are essential for engineering design. Nyquist plots highlighted a predominantly capacitive behavior, with a high dielectric constant observed at low frequencies, as expected for such materials. Mechanical tensile testing was performed to understand the macroscale behavior of the films. Subsequently, their electromechanical response was analyzed through force sensitivity tests using a custom-built setup. These tests indicated that triboelectric effects dominate charge generation, with this behavior strongly influenced by surface characteristics and the choice of contacting polymer. These findings suggest that neutralization enhances the controlled electrical properties of chitosan films, positioning them as potential candidates for triboelectric-based electronic devices and sensors [3].

Keywords: *Chitosan film, electromechanical characterization, dielectric properties, electrical impedance spectroscopy.*

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Direct ink writing of silicon nitride-based ceramics: linking rheology, printability and densification

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Abstract. Silicon nitride (SiN) ceramics are among the most promising materials for advanced structural applications due to their exceptional combination of mechanical strength, thermal stability, and chemical resistance. However, processing complex geometries by conventional manufacturing methods is difficult and costly. Additive manufacturing (AM), particularly Direct Ink Writing (DIW), has emerged as a viable strategy for shaping such ceramics, allowing greater design freedom and material efficiency. Yet, the successful implementation of DIW for dense SiN parts depends critically on the optimization of both the paste formulation and the printing parameters. Paste rheology must be finely tuned to ensure extrudability, shape retention, and interlayer adhesion, while printing parameters such as nozzle diameter, infill pattern, and deposition speed strongly influence final part quality. Furthermore, post-processing methods like cold isostatic pressing (CIP) can be an option to mitigate porosity and to enhance the mechanical performance of the final parts. Despite the progress stated in literature concerning the use of DIW for ceramics, printability limitations for silicon nitride-based ceramics remain a central issue, requiring careful adjustment of paste composition and printing conditions.
In this context, the present work combines rheological tuning of SiN aqueous-based pastes with a systematic analysis of DIW printing parameters and post-processing strategies aiming to attain high dense silicon nitride parts. The integration of CIP further enhanced densification and structural integrity. Through this integrated approach, dense ceramic parts with high mechanical integrity were fabricated, reaching relative densities of ~99% and flexural strengths up to 650 MPa, and microhardness values of ~1475 HV2, confirming the potential of DIW as a viable route for structural manufacturing of this particular ceramic material.

Keywords: *Silicon nitride, additive manufacturing, robocasting, printability, rheology, ceramic pastes, extrudability, mechanical properties.*

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Sustainable recovery of metals from e-waste: optimizing metal oxide dissolution in organic acids

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Abstract. The significant increase in the use of electronic devices has led to the generation of electronic waste (e-waste) or waste from electrical and electronic equipment (WEEE), which is expected to reach 120 billion tons by 2050 (Xia ; Ghahreman, 2024). This increase highlights the urgent need for sustainable methods of e-waste management and metal recovery, as e-waste contains valuable materials such as metals, glass, and plastics.

Hydrometallurgy commonly uses leaching agents as HCl, HNO, and HSO, but these chemicals have significant environmental impacts. Organic acids, such as citric, acetic, and oxalic acids, emerge as more sustainable alternatives (Habbache et al., 2009), (Oke et al., 2024).

This study investigates the use of sustainable (bio)organic acids to dissolve metal oxides such as zinc and copper oxide, focusing on factors such as acid concentration, temperature, reaction time, and solid-to-liquid ratio to optimize metal recovery from e-waste.

According to preliminary results, more than 90 % of the metal oxides dissolve in optimum conditions. Atomic absorption spectroscopy (AAS) and total reflection X-ray fluorescence spectrometry (TXRF) were used to compare the concentrations of dissolved metals. Replacing inorganic acids with organic acids promotes sustainable metal recovery and supports the circular economy.

Keywords: *Electronic Waste, Acid Leaching, Dissolution, Metal Oxide, Metal Recovery*

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Natural uv shields from the ocean: mycosporine-like amino acids as future cosmetic ingredients

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Abstract. The beauty and personal care industry is experiencing a profound shift as it moves toward cleaner, more sustainable formulations. Growing concerns about the safety of synthetic chemicalsoften linked to irritation, allergic responses, and toxicityare prompting both consumers and manufacturers to seek out natural alternatives. At the same time, environmental sustainability has become a key priority, pushing the industry to embrace eco-conscious practices and ingredients (Singh et al., 2021).

Among the most promising natural resources are marine organisms, especially algae, which offer a rich array of bioactive compounds with cosmetic benefits. Of particular interest are mycosporine-like amino acids (MAAs), which naturally absorb ultraviolet A (UVA) radiation, making them strong contenders to replace traditional chemical UV filters. Another standout is R-phycoerythrin (R-PE), a bright red protein pigment found in red algae, valued not only for its vivid, non-toxic coloration but also for its antioxidant and photoprotective properties that help shield skin from environmental stress (Vaz et al., 2025).

These marine-derived compounds offer multifunctional benefits that align well with current trends in skincare innovation. However, challenges remain in effectively extracting and stabilizing these sensitive molecules to ensure consistent performance in product formulations.

To address this, a disruptive extraction method that employs environmentally friendly solvents, specifically aqueous eutectic mixtures, to isolate and preserve MAAs and R-PE was developed. This process outperforms conventional solvent-based techniques in terms of efficiency. Additionally, the resulting extract offers enhanced stability under heat and light and demonstrates exceptional ability to absorb the UV radiation, and high-energy visible (HEV) blue light spectrum.

Keywords: *Macroalgae, Biorefinery, Cosmetics*

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Acidogenic fermentation of food waste and byproducts using mixed microbial cultures: state of the art, opportunities and challenges

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Abstract. This work provides a comprehensive overview on the research related to short-chain organic acids (SCOAs) production through acidogenic fermentation (AF) of food waste and by-products, using mixed microbial cultures (MMC). It highlights the current state of the art, explores emerging opportunities, and discusses key challenges that must be addressed to advance the knowledge in this field.

In the European Union, ca. 50.3 million tons of waste are annually produced, with household kitchens and food industry waste accounting for ca. 23% (Battista et al., 2022). In recent years, AF, using MMC, has been gaining attention for converting the organic food waste and byproducts into valuable biomolecules, particularly SCOAs, carboxylic acids comprised of 2 to 6 carbon atoms with potential as substrates for bioproducts production, particularly polyhydroxyalkanoates (PHAs). Traditionally, SCOAs are obtained chemically from non-renewable raw materials, like oil, or by pure cultures of bacteria. Recent studies have demonstrated the potential of MMC to convert different waste streams into SCOAs, including spent frying oil, cane molasses, dairy industry wastewater, meat and bone meal, and cheese whey, among others (Oliveira et al., 2023; Varghese et al., 2022). The optimization of the process parameters for SCOAs maximization yield has been the key focus, and included biomass and substrate pre-treatment, pH, temperature, retention time, organic loading rate, and headspace pressure.

Despite the promise of AF, challenges remain in the low concentrations of SCOAs, their fractionation and purification (Ramos-Suarez et al., 2021). Nonetheless, the integration of SCOA production through a three-step process has shown potential to significantly reduce costs, making PHAs production commercially viable. Due to the environmental and economic impact of conventional fossil-based SCOAs production, AF represents a eco-friendly alternative. However, this field still faces limitations in terms of scalability, economic feasibility, and real-world applicability, underscoring the need for further research and development.

Keywords: *Acidogenic Fermentation, Food Waste, Short-Chain Organic Acids, Mixed Microbial Cultures*

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Optimization of the extraction process from used lithium-ion batteries

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Abstract. Lithium-ion batteries (LIBs) are essential devices for portable energy storage. Their increasing use has heightened the demand for efficient recycling technologies [1][2][3]. The recovery of valuable metals such as nickel (Ni), cobalt (Co), manganese (Mn), and lithium (Li) is critical for both economic and environmental reasons. However, the significant variability in battery composition makes complete recovery through a single process challenging [2][4][5]. Given their high metal content, LIBs represent a significant secondary source of these critical materials. The combination of mechanical pretreatment with hydrometallurgical techniques has proven to be an effective strategy for metal recovery [6][7].
This study aimed to develop a process to optimize the extraction of one of the metals from inorganic leachatesobtained through the treatment of lithium nickel manganese cobalt oxide (NMC) cathodes with concentrated acidusing the solvent extraction method. Metal concentrations were quantified using Total Reflection X-ray Fluorescence (TXRF) spectroscopy or Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES). The work began with a synthetic solution containing only two metals, A and B. Different aqueous-to-organic phase ratios were evaluated to determine the optimal conditions for the selective extraction of A. The results showed effective recovery of A from spent LIBs, with the ideal phase ratio identified to maximize selectivity. Additionally, the effect of pH on the extraction process was investigated, and an optimal pH range between 4.5 and 6 was established for efficient metal separation. To better simulate the complex composition of real LIBs and assess its influence on the extraction process, the synthetic A and B solution was spiked with C, D, and F. This approach provided further insight into process optimization under more realistic conditions.
Note: It is worth mentioning that the data acquired during this work are currently being used to support the preparation of a patent application.

Keywords: *Cobalt, Battery Recycling, solvent extraction, metal, Circular economy.*

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A bio-based story: how can agrifood by-products contribute to materials production and their end-of-life biodegradability?

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Abstract. Can agri-food by-products be used to develop new materials? Do they confer important properties?
Despite the usual end-of-life of these by-products, there is already a strong demand for their use, opening doors to new challenges and new achievements.
Potatoes and tomatoes have some of the largest global production shares, resulting in numerous by-products from their cultivation to their consumption. With focus on potato washing slurries to recover starch and on tomato by-products as additives (ripe and unripe fruits and tomato pomace, the latter coming from the processing of fruits into paste), the development of 100% bio-based filaments for 3D printing has become possible. By pre-treating these by-products and processing them using various technologies, the recovered starch can be plasticized into thermoplastic starch (TPS) compatible with production of functional materials. However, on its own, when processed into filament, it lacks the mechanical strength required in FDM, which can be overcome by adding tomato by-products. These not only add color to the TPS but also significantly alter its properties, influencing the mechanical performance of these materials and their biodegradability. Since circular economy must be present in all that is made, this work contributes to reduce the use of fossil based raw materials by giving a second chance to agrifood by-products, enhancing the possibility of having 100% biodegradable bio-based filaments in additive manufacturing.
Keywords: Thermoplastic starch, Tomato by-products, Bio-based additives, Additive manufacturing, Fused Deposition Modelling

Keywords: *nan*

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Frictional wear behavior of an b4c-sic composite sintered at low temperature from b4c and si.

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Abstract. Boron carbide (BC) is a ceramic material highly valued for its exceptional hardness and toughness. However, its traditional fabrication requires very high sintering temperatures, around 2300řC, leading to significant energy consumption. To overcome this, additives are introduced during sintering to lower the required temperatures. Among them, silicon has proven effective, reducing the sintering temperature to 1400řC with a holding time of 15 minutes and an applied pressure of 75 MPa. This process produces a BC-SiC composite with mechanical properties comparable to pure BC, achieving a hardness of about 30 GPa while maintaining similar toughness.
Given its promising features, the wear behavior of this composite was evaluated and compared to the reference material through fretting wear tests. These tests used 6 mm diameter balls made of different materials: diamond, alumina (AlO), and borosilicate glass, under identical conditions. Test parameters included loads of 5 N and 1 N, a frequency of 10 Hz, and 100,000 cycles. Friction coefficients were recorded for each combination. Post-test analyses involved optical microscopy, SEM-EDS for wear track characterization, and profilometry to measure material loss. Results showed two-body abrasion from diamond, while alumina and glass caused three-body abrasion, with glass producing the most significant wear.

Keywords: *nan*

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Pebax-based membranes for co capture

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Abstract. Roughly 2.4 billion people are exposed to dangerous household air pollution (WHO, 2022). Different gases contribute to indoor air pollution, including volatile organic compounds (VOCs), inorganic gases, and emerging contaminants. One of the most common indoor contaminants is carbon dioxide (CO2), which can be associated with reduced professional performance and health problems such as respiratory and heart diseases (López et al., 2023). The implementation of compact indoor CO2 capture technologies is of great importance. Nevertheless, technologies for direct air capture are still scarce or non-existent for commercial use. Ionic liquids (ILs) are a class of solvents with unique properties, including low volatility, low vapor pressure, non-flammability, low corrosiveness, and high selectivity for CO2, which can support the development of sustainable processes. Nonetheless, ILs generally present high viscosity, which leads to poor mass transfer and kinetics. To address this problem, our group has already proposed the incorporation of ionic liquids in sub-micron carbon capsules (ENILs) to achieve virtually instantaneous kinetics to absorb CO2, improve mechanical stability, increase mass transfer rates, and lower the energy regeneration demand at mild conditions (Silva et al., 2020). Our group also proposed the incorporation of ENILs in the active layer in hollow fiber modules for dehumidification (Qasem et al., 2025). This work proposes to evaluate these approaches of incorporating ILs in polymeric membranes based on gas permeation measurements by the time lag method. The aim of the work is to develop membranes for indoor air quality by creating new pebax formulations comprising ionic liquids, as shown in Scheme 1, aiming at develop a new separation unit.

Keywords: *Physical and chemical CO2 capture; Amino acid-based membranes; Solution-diffusion model; Membrane technology; Indoor CO2 direct air capture.*

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The role of circular economy practices, and decision support system for sustainable performance

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Abstract. This research explores how Circular Economy practices, coupled with Decision Support Systems, contribute to sustainable performance within the context of coastal ecosystem restoration. Focusing on the Centro Region in Portugala biodiversity-rich area facing mounting environmental pressuresthe study investigates the integration of social, economic, and environmental Circular Economy practices in decision-making. The theoretical foundation combines the Unified Theory of Acceptance and Use of Technology with constructs from sustainability science and stakeholder engagement. The research identifies the critical role of UTAUT factorsperformance expectancy, effort expectancy, social influence, and facilitating conditionsin influencing the adoption of DSS. Furthermore, it examines how eco-design, stakeholder collaboration, and technology awareness mediate or moderate the relationship between CE practices and sustainable innovation. Using a quantitative, cross-sectional design with structured questionnaires targeting key stakeholders (e.g., sustainability officers, environmental engineers), the study aims to statistically analyze these interdependencies through Structural Equation Modelling. The research contributes both theoretically and practically: it bridges the gap between technology acceptance models and CE practices, and it offers actionable insights for enhancing environmental performance, economic resilience, and community engagement. Ultimately, this study seeks to inform marine ecosystem management strategies that are both technologically supported and socially inclusive, thereby facilitating sustainable innovation in regions under environmental stress.
Keywords: Circular Economy, Decision Support System, Sustainable Performance, UTAUT, Marine Ecosystem Management
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Research Summit 2025
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Development of thermoplastic materials by modification of biopolymers of marine origin

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Abstract. Over the past two decades, there has been an increasing interest in the use of bioresources as a response to the exhausting supply of fossil fuels and the serious environmental issues caused by their extensive use (Müller et al., 2019). The oceans are a vast source of functional biopolymers, particularly polysaccharides. Amongst the more common marine polysaccharides are alginates, chitin (and its derivative chitosan) and carrageenans, which can be extracted from algae and seafood wastes, and have been already used in various applications, from the biomedical field to the food packaging industries (Wong et al., 2021).
Chemical modification is a widely used strategy to enhance or alter the properties of polysaccharides. By introducing, substituting, or removing specific functional groups along the polysaccharide chains, their physicochemical properties, such as hydrophobicity and thermal processability, can be significantly improved, allowing these polymers to extend their uses to new applications (Cumpstey, 2013).
In this context, this PhD work aims to develop marine polysaccharide derivatives by chemical modification, to be used as thermoplastics or additives in thermoplastic formulations. In particular, this project has been centered on the modification of chitosan by reaction with aliphatic isocyanates. These derivatives showed good thermal stability and improved hydrophobicity, when compared to the initial polysaccharide. Afterwards, some thermoplastic formulations were prepared by melt-mixing the derivatives with commercial thermoplastics, namely poly(propylene) (PP) or poli(hydroxybutyrate) (PHB), thus substituting part of these thermoplastic with a bio-based derivative. Some of the formulations were already processed by injection molding, and some preliminary mechanical characterization tests were performed. Next, the formulations will be investigated regarding their thermal and mechanical properties, as well as other relevant features, such as interaction with water, biodegradation or antimicrobial capacity.

Keywords: *nan*

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Effect of seed particles colloidal stability in the production of bimodal e-pvc products

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Abstract. The particle size distribution control in the production of poly(vinyl chloride) homopolymers in aqueous emulsion (E-PVC) plays a crucial role in the plastisols rheological properties as well as in the final product performance.. (Pham et al., 2009) (Shin, Youk, ; Kim, 2014)
This work explores the use of preformed polymer particles ("seeds") in a new polymerization reaction to achieve bimodal particle size distributions. Based on the conventional emulsion polymerization process, previously described in the literature, modifications were made to obtain seeds with larger particle sizes. (Shin, Youk, ; Kim, 2014) To evaluate the performance of these seeds, the colloidal stability was investigated using an indirect method based on changes in the mediums electrical conductivity. The resulting dispersions were centrifuged, and conductivity was measured before (latex) and after centrifugation (supernatant). An increase in the supernatant conductivity was interpreted as an indication of emulsifier release from the particles to the surrounding medium. For seeds with similar particle sizes, it was observed that micelle formation in the presence of cetyl alcohol leads to larger and more stabilized particles. Cetyl alcohol adsorbs onto the particle surfaces, enhancing stabilization and hindering emulsifier release. These results were corroborated by measurements of colloidal stability (CS) and zeta potential (). It was therefore concluded that particles exhibiting lower emulsifier release presented more negative zeta potential values, consistent with stronger electrostatic repulsion and, consequently, higher colloidal stability. However, it was also found that high colloidal stability of the seed particles is unfavorable in the subsequent polymerization, as overly stabilized particles tend to resist further growth, thus compromising the achievement of the desired bimodal structure.
The correlation between emulsifier release, medium conductivity, and zeta potential proved to be an effective approach for characterizing the robustness of colloidal systems in E-PVC, contributing to the development of materials with optimized rheological properties.

Keywords: *Poly(vinyl chloride), emulsion polymerization, particle size distribution, seeds, colloidal stability.*

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A circular approach to tanned leather waste valorization through additive manufacturing

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Abstract. The global leather industry generates substantial quantities of solid waste, raising environmental concerns due to the limited biodegradability and heavy metal content of tanned residues. This work addresses the challenge of leather waste management by exploring its valorisation through additive manufacturing (AM), aligning with circular economy principles. The research focuses on developing leather polymer composites (LPCs) using biodegradable polymer matrices suitable for extrusion-based AM technologies, particularly fused filament fabrication. A first approach involved analysing the crystallisation kinetics of LPC using a polylactic acid matrix to assess the impact of leather waste powder (LWP) on the polymeric crystalline structure. Using differential scanning calorimetry and kinetic models, it was demonstrated that LWP accelerates cold crystallisation and promotes the formation of three-dimensional crystalline structures by acting as a nucleating agent. These effects were confirmed by lower crystallisation temperatures, increased crystallinity, and reduced half-time for crystallisation. Polarised optical microscopy supported these findings, revealing higher number of spherulitic structures. The second approach focused on developing LPC with a bio-based and biodegradable polymeric blend composed by poly(butylene adipate-co-terephthalate) and thermoplastic starch. Extruded filaments containing 1040 %vol of LWP were produced and characterised through tensile testing, scanning electron microscopy, thermogravimetric analysis, and biodegradation trials. The addition of 1020% LWP improved tensile strength and stiffness, albeit reducing elongation at break, while over 20% the filaments were unable to be processed therefore discarded. Morphological analysis revealed voids and agglomerates at higher LWP content, impacting printability and mechanical integrity. Printed parts retained over 90% disintegration under composting conditions within 90 days, confirming their biodegradability. The work so far demonstrates the potential of LWP as a functional filler for biopolymers in AM, advancing material development while addressing environmental and industrial waste challenges. The findings contribute to the field of sustainable design and circular manufacturing strategies using bio-based composites.

Keywords: *nan*

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Influence of amylose content and matrix complexity on thermal transitions and crystallization kinetics of thermoplastic starch for extrusion applications

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Abstract. Understanding the thermal transitions and crystallization behavior of thermoplastic starch (TPS) is critical for optimizing its processability, particularly in blown film extrusion. This study investigates the hypothesis that both amylose content and matrix complexity, specifically the presence of proteins and phenolic compounds, significantly influence TPS crystallization kinetics and thermal properties. TPS granulates were prepared from three rice-based sources: purified rice starch, underutilized rice flour, and pigmented rice grain, spanning amylose contents from 15.8% to 29.5% and varying levels of non-starch components. Differential scanning calorimetry revealed that higher amylose content enhanced the glass transition, cold crystallization, and melting temperatures, reflecting increased molecular organization and thermal stability. Crystallization enthalpy also increased with faster cooling rates, suggesting accelerated nucleation. However, this effect was more pronounced in high-amylose and less complex matrices. In contrast, it is proposed that greater quantities of phenolic compounds and proteins in rice by-products hinder TPS crystallization through hydrogen bonding and steric effects, leading to smaller spherulites, broader crystallization peaks, and reduced crystallization enthalpy. Non-isothermal kinetic analysis using the Avrami, Tobin, and Kissinger models indicated that more complex matrices promote heterogeneous nucleation and three-dimensional crystal growth, with activation energies increasing with matrix complexity and decreasing as amylose content increases. X-ray diffraction and polarized optical microscopy confirmed the presence of VH-type crystalline structures and distinct spherulite morphologies across the TPS samples. These findings support the hypothesis that both amylose content and matrix complexity significantly modulate TPS crystallization kinetics and thermal behavior under dynamic processing conditions. The results offer valuable guidance for designing TPS materials for extrusion-based manufacturing and for utilizing starch-rich by-products in bioplastic development.

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Development of new biobased stimulants to improve the production of resin by pine trees

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Abstract. Resin, or oleoresin, is a translucent, viscous liquid, extracted from conifers of the genus Pinus (Pine), which is composed of a volatile fraction, turpentine, rich in monoterpenes and a non-volatile fraction, rosin, rich in diterpenic acids. These compounds have numerous industrial applications spanning from disinfectants and cleaning products, to paints and adhesives, fragrances or even pharmaceuticals. (Silvestre, et al, 2008 ; Neis et al., 2019; Yadav et al., 2016)
The extraction of resin from pine trees has several steps, among which the application of stimulant agents, traditionally based on sulfuric acid, that promotes high resin production. However, this approach has several associated risks, both for the environment and for those who manipulate the stimulants, making it imperative to develop more sustainable alternatives. Thus, the objective of the present study is the development of new stimulants based on natural compounds with increased safety and productivity. The results obtained so far and under a patenting process demonstrate that under micro-tapping conditions some of the developed stimulants enabled resin productions several times higher than those obtained using the conventional sulfuric acid stimulants. In addition, we also aim at developing new applications of resin acids and its derivatives, namely for the surface treatment of cellulose-based materials.

Keywords: *nan*

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Sustainability transitions in higher education: socioeconomic metabolism, ecological footprint, and the path to circular and innovative universities

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Abstract. Higher Education Institutions (HEIs) play a crucial role in promoting sustainability through research, teaching, and institutional processes. However, there are a significant gaps and lack of a systematic integration in the HEIs sustainability plans, evaluation and mitigations with ecological footprints, socioeconomic metabolism analysis, and circular economy principles. By combining these concepts, this approach explores sustainability transitions in HEIs. The study will intend to assess and integrate HEIs socioeconomic metabolism, sustainability, and innovation under the framework of the circular economy, social metabolism and highlights their interconnectedness. The Best practices, research gaps, and areas for innovation will be found through a scoping review of sustainability reports from top 25 international universities and, through a comprehensive case studies and quantitative analysis, this research will identify opportunities to minimize waste generation, optimize resource use, and recommend sustainable infrastructure in HEIs social capital operations. The research will investigate strategies to change conventional Universities into circular, impactful, and innovation-driven establishments using a study methodology and scenario-based modeling. The research will highlight how these initiatives can reduce ecological footprints in HEI while enhancing campus resilience and promoting a culture of Sustainability stewardship. This study will explore the development of Socioeconomic and ecological footprint scenarios to foster sustainability on university campuses, integrating innovative practices and system-level changes. It will also provide a roadmap for universities to model sustainability and drive systemic change within and beyond their communities. Finally, it will develop a footprint to framework scenario of Sustainability through the lens of Socioeconomic metabolism and associated cost-benefits in University of Aveiro. Policymakers, academic leaders, and sustainability practitioners will be able to operationalize systemic change toward more resilient, environmentally friendly, and socially conscious higher education institutions with the help of the findings.
Keywords: Ecological Footprint, Circular economy, socioeconomic Metabolism, Sustainability, Higher Education Institutions, Innovations

Keywords: *nan*

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Hydrophobicity enhancement of water-based screen-printed sensors for freshness evaluation of packaged fish

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Abstract. Expiration dates do not accurately reflect fish freshness, resulting in unnecessary waste, which reaches up to 35% at retail and consumption.[1] Alternatively, pH-responsive colorimetric sensors can evaluate freshness by changing color in response to volatiles compounds (TVB-N) released during fish spoilage. Although these sensors can be directly printed onto fish packaging, many commonly used solvents are not food compatible. Water-based inks offer a great alternative, however, high humidity inside the packaging can lead to the sensor degradation.

In this study, a cost-effective colorimetric plastic sensor with high sensitivity to TVB-N, released by packaged salmon, was developed using screen-printing. Anthocyanins integrated in a polysaccharide matrix were used to produce the ink, which was optimized and screen-printed to produce saturated uniform sensors. Due to the hydrophilicity of the sensor, a polydimethylsiloxane (PDMS) layer was applied using a spray-gun. This additional coating prevented wash off while maintaining sufficient permeability for trimethylamine diffusion. When exposed to salmon the sensor underwent a noticeable color change, indicating its ability to predict spoilage.

Due to its effectiveness and simplicity, this bio-based sensor allows improvement of conventional packaging by offering a more reliable method to evaluate fish freshness. Its integration in packaging not only helps reducing food waste, but also provides the consumer greater confidence when buying the product. Moreover, using screen-printing enables scalable production of this sensors, making accessible for the food industry.

Keywords: intelligent packaging; colorimetric sensor; ink; anthocyanins; PDMS; trimethylamine.

Keywords: *nan*

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Development of a low-impact strategy for the sustainable synthesis of bio-based poly(hexamethylene 2,5-furandicarboxylate)

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Abstract. The transition toward greener and more sustainable polymers demands not only the use of renewable feedstocks but also the adoption of environmentally benign and efficient polymerization methods. Among the various approaches being explored, Ring-Opening Polymerization (ROP) has gained considerable attention due to its potential to meet both environmental and performance-related criteria. ROP enables precise control over polymer structure, including molecular weight, dispersity, and end-group functionality, which is crucial for tailoring materials to specific applications from packaging to biomedical devices. Its compatibility with a wide range of monomers, particularly those derived from renewable resources such as lactones and cyclic carbonates, enhances its sustainability profile. Recent advances in furan-based polymer synthesis have focused on the efficient production of 2,5-furandicarboxylic acid (FDCA), a key biobased monomer, yet despite its promising properties for sustainable materials, ROP strategies utilizing FDCA remain scarce in the literature, highlighting a critical gap in the development of high-performance, renewable polymers (Abid et al., 2024).
In the present study focused on the ROP of macrocyclic oligo(hexamethylene 2,5-furandicarboxylate) (CHF), prepared through the cyclodepolymerization of the corresponding low molecular weight linear polyester precursor under high dilution conditions, to yield, for the first time, poly(hexylene 2,5-furandicarboxylate) (PHF). The ROP conditions optimisation included screening of various safe catalysts under a wide range of time and temperature conditions. Comprehensive characterization of the resulting macrocycles and PHF was carried out using advanced analytical techniques to evaluate their structural and performance properties.

Keywords: *nan*

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Biobased solvent systems for efficient recycling of abs via targeted san dissolution

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Abstract. Acrylonitrile-butadiene-styrene (ABS) plastics, widely employed in long-lasting products such as electronic devices, automotive components, and household goods, are predominantly disposed of through landfilling or incineration. In response, solvent-based recycling technologies have gained traction as viable methods for producing high-purity recyclates, with particular interest in renewable solvents (Commision to the European Parliament, 2018). This research focuses on advancing physical recycling strategies for ABS by exploring the use of bio-based and environmentally friendly solvents, in line with circular economy goals. Initially, a theoretical screening using the COnductor-like Screening Model for Realistic Solvents (COSMO-RS) was employed to inspect the most promising solvents capable of selectively dissolving the styrene-acrylonitrile (SAN) fraction of ABS. Among the candidates, bio-based ester-type compounds emerged as the most promising for effective separation. This prediction was validated through laboratory experiments, which confirmed the efficacy of four bio-derived solvents in dissolving SAN. Fourier-transform infrared spectroscopy (FTIR) and proton nuclear magnetic resonance (¹H NMR) analyses were employed to characterize both the dissolved and residual fractions. The results demonstrate that carefully selected renewable solvents enable rapid and selective dissolution of ABS components under ambient conditions, achieving efficient separation within 40 minutes.

Keywords: *nan*

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Nature-based solutions to improve water and energy efficiency and social equity in low-income communities

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Abstract. The urban water cycle, while essential to public health and quality of life, remains highly energy-intensive and represents a significant share of electricity use and operational costs in cities. In low-income communities, these challenges are compounded by socio-economic vulnerabilities and limited infrastructure resilience. Nature-based Solutions (NbS) have emerged as a key strategy to promote water and energy efficiency, enhance climate resilience, and foster social inclusion [1], [2], [3]. This study evaluates the RECAREI Social Housing Complex in Matosinhos, Portugal, as a case study to quantify the impacts of implementing water conservation strategies and integrating NbS at the community scale. Results indicate that measures such as the use of rainwater and alternative sources of non-potable water can reduce potable water consumption by 39%53% and wastewater production by 16%23%, leading to annual energy savings of 8,313 kWh in water supply and wastewater management systems [4]. These energy reductions correspond to approximately 1,255 kg of avoided CO emissions per year. Financially, these measures can save up to 73 per household annually, generating collective savings of over 11,000 for residents and 6,000 for local authorities [4]. The incorporation of NbSsuch as rain gardens and sustainable urban drainage systemscan further enhance these benefits by up to 30%, contributing to ecosystem regeneration, urban biodiversity, and improved community well-being. These findings reinforce the transformative potential of NbS in urban regeneration, particularly in vulnerable territories. By adopting a Water-Energy-Food-Ecosystems nexus approach, the research highlights the systemic advantages of integrated planning and supports the development of equitable and sustainable public policies. This work aligns with the United Nations Sustainable Development Goals (SDGs), especially SDGs 1, 6, 7 and 11, and contributes to advancing urban decarbonisation and the creation of resilient, inclusive communities.

Keywords: *nan*

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Molecular insights into the influence of ionic liquids on carbonic anhydrase ii activity

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Abstract. Carbonic anhydrases (CAs) are promising biocatalysts for CO capture technologies due to their remarkable catalytic efficiency. However, their practical application under industrial conditions requires the preservation of enzymatic stability and activity. In this study, the impact of various ionic liquids (ILs) at 0.5 M on bovine carbonic anhydrase II (CA-II) was investigated through Molecular Dynamics (MD) simulations and enzymatic activity assays. MD simulations were performed using Yasara (v21.12.19) with the AMBER14 force field. Structural analyses included root-mean-square deviation (RMSD), radius of gyration (Rg), root-mean-square fluctuation (RMSF), and solvent-accessible surface area (SASA). Enzymatic activity assays were conducted using AC-PBS or AC-PBS-IL systems (0.5 M), using a colorimetric kit. . Absorbance was measured every 5 min. over a period of one hour. The MD analyses revealed that ILs induced significant alterations in the stability and conformation of CA-II, with effects strongly influenced by anion type and pH. [C4mim][Tos] preserved structural integrity and enhanced catalytic activity (306%), whereas [C4mim][HSO] caused pronounced destabilization and near-total loss of activity (0.37%), likely due to severe acidification of AC-PBS_IL system. Enzymatic performance correlated with pH variations: acetate-based ILs ([C4mim][Acetate] and [C2mim][Acetate]) maintained moderate activity under mildly acidic conditions, possibly due to favorable interactions with charged enzyme surface residues. In contrast, [C4mim][HSO] likely disrupted Znš coordination and the catalytic role of a key histidine residues (HIS94, HIS96 and HIS119) impairing CO hydration. Conversely, [C4mim][Tosylate] maintained pH stability and preserved the active site environment, minimizing undesired protonation effects. These results demonstrate that IL-CA-II interactions, dependent on solution pH, cation structure, andmost notablyanion structure, influence the enzymes conformational stability and catalytic activity. The tosylate anion stood out as a performance enhancer, while [HSO] caused severe inhibition. The strong agreement between molecular dynamics simulations and experimental data reinforces the value of computational approaches in the pre-screening of ILs for biocatalysis.

Keywords: *nan*

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Sustainable and scaled-up technology to extract proteins from tenebrio molitor using aqueous solutions

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Abstract. Aim: The increasing global population has intensified the demand for sustainable protein sources. Insects are promising candidates due to their high protein content, nutrient richness, low environmental impact, and cost-effective production compared to traditional sources like poultry and cattle. However, consumer acceptance remains a challenge in Western countries. It has been suggested that protein extraction and formulation into new food products can enhance end-user acceptance. With this in mind, the optimization of the extraction and purification was carried out to make the consumption of insects more practica [1,2].
Method: Design of Experiments (DOE) was applied to optimize operational parameters and maximize protein extraction yields using aqueous solutions with the insect species: Tenebrio molitor. Insect flour was mixed with solvent, centrifuged, and the supernatant collected for analysis. Proteins were recovered via isoelectric precipitation, followed by centrifugation and freeze-drying to obtain a purified protein powder. Scale-up assays were conducted to evaluate industrial feasibility. Protein content was quantified using the BCA method for solutions and weight measurements for precipitates. Protein profiles were analysed by SDS-PAGE.
Results: Optimized parameters were defined (temperature of extraction, duration, and the concentration of the aqueous solution) and yielded extraction efficiencies of over 89% for T. molitor with the final protein powder contained 5090% of extracted proteins and is dependent of the liquid/solid ratio, demonstrating flexibility for producing solid or liquid food variants by adjusting the volume used.
Conclusion: These findings highlight the potential of integrating insect proteins into novel food products as a sustainable strategy to meet global protein demands. Ongoing scale-up tests aim to assess industrial feasibility and further promote their adoption in human diets.

Keywords: *nan*

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Study of some diophantine equations

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Abstract. The study of Diophantine equations is probably one of the oldest research areas in mathematics, which got a lot of attention after Fermats statement that the equation xˆn + yˆn = zˆn does not have any solution if n 4 besides the trivial ones. After Wiles groundbreaking proof of Fermats statement, a lot of attention has been given to the study of the so-called generalized Fermat equation. Let A,B,C be non-zero pairwise coprime integers, and let p, q, r be positive integers, and consider the affine surface given by the equation Axˆp + Byˆq = Czˆr.
The general approach to studying these equations is the following:
1) Associate, to a putative solution of the equation, a geometric object.
2) Modular method: Use modularity to associate this object to a space of automorphic forms.
3) Try to eliminate these forms, arriving at a contradiction, for example,by analyzing their finite points for different primes
Darmon studied these geometric motives and gave them explicitly for some equations, such as the ones of signature (p,p,q) and (q,q,p). For the ones of signature (p,q,r), he mentioned that the Frey representations attached to these equations come from the study of Hypergeometric motives.
Motivated by Darmons approach, the student Golfieri studied in his Ph.D. different Diophantine Equations as well as developed new results in Hypergeometric Motives.
In this presentation, it will be presented, briefly, the advances toward the solutions of some of these equations made by the student Golfieri throughout his Ph.D, as well as present the main results on Hypergeometric Motives and how they relate to Diophantine Equations.

Keywords: *Diophantine equations, Hypergeometric Series, Hypergeometric Motives*

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Multiple orthogonality and applications

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Abstract. Multiple orthogonal polynomials are a generalization of standard orthogonal polynomials' theory that arise from considering orthogonality conditions respect to, not one, but an arbitrary number of weight functions. This leads, on one hand, to the type II polynomials, that have been widely studied and many families are already known. On the other hand, there are the multiple type I polynomials, that have not been studied as extensively. Recently, an important step in this direction has been given with the finding of explicit expressions for the type I polynomials corresponding to some well known families such as Hahn, Meixner, Kravchuk, Charlier, Jacobi--Piñeiro, Laguerre or Hermite. These ones are expressed through special functions like the generalized hypergeometric or Kampé de Fériet series.
Multiple orthogonal polynomials have applications in many different areas. Here we will focus on their connection with stochastic precesses' theory, which is given through the Hessenberg matrix that describes the polynomials' recurrence relation. Under certain conditions, this matrix can be turned into a stochastic matrix describing a Markov chain. Many of the previous mentioned families are useful in this way to built Markov chains and establish properties about them.

Keywords: *Orthogonal polynomials, Multiple orthogonal polynomials, Hypergeometric series, Askey scheme, Recurrence relation, Markov chains*

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Expanding the generalizability of a functional impairment polygenic risk score model across disease contexts using the uk biobank data

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Abstract. <strong style="background-color: initial;»Background:
Functional impairment impacts quality of life across multiple health conditions. A logistic regression model using polygenic risk scores (PRS) for the 6-minute walk test and quadriceps muscle strength was developed by (Marçalo et al., 2025) to stratify individuals into high- or low-impairment prognostic groups for chronic obstructive pulmonary disease.

Objective:
We aim to evaluate the generalizability of this PRS-based model across diverse clinical conditions using the UK Biobank data.

Methods:
Based on genomic data from the UK Biobank (~500,000 individuals), polygenic risk scores (PRS) for the 6-minute walk test and quadriceps muscle strength are calculated using beta coefficients from the original study. These scores, together with sex, are then incorporated into the logistic regression model to predict prognostic group assignment. Once all individuals are classified into the appropriate cluster, clinical and health-related data will be used to explore differences between prognostic groups. If the model classifies individuals into clusters with clear and meaningful differences across various conditions and characteristics, its generalizability will be demonstrated, enabling early identification of functional decline with potential applications in precision medicine and preventive care.

Keywords: *Polygenic Risk Score, Functional Impairment, UK Biobank, Genomic Prediction, Disease Stratification*

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Compositional biplots based on integrated principal component analysis

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Abstract. Integrated Principal Components Analysis (iPCA) is an innovative method for analyzing unsupervised, multivariate data using a matrix-variate normal model with a Kronecker product covariance structure. This framework allows both shared and dataset-specific patterns to be identified across multiple datasets.
Biplots are valuable tools for visualizing relationships between variables and samples, as they represent data matrices using vector geometry. However, integrating multiple compositional datasets into a single coherent visualization remains a challenge. This work aims to tackle this issue by applying iPCA to compositional datasets. This will allow for the construction of biplots for each dataset individually, as well as an integrated biplot that captures the joint structures. The methodology involves modeling the datasets using iPCA and visualizing the results through a sequence of biplots, combining them into a unified representation. Expected results include enhanced interpretability of shared and individual patterns in compositional data, providing a more comprehensive understanding of the datasets.

Keywords: *nan*

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Evaluating the impact of the generalization of usf-b units in portugal on key healthcare indicators

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Abstract. In 2023, Portugal implemented the generalization of Family Health Units (USF) to Model B, aiming to enhance primary healthcare performance. This study evaluates the impact of this transition by analyzing monthly performance indicators, from January 2022 to the most recent available period, focusing on units that transitioned from USF-Model A (USF-A) to USF-B in January 2024.

The main issue addressed is whether this structural change led to measurable improvements in USF performance. A secondary objective is to compare the evolution of these indicators in units that transitioned with those that remained as USF-A or were already USF-B. To address this, we extracted monthly national data from the official Health Ministry platform and selected indicators with the highest weight in the global performance index (IDG). Units were classified into three groups: (i) transitioned (AB with IDG 60 in December 2022), (ii) remained USF-A (IDG <60), and (iii) stable USF-B units. All indicators were analyzed both using their raw values and normalized scores. We applied descriptive and inferential statistics, including t-tests, Cohen's d for effect size, and time series modelling (ARIMA and trend slope comparison). Additionally, we evaluated whether changes in performance thresholds influenced results.

Preliminary findings show significant increases in key indicators post-transition in the transitioned group, with effect sizes ranging from small to large depending on the indicator. However, improvements were also observed in the other groups, raising questions about whether observed gains are exclusively attributable to the USF-B model.

This research highlights the importance of rigorous, data-driven evaluations of healthcare reforms. Future work will focus on segmented regression and interrupted time series analysis, to better isolate the causal impact of the policy change.

Keywords: *nan*

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Statistical analysis of the influence of neurodevelopmental disorders on attitudes toward mathematics for primary school students

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Abstract. To follow a quantitative approach in the research, a convenience sampling of primary schools in the municipality of Leiria was carried out, aiming to collect data on attitudes toward pleasure in learning Mathematics, valuing Mathematics, and feeling confident in Mathematics for 3rd and 4th year students. The TIMSS 2019 (Trends in International Mathematics and Science Study) questionnaire was used to collect data from 775 students. At the end of the academic year, information on the Learning and Inclusion Support Measures and Adaptations to the Assessment Process that every student benefits from will be gathered, alongside data on the neurodevelopmental disorders diagnosed. By cross-referencing this information with the final Mathematics grades of students at the end of the academic year, the study aims to examine the impact of neurodevelopmental disorders on the attitudes toward Mathematics for primary school students.
For future development, two statistical models commonly used in the analysis of multivariate data were studied: (i) Exploratory Factor Analysis considered for estimating latent factor scores associated with attitudes toward Statistics, whose scores were compared based on the educational profiles of a provided sample of lower secondary school students; and (ii) Hierarchical Linear Models for applying this technique to the intended research, which could possibly help to ascertain the main attitudes towards Mathematics, presumably affected by neurodevelopmental disorders, at the level of the student, the class and the school.

Keywords: *Sampling, Questionnaire, Factor scores, TIMSS, Inclusive Education*

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IEA International Association for the Evaluation of Educational Achievement. (n.d.). TIMSS: Trends in International Mathematics and Science Study. https://timssandpirls.bc.edu/

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Stability and collisions of excited spherical boson stars: glimpses of chains and rings

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Abstract. Scalar, spherically symmetric, radially excited boson stars were previously shown to be stabilized[1-2], against spherical dynamics, by sufficiently strong self-interactions. Here, we further test their stability now in a full 3+1D evolution. We show that the stable stars in the former case become afflicted by a non-spherical instability. Then, we perform head-on collisions of both (stable) fundamental and (sufficiently long-lived) excited boson stars. Depending on the stars chosen, either a black hole or a bosonic remnant are possible. In particular, collisions of excited stars result in a bosonic bound state which resembles a dynamical super-position of chains and rings, akin to the ones found as equilibrium solutions in [3]. These evolutions emphasize a key difference concerning the dynamical robustness of fundamental $vs.$ excited spherical boson stars, when generic (beyond spherical) dynamics is considered.

Keywords: *General Relavity, Numerical Relativity, Black holes, boson stars, compact object mergers*

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Mds convolutional codes

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Abstract. One of the main challenges in coding theory is the construction of optimal codes that can correct as many errors as possible when data is transmitted over unreliable or noisy channels. Convolutional codes, introduced in the 1950s [1], play an important role in enabling reliable communication in systems such as satellite links and streaming services [2]. Despite their usefulness, there are still few known constructions of optimal convolutional codes over small finite fields [3, 4, 5, 6, 7]. This is a significant limitation, as small fields are often preferred in practice for their simplicity and efficiency.
In this talk, we will focus on a particular class of optimal convolutional codes called MDS (Maximum Distance Separable) codes, which achieve the best possible error correction among all convolutional codes with the same parameters. We will present new constructions of MDS convolutional codes. These constructions are based on algebraic techniques and make use of structured matrices. We will also explain how carefully designed repetition patterns in the generator matrices contribute to achieving optimal performance [8, 9]. Finally well introduce a new criteria that guides the construction of these codes, ensuring they have excellent distance properties [10].

Keywords: *Convolutional Codes, Maximum Distance Separable (MDS) Codes, Free Distance, Finite Fields*

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Clustering and anomaly detection in zero-inflated count time series

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Abstract. The clustering of time series has proven to be of interest in various fields, ranging from economics and finance to environment and medicine, among others. Specifically in the context of logistics, clustering time series may help to outline strategies for better decision-making, particularly in maritime ports. Some of the problems that may arise within this context range from clustering ships based on the types of materials they are transporting to clustering cranes based on their productivity levels.

There are numerous models that account for continuous-valued data, while discrete-valued statistical models, particularly in the time series realm are more of a recent development. Some recent efforts in time series clustering focus in traditional methods, such as fuzzy clustering [1], but for this works purpose, we explored model-based clustering algorithms [2]. Furthermore, we studied models that account for discrete-valued variables, particularly ones that show zero-inflation and might have different degrees of dispersion. In practice, count data may present temporal correlation, which can be modelled through different INAR structured recursions with zero-inflated innovations; in other cases, the temporal correlation may not be significant, leading us to consider some possible zero-inflated distributions to fit our data, such as the Zero-Inflated Poisson [3], Zero-Inflated Negative Binomial [4] and Zero-Inflated Conway-Maxwell Poisson [5]. A simulation study was carried out for varying levels of difficulty of INAR(p) processes, as well as a practical application, regarding the arrivals of different types of cargo in the maritime port of Sines. The dataset consists of temporal observations concerning the activity of some cranes, which will be grouped through a model-based clustering algorithm. Finally, an anomaly detection technique is used to flag possible abnormal observations within the cranes of each cluster, taking into account models which were estimated for each of the groups in the first phase of the algorithm.

Keywords: *Count Data, Model-Based Clustering, Zero-Inflation, Anomaly Detection*

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[CIDTFF] Education

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Beyond words: interculturality makes its mark

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Abstract. Globalization and increased migration have amplified the heterogeneity of school communities, where multiple languages, cultures, and worldviews coexist. In this context, schools play a key role in educating empathetic and socially aware citizens. Within this scope, the project Além das Palavras: A interculturalidade dá cartas emerged. It was developed by five students of two masters degrees in teaching at the University of Aveiro, as part of the curricular unit Special Educational Needs in a school of the Aveiro region. It was developed within the Erasmus+ BOLD project (ERASMUS+ Cooperation Partnerships 2022; 2022-1-DE01-KA220-HED-000086001) and adopted a Service-Learning methodology (Aramburuzabala et al., 2019), combining academic learning with civic engagement. Its main aims were to foster pupils intercultural competence development and promote inclusion in the school context by valuing linguistic and cultural diversity (Rauschert ; Byram, 2017).
The central activity involved over 100 pupils and 11 teachers and it consisted of a cards tournament where participants were forbidden from using verbal or written communication and received distinct rule sets, unknown to players from other groups. As players rotated between tables, communicative conflicts and frustration arose, along with attempts to impose ones own norms. This experiential simulation aimed to replicate the challenges faced in intercultural contexts, such as the absence of shared language and differing social norms. Following the game, the focus group discussions invited students to reflect on their experiences, emotional responses, and adaptation strategies.
The reflections revealed initial tendencies to impose personal rules, resist unfamiliarity, and misunderstand others, followed by an increased awareness of the value of non-verbal communication and active listening. Participants frequently related the activity to real-life scenarios involving migration, cultural adjustment, and social exclusion. The activity was recognised as impactful by both pupils and teachers, particularly in fostering empathy and dialogue around diversity.

Keywords: *Intercultural competences, Service-Learning, Inclusive education, Cultural diversity, Non-verbal communication*

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Precision or illusion? navigating the algorithmic mirage of confidently inconsistent ai in the validation of a data collection instrument

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Abstract. The development and validation of instruments for the collection of educational data, including psychometric assessments, require a high degree of methodological precision and replicable findings. Given the increasing prevalence of artificial intelligence-based tools, researchers have examined their applicability in various analytical methodologies, such as factor analysis, reliability evaluation, and construct validation. This work critically reflects on the integration of generative AI into the validation process of the GreenComp-Based Questionnaire (GCQuest), which is an instrument designed to assess sustainability competences. It focuses on the inconsistencies that were identified when using tools such as Julius and PowerDrill.ai for statistical validation. Despite working with an identical dataset, results varied across sessions due to subtle changes in prompt phrasing and model interpretation. These inconsistencies highlight the stochastic and opaque nature of large language models, which poses risks to reproducibility and research integrity (Megahed et al., 2023). Systematic logging of multiple interactions revealed that, although the outputs appeared robust, they diverged unpredictably. This raises concerns about the reliability of AI-generated results in high-stakes educational research. According to the literature, these findings emphasize the importance of human oversight, ethical safeguards, and robust methodological controls when incorporating AI into research workflows (Bulut et al., 2024; Riordan et al., 2024). As Burleigh and Wilson (2024) argue, replacing human reasoning with unverified AI outputs can undermine both the epistemic and ethical foundations of research. This paper therefore advocates for a human-centred and cautious approach to the development of AI-supported instruments, including training in prompt engineering, triangulation with traditional methods, and the application of ethical frameworks, to ensure the trustworthy and replicable use of AI in education.

Keywords: *Artificial Intelligence, Educational Research, Instrument development, GCQuest, Psychometric validation, Prompt engineering*

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Service-learning in initial teacher education: a systematic review

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Abstract. Service-learning (SL) is a teaching methodology that allows students to engage in collaboration-oriented activities for previously identified community needs, such as social, environmental and/or humanitarian issues (Aramburuzabala, 2020). This approach provides students with the opportunity to critically reflect on their experiences and establish meaningful connections between academic content and real-life practice in community contexts (Bringle ; Hatcher, 1996).
Given the acknowledged impact of this methodology on students' competence development (Furco ; Norvell, 2019), a systematic review is being carried out focused on SL in the context of initial teacher education. This review aims to systematize evidence on the benefits and challenges of SL for future teachers professional development.
The review is part of the Erasmus+ BOLD project (ERASMUS+ Cooperation Partnerships 2022; 2022-1-DE01-KA220-HED-000086001) and is being conducted according to PRISMA guidelines (Page et al., 2021). The literature search is taking place in the b-on, Scopus and Web of Science databases, including only peer-reviewed scientific articles published between 2020 and 2025 that address SL experiences in initial teacher education. Content analysis is being applied to data.
A preliminary analysis allows advancing that some of the main benefits are related to a reduction of the gap between theory and practice, allowing pre-service teachers to experience real-world problems of schools and societies and to develop their civic engagement and social action. As to the challenges, literature underlines that in most contexts, teacher education programs do not have long-term and well-established relationships with local communities which endangers the collaborative implementation of SL projects.
This work is being developed within the Scientific Initiation Programme for Young Students in Education (PIC-Edu), promoted by the Centre for Research in Didactics and Technology in the Training of Trainers.

Keywords: *Service-learning, Initial teacher education, Teacher professional development, Community-university connection.*

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Mapping the use of artificial intelligencein basic education: emerging practices and formative challenges in brazilian schools

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Abstract. This paper presents partial results from the university extension project Basic Education and Artificial Intelligence: Pedagogical Strategies, Impacts on Teaching and Learning, and Critical Reflections, carried out between March and June 2025. The course involved 344 undergraduate teaching students from various Brazilian universities, following a pedagogical approach that integrated theory and practice through local mapping in public and private Basic Education schools across different regions of the country. In light of the increasing presence of Artificial Intelligence in schools, and the absence of clear guidelines for its pedagogical use, the project raised the question: how are institutions appropriating or not these technologies? It aimed to understand the uses of AI in school routines, its meanings, impacts, and challenges to the current school culture. The research adopted a qualitative approach, including systematic observations, semi-structured interviews, and document analysis. Data collection was guided by a 19-question form, ensuring methodological rigor, institutional confidentiality, and ethical standards. The methodological process involved three stages: student training, school visits with field journals, and the development of reflective reports. The analysis was grounded in Paulo Freires (1987) critical pedagogy, particularly the concepts of consciousness and dialogic education, linked to studies on school culture (Saviani, 2021). This framework enabled interpretations beyond technical descriptions, highlighting ideological implications in the reproduction or confrontation of educational inequalities. The analysis also considered authors like Williamson and Eynon (2020), who warn of surveillance and datafication risks, and Selwyn (2019), who advocates for critical engagement with technology. Findings show that although some schools use tools such as ChatGPT, Canva, and adaptive platforms, AI usage remains occasional, superficial, and disconnected from critical pedagogical projects. The results align with SDGs 4 and 10, underscoring the urgency of policies and training that promote a critical, ethical, and inclusive integration of AI in Basic Education.

Keywords: *Basic Education, Artificial Intelligence in Education, Teacher Education, Pedagogical Practices, School Culture, Historical-Critical Pedagogy.*

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A integração da realidade virtual na educação: necessidades e desafios

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Abstract. É desafiante a implementação na educação da Realidade Virtual com recurso a headsets, que designo por Realidade Virtual Imersiva (iVR, immersive virtual reality), especialmente quanto à sua integração no currículo e práticas pedagógicas do ensino superior online. Entre os principais obstáculos estão a falta de orientações práticas e modelos pedagógicos claros, como modelos de design instrucional específicos. Os atualmente disponíveis são escassos e pouco descritivos: 1) o XR ABC Framework e o iVR Learning (M-iVR-L) Framework foram concebidos para o ensino superior online com iVR, destacando aspetos como segmentação das sessões para evitar sobrecarga cognitiva, exploração prévia da tecnologia e acompanhamento pedagógico; 2) modelos como o TESLA e o modelo Castronovo et al. Design Model (2019), mais genéricos, focam-se em criar objetivos direcionados ao público-alvo, elementos de avaliação, definição de recursos e propósitos com base em estruturas clássicas. Oferecem uma visão sistemática, mas pouco adaptada às especificidades da iVR. Para suprir essa ausência, seria pertinente utilizar um modelo de design instrucional que combine as particularidades da iVR dos primeiros modelos com os elementos tradicionais dos segundos modelos (Castelhano et al., 2023). A literatura reforça o potencial da tecnologia: há vasta oferta de ferramentas e ambientes iVR aplicáveis à educação em áreas como geografia, ciência, arte e entretenimento, mas sua aplicação exige fundamentos instrucionais sólidos. Tipologias comuns incluem Manipulação Interativa e Exploração, Interação Multimodal e Treino de Competências (Castelhano et al., 2024). Contudo, é imperativo desenvolver e validar modelos instrucionais específicos para iVR que aliem inovação tecnológica, cenários de aprendizagem e práticas educativas (Beck et al., 2020), delineadas para o currículo. Assim, torna-se fundamental avançar para a criação e validação de modelos instrucionais direcionados à iVR no ensino superior online, garantindo que o investimento na imersão se traduza num recurso integrado (Castelhano et al., 2023; Castelhano et al., 2024).

Keywords: *Realidade Virtual Imersiva (iVR); Design Instrucional; Ensino Superior Online*

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Ansiedade à matemática e desempenho escolar dos alunos do 9žano: relação mediada pela autorregulação e bem-estar psicológico

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Abstract. A Matemática tem sido, ao longo dos últimos anos, uma das áreas de maior preocupação e interesse nos estudos internacionais e nacionais, no que diz respeito ao desempenho dos alunos. Nos resultados de alguns estudos mais recentes referem que o desempenho escolar a Matemática de quase todos os alunos diminuiu. Estes resultados do PISA (Programme for International Stuent Assessment) mostram que é necessário promover a aprendizagem da Matemática.
A investigação realizada tem evidenciado a necessidade premente de continuar a estudar a ansiedade face à matemática por parte dos alunos, as consequências no desempenho escolar e prosseguimento de estudos.
Segundo Campos (2022), há pesquisas sobre a ansiedade face à matemática em várias áreas, sendo objetivo de cada investigador estudar um determinado contexto. A ansiedade à Matemática tem sido discutida na Psicologia, na Neurociência, na Genética, na Educação e na Educação Matemática. Estas pesquisas indicam que a ansiedade matemática interfere
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diretamente na memória de trabalho dos alunos com padrões de risco comportamental associados à ansiedade matemática.
Face a estes pressupostos, este estudo visa estudar a ansiedade face à matemática, dos alunos que frequentam o 9.ž ano de escolaridade, a sua relação com o desempenho na matemática, o bem-estar psicológico, e com a autorregulação da aprendizagem matemática. Para a recolha dos dados, serão aplicadas três escalas, designadamente: Escala de Ansiedade à Matemática (EAM), Escala de Autorregulação para Adolescentes (EARA), Escala de Bem-Estar Psicológico para Adolescentes (EBEPA). e um questionário sociodemográfico.
Definiu-se como premissa, a questão: Que relação existe entre a ansiedade do aluno face à Matemática e o seu desempenho escolar nesta disciplina, mediados pela autorregulação e pelo bem-estar psicológico?
A partir dos resultados, será elaborado um guião com medidas que contribuam para a diminuição da ansiedade à Matemática, para o desenvolvimento de comportamentos de autorregulação na aprendizagem matemática e que contribuam para o bem-estar psicológico durante a aprendizagem desta disciplina.

Keywords: *Ansiedade Matemática, Autorregulação, Bem-Estar Psicológico, Desempenho Escolar, 9.ž Ano de Escolaridade.*

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Female voices in astronomy (1850-1919)

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Abstract. This work analyses women's accounts of their participation in science in general and astronomy in particular. No specific geographical region was defined, but the period between 1850 and 1919 was chosen because, on the one hand, there was an increase in the number of technical and higher education institutions aimed at training women and, on the other, happened the first hiring of women by observatories, due to the creation of major astronomical projects such as the Carte du Ciel and the Henry Draper Catalogue.
In a speech to the Women's Congress in 1876, Maria Mitchell (1818-1889), professor and director of the Astronomy Department at Vassar College (a women's institution), argued: I should like to urge upon young women a course of solid scientific study in some one direction for two reasons: 1st. The needs of science. 2nd. Their own needs. Like her, many other women showed determination and vision as to what women could achieve in 20th century science.
In this communication, our aim is to give voice to these women and their testimonies as students, teachers, promoters, and benefactors. Through their testimonies, we find several examples of how, in the period under analysis, there was a growing awareness of the role that women could and should play, as well as the difficulties faced by pioneers in accessing a scientific career.

Keywords: *History of Astronomy, Womens History, Amateur Astronomy, 19th century*

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O ensino da escrita em português: contributos da integração da escrita colaborativa e da genai

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Abstract. Face às dificuldades persistentes no domínio da competência escrita, em Portugal (CNE, 2024; IAVE, 2023) este estudo, de natureza qualitativa (Creswell, 2013), pretende investigar como a escrita colaborativa em articulação com o uso da inteligência artificial generativa (GenAI) poderá contribuir para melhorar a competência escrita em português de alunos do 4.ž ano de escolaridade. Para tal, definiram-se as seguintes questões de investigação: i) Como contribui a escrita colaborativa, apoiada por ferramentas de GenAI, para o desenvolvimento da competência escrita planificação, textualização e revisão de alunos do 4.ž ano do ensino básico; ii) Como apoia a GenAI o desenvolvimento da competência escrita em português dos alunos?; e iii) De que forma a articulação entre a escrita colaborativa e a GenAI promove o trabalho colaborativo e a motivação para a aprendizagem da escrita em português? Adotando a abordagem Educational Design Research (EDR) (McKenney ; Reeves), o estudo prevê a implementação de atividades que articulam a escrita colaborativa e a GenAI, (co)construídas com o professor da turma, ao longo de um ano letivo, em dois ciclos de implementação. A análise dos dados, recolhidos através de inquéritos por entrevista, grupos focais, observação participante, rubricas de avaliação e análise dos produtos textuais dos alunos, permitirá formular recomendações para a didática da escrita com GenAI, publicar um guião pedagógico destinado a professores e a dinamizar workshops com a comunidade docente. Pretende-se, assim, contribuir para a melhoria do ensino da escrita em português, em consonância com os desafios de uma realidade marcada pela imprevisibilidade e pela aceleração tecnológica e comunicacional.

Keywords: *Competência escrita em português; escrita colaborativa; GenAI; 4.ž ano de escolaridade; EDR*

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Políticas educacionais em angola: um estudo a partir da expansão do ensino privado no ii ciclo do ensino secundário

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Abstract. As mudanças discursivas introduzidas na Lei de Bases do Sistema Educativo (Lei nž 17/2016) e em outros documentos político-legais, parecem revelar influências externas de entidades supranacionais produzidas num quadro da globalização e com afirmação de políticas neoliberais. Este trabalho de investigação visa contribuir para aprofundar o conhecimento sobre o impacto de regulações supranacionais, de pendor neoliberal, no desenvolvimento das políticas educacionais para o IIž Ciclo do Ensino Secundário angolano, desde o plano do discurso político-normativo ao plano da ação, tendo como analisador a expansão do ensino privado neste nível educativo. A partir da (Lei 17/2016), registou-se um aumento de escolas privadas em Angola. Porém, os altos custos das propinas dificultam o acesso à educação para a maioria dos estudantes. O Estado não assegura o ensino público para todos jovens (Lei 32/20 de 12 de agosto), levando a que sejam excluídos do sistema educativo. Este trabalho tem as seguintes questões de partida: Em que medida a construção e operacionalização de políticas educacionais, com foco na expansão do Ensino Privado no IIž Ciclo do Ensino Secundário em Angola, têm sido reguladas? De que modo a expansão da escola privada em Angola interfere nos percursos escolares dos estudantes do IIž Ciclo do Ensino Secundário? O paradigma deste estudo é interpretativo, a investigação é de natureza predominantemente qualitativa. A análise dos dados aponta para a confirmação da contaminação dos discursos numa perspetiva gestionária e para ações que conduzem a processos de desigualdade nos processos educativos.

Keywords: *Palavras-chave: regulação supranacional; política educacional; política neoliberal escolas privadas; escolas públicas.*

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Generative ai in science and engineering education: exploring faculty training through competence development

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Abstract. Educational practices are being impacted by the fast growing and evolution of Generative Artificial Intelligence (GenAI). The pace of technological change forces all involved in education to adapt and understand the effective use of GenAI. Despite the growing interest and the great number of university educators already using GenAI, it is crucial to understand how to properly integrate his tools into their teaching and learning processes.
This doctoral research, that is to be executed in 3 phases, explores how competence development can guide the design of faculty training strategies in the context of GenAI. The project adopts a mixed-methods, a design-based approach, combining literature synthesis (phase 1), and fieldwork (phase 2). Phase 1 involved a critical review of existing frameworks, resulting in a preliminary set of pedagogical, technical, and ethical competence domains. Phase 2, currently in progress, focuses on capturing the perspectives of science and engineering educators at a private university in Ecuador through surveys, interviews and focus groups. The goal is to validate the phase 1 framework proposal and understand their perceived competence needs, levels of adoption, and motivational factors surrounding GenAI use.
Rather than testing a predefined model, the study emphasizes co-construction and responsiveness to local realities. The final phase (phase 3) will bring the knowledge gathered to propose a training prototype tailored to diverse faculty profiles and institutional contexts.
This presentation shares emerging insights from the fieldwork phase and reflects on methodological strategies that support the iterative development of competence-based training. The research contributes to ongoing discussions on capacity-building, offering a grounded, practice-oriented perspective on faculty GenAI integration in higher education.
Key words: GenAI, Generative AI, competence, mixed methods, design based research

Keywords: *nan*

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Pedagogia inclusiva no ensino superior com a integração do desenho universal para a aprendizagem e da inteligência artificial

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Abstract. O crescente acesso ao Ensino Superior (ES) de estudantes com Necessidades Educativas Específicas (NEE) (e.g., Castellano-Beltran et al., 2025) e as suas taxas de sucesso reveladas inferiores (Bartolo et al., 2025), impulsionam a necessidade de inovação das práticas docentes (Carballo et al., 2021; Moriña et al, 2025).
O Desenho Universal para a Aprendizagem (DUA) (Meyer, 2014), integrado com a Inteligência Artificial (IA) (Song et al., 2024), tem o potencial de dar resposta à variabilidade da população estudantil (Saborío-Taylor ; Rojas-Ramírez, 2024), contribuindo para o fomento da presença, da participação e do progresso de todos os estudantes (Ainscow et al., 2006).
O seu alinhamento (e.g., elevada flexibilidade, adaptabilidade e escalabilidade (Loitsch ; Striegl, 2024)) possibilita aos docentes criar materiais e opções de apresentação dos conteúdos e de avaliação mais diversificadas para apoiar diferentes necessidades promovendo, significativamente, a aprendizagem dos vários tipos de estudantes (Chalkiadakis et al., 2024).
Apesar das suas possibilidades promissoras, desafios, como a preparação insuficiente dos docentes, precisam de ser abordados para explorar o potencial do DUA e da IA no ES (Evmenova et al., 2024).
Assim, torna-se fundamental compreender como promover a aprendizagem profissional do corpo docente no âmbito da Pedagogia Inclusiva (Florian, 2015), envolvendo o DUA alinhado com a IA.
Este estudo qualitativo visa compreender (i) estratégias que os docentes têm promovido para a aprendizagem de estudantes com NEE, recorrendo à IA, (ii) estratégias que os estudantes com NEE têm promovido para a sua aprendizagem, recorrendo à IA, (iii) como promover a aprendizagem profissional de docentes universitários no âmbito da Pedagogia Inclusiva, com a integração de DUA-IA.
A fase atual do projeto permite apresentar o mapeamento de práticas, com recorrendo à IA, que têm promovido a aprendizagem de estudantes com NEE, a partir dos contributos da literatura científica.

Keywords: *Ensino Superior; Aprendizagem profissional; Pedagogia Inclusiva; Desenho Universal para a Aprendizagem; Inteligência Artificial*

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Artificial intelligence and dual inclusion: enhancing inclusive research by including those who include

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Abstract. Inclusive research often faces challenges, as researchers experience difficulties in processing complex information in scientific contexts. Artificial Intelligence (AI) presents an opportunity for inclusive research. AI supports and includes researchers in the research process, effectively demonstrating their advocated principles. This paper proposes the concept of dual inclusion, suggesting that including researchers through assistive technologies enhances their capacity to explore inclusive solutions for students with Intellectual and Developmental Disabilities (IDD) in higher education.

Although AI is increasingly present in scientific contexts, it is rarely conceptualised as an assistive technology (AT) for enhancing accessibility within the research process itself. This gap invites critical reflection on how the tools the researchers use can embody the inclusive values they promote. When AT supports the researchers themselves, the research process becomes an expression of the inclusion they intend to promote.

This reflection stems from the practical application of AI in the Scoping Review entitled "Inclusion Models in Higher Education for Students with Intellectual and Developmental Disabilities: a Scoping Review on Transition Support to Post-University Life,"developed by the JBI Manual for Evidence Synthesis (Aromataris et al., 2024). The ChatGPT 4.0 model supported assistive planning, evidence screening, data systematisation, and scientific writing. All steps were validated through human oversight and methodological triangulation to ensure rigour and transparency.

AI promotes the active inclusion of researchers transitioning into academic research, broadening their engagement, and enhancing support for research subjects. Its ethical and transparent integration, anchored in principles of scientific integrity and shared responsibility (European Commission, 2025), affirms inclusion not merely as an object of study but as a methodological and ethical commitment that shapes research practice.

Keywords: *AI, Inclusion, IDD, Higher Education, Assistive Technology*

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Enhancing emotional competencies in children aged 612: the emo(ções/ciones/zioni/tions/ii) educational proposal in the smart knowledge garden

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Abstract. Emotional difficulties during school age have intensified over recent decades, requiring more structured and effective educational responses from a childs first years at school. Recent studies, such as that of Armitage et al. (2024), attribute this worsening to a combination of factors, including family instability, early academic pressure, socioeconomic inequalities, and shifts in socialization patterns. Despite the growing recognition of Emotional Intelligence (EI), its integration into the formal curriculum remains limited, hindering consistent implementation practices.

The educational proposal Emo(ções/ciones/zioni/tions/ii) emerges as an innovative initiative in the field of non-formal education, aimed at promoting EI through methodologies that foster active knowledge construction by students. Developed from the module Tenda dos Espelhos (Mirror Tent) of the Jardim da Ciência at the University of Aveiro, within the scope of the Smart Knowledge Garden project (Porto et al., 2023), three sets of playful-educational activities were designed for children aged 6 to 12 (6-8, 8-10, and 10-12), focusing on the five basic emotions: joy, sadness, anger, fear, and disgust.

The development of this educational proposal was guided by strategies such as dramatizations, role-playing, cooperative dynamics, and emotional regulation techniques, recognised in the emotional education literature, as effective in promoting the ability to recognize, regulate, and appropriately express emotions (Armesto et al., 2025). In this proposal, the exploration of the film Inside Out (Disney/Pixar) is particularly noteworthy, as this film is widely valued in emotional education for its capacity to symbolically portray complex emotional conflicts in an accessible way (Quratulain et al., 2024).

This initiative, currently in its implementation phase, seeks to contribute to the creation of more inclusive and emotionally sensitive educational environments, intentionally promoting children's well-being and socioemotional development.

Keywords: *Emotional intelligence; Basic emotions; Non-formal education; Primary education levels; Teacher education*

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Integration of artificial intelligence tools into an educational case study

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Abstract. This study analyzes the use of Artificial Intelligence (AI) tools in qualitative research in education, developed as part of an ongoing doctoral project, highlighting their respective contributions and challenges. The research is based on a case study carried out in a school cluster in Portugal, involving document analysis and 12 semi-structured interviews with school leaders. Its objective is to understand the effects of the External School Evaluation Program, promoted by the Inspectorate-General of Education and Science, on the development of inclusive practices within the school context.
Throughout the research, different AI tools and/or tools that incorporate AI were mobilized, with different contributions: i) TurboScribe enabled the automated transcription of interviews; ii) MAXQDA supported thematic coding and the creation of interpretive visualizations; iii) Elicit facilitated the literature review by identifying relevant scientific sources; iv) DeepL assisted in the translation of selected texts; v) ChatGPT contributed particularly to planning and drafting syntheses; and vi) Gamma enabled the generation of interactive visual presentations for scientific dissemination.
As mentioned by Lustosa et al. (2024), these tools can act as mediators in the production and dissemination of scientific knowledge. They allow for more efficient time and task management, as well as the systematization and clarity of scientific discourse. However, challenges emerge: their use requires digital literacy and critical thinking skills to assess the veracity of the content produced (Wut et al., 2025), and outputs must be employed ethically and reflectively (Trindade ; Oliveira, 2024).
It is concluded that tools incorporating AI, when used critically and complementarily, can enhance methodological innovation and deepen analysis in qualitative research, provided they are anchored in critical thinking, a solid ethical commitment, and human supervision to ensure transparency and scientific integrity (Carbajal-Degante et al., 2023).

Keywords: *Artificial Intelligence; Qualitative Research; Case Study; Portugal.*

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Five years of european alliances: standing on the shoulders of the back office?

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Abstract. The European Alliances initiative aims to establish joint governance and management structures across institutions and countries. While previous research has predominantly examined the complexities of inter-institutional management, little attention has been given to the internal organizational transformations within higher education institutions resulting from their participation in an Alliance.

This article addresses this gap through a case study of Portuguese public universities. It intends to analyze how organizational structures have been transformed as a result of their involvement in European Alliances. Drawing on interviews with vice-rectors and institutional representatives from nine universities engaged in these Alliances, we identify two main pressures driving administrative change.

The first pressure stems from the need for coordination with other institutions in the consortium, supra-university structures, and various stakeholders, including the academic community, businesses, government, and society. These demands have driven the establishment of working groups to support the new Alliances activities. However, our interviews revealed that most of these groups operate informally and are not officially mapped within institutional structures, often requiring statutory changes for formalization.

The second pressure arises indirectly from the influence of the Alliances on universities, especially in the teaching mission. By introducing or reinforcing themes such as pedagogical innovation, joint degrees, and lifelong learning programs, these initiatives have prompted universities to bolster administrative support through new hires or internal reassignment.

Notably, these organizational changes have predominantly affected non-academic staff, who play crucial implementation roles despite having precarious contracts and limited decision-making authority.

This study contributes to the literature on European Alliances by highlighting the need to recognize and manage internal organizational changes that may impede effective inter-institutional integration.

Keywords: *Knowledge Society; Relationship with Society; Higher Education Institutions; Governance and Management; European Universities Initiative*

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O impacto das políticas públicas nos programas doutorais e na investigação em enfermagem em portugal

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Abstract. O Impacto das Políticas Públicas nos Programas Doutorais e na Investigação em Enfermagem em Portugal
Palavras-chave: enfermagem; programas doutorais; políticas públicas; Portugal
A tese que se apresenta procura analisar de que forma as políticas públicas nacionais influenciaram o desenvolvimento dos programas doutorais e a produção científica em enfermagem em Portugal, nos últimos 25 anos. Pretende-se compreender quais os efeitos na formação de enfermeiros doutorados e na consolidação da enfermagem como disciplina científica.
Será realizada uma abordagem mista, combinando métodos quantitativos e qualitativos. Encontramo-nos em processo de recolha de dados por inquéritos por questionário dirigidos a estudantes de doutoramento. Serão feitas entrevistas semiestruturadas com os principais stakeholders, nomeadamente representantes de IES com formação em enfermagem, decisores políticos, diretores de centros de investigação, entre outros. Realizar-se-á uma análise de conteúdo documental a dados disponibilizados publicamente pelas principais instituições financiadoras em Portugal.
Portugal está alinhado com a Europa e evidencia progressos relevantes e auspiciosos na evolução da investigação e formação pós-graduada em enfermagem, com a criação, desde a década de 2000, de quatro programas doutorais em enfermagem e a implementação de centros de investigação. No entanto, persistem desafios estruturais, nomeadamente: falta de financiamento contínuo, carência de docentes doutorados, dificuldades de conciliação familiar e profissional, e fraca valorização institucional da investigação em enfermagem, observa-se ainda a consolidação do modelo norte-americano de doutoramentos profissionais (DNP), com impacto direto na prática clínica e liderança, contrastando com os modelos predominantemente académicos adotados na Europa e em Portugal.
Apesar de avanços significativos, é necessário reforçar as políticas públicas que sustentam os programas doutorais em enfermagem, com maior investimento em financiamento, infraestruturas e qualificação docente. O fortalecimento da investigação em enfermagem e a valorização da formação doutoral são determinantes para o avanço da disciplina, a melhoria dos cuidados de saúde e o reconhecimento da enfermagem como ciência autónoma e interdisciplinar.

Keywords: *nan*

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Ensino superior e integração europeia: qual o papel das alianças europeias de ensino superior?

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Abstract. A Iniciativa das Universidades Europeias (IUE) surgiu como uma estrutura transnacional para o Ensino Superior, financiada pela UE (União Europeia). Esta Iniciativa contribuiu para a integração comunitária no Ensino, Investigação e Inovação, sob os desígnios de promoção de uma identidade europeia partilhada e de reforço dos valores europeus tanto a nível simbólico como institucional.

Este artigo investiga como as alianças das instituições de Ensino Superior europeias, refletem a integração europeia nos seus documentos estratégicos e operacionais. Dada a reduzida exploração do tema na literatura, foi adotada uma abordagem qualitativa. O estudo centra-se na análise documental de declarações de missão (e de documentos de natureza similar) de oito alianças europeias que envolvem universidades públicas portuguesas. Assim, realizou-se uma análise de conteúdo para identificar referências explícitas à integração europeia e ao seu papel na definição das missões e atividades institucionais.

Os resultados obtidos indicam que as Alianças têm impactos relevantes em múltiplas dimensões. No Ensino e na aprendizagem, promovem programas de graduação conjuntos, mobilidade de docentes e estudantes, aprendizagem combinada e digitalização. Na governação institucional, estão a emergir novas estruturas, em que algumas Alianças procuram atuar como grupos de interesse para conseguirem influenciar as políticas da UE. Na investigação, as parcerias transnacionais potenciam os projetos colaborativos, a transferência de conhecimento e a competitividade, com o objetivo de reforçar o papel da UE no panorama académico mundial.

Para além destes impactos diretos, esta iniciativa promove a expansão de um sistema europeu de Ensino Superior, moldada pelas exigências do mercado de trabalho, pelos avanços tecnológicos e pela cooperação institucional. Reforça também a governação multinível, o alinhamento de valores entre alianças e o desenvolvimento de uma identidade académica partilhada. Além disso, esta investigação revelou uma tendência isomórfica crescente, sugerindo uma convergência de modelos institucionais, incorporando ainda mais a dimensão europeia no Ensino Superior.

Keywords: *Ensino Superior, Integração Europeia, Alianças Universitárias, Universidades, UE*

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The influence of remote work on ams perceptions of work-life balance in publichigher education institutions in mainland portugal

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Abstract. The increasing adoption of remote work in public Higher Education Institutions (HEIs) in mainland Portugal has highlighted the need to understand how these institutions are developing and implementing remote work policies and practices to promote work-life balance among Administrative and Management Staff (AMS). This study addresses the global research question: How are HEIs in Portugal developing and implementing remote work policies and practices to foster work-life balance, and how do Administrative and Management Staff evaluate their implementation? To answer this, three sub-questions are explored: (Q1) How are HEIs developing and implementing remote work policies and practices to promote work-life balance for AMS? (Q2) How do AMS perceive the effects of remote work on their personal and professional lives? (Q3) What types of institutional policies can be developed to further support remote work and improve work-life balance? A mixed-methods approach is adopted. Semi-structured interviews with institutional representatives are used to address Q1, while questionnaires administered to AMS address Q2 and Q3, enabling the collection of both organisational and individual perspectives (Esposito et al., 2022; Luz et al., 2021). The research is grounded in a review of national and international literature on flexible and remote work, which highlights both the benefits and challenges of these practices in the higher education context (Franken et al., 2021; Yang et al., 2023). Although studies have examined flexible work in business sectors, there is a significant gap regarding its implementation and perception within Portuguese HEIs, particularly among non-academic staff (Esposito et al., 2022). By focusing on these research questions, this study aims to provide empirical evidence to inform the development of more effective and tailored institutional policies, contributing to the academic debate and the improvement of human resource management practices in Portuguese higher education.

Keywords: *higher education sector; flexible working; job preferences; remote work*

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The relationship with society in academic performance evaluation

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Abstract. With the New Public Management, demands for more efficiency and accountability have emerged, leading to the introduction of measurement practices in Higher Education Institutions (HEIs), mainly directed into teaching and research. However, the Third Mission (TM) - defined as the generation, use, application, and exploitation of knowledge and other university capabilities outside academic environments (Molas-Gallart et al., 2002, pp. 23) - remains under-measured.
This scenario is mainly due to a lack of consensus on the definition of the third mission, which makes it difficult to clearly identify TM activities and to establish well-defined indicators and metrics. Additionally, there is a perception that, when TM is measured, it ends up being undervalued (Berbegal-Mirabent ; Sole, 2012; Taieb, 2024; Melo et al., 2010).
This article aims to understand how the TM is defined in the literature and which indicators/metrics are being used to evaluate/assess this dimension in terms of academic performance evaluation.
Data will be collected through a systematic literature review on the conceptualization of the third and on the indicators/metrics employed for its evaluation. English-language articles published in the last 20 years will be sourced from the Scopus database, as this period marks key developments in the field (Taieb, 2024). Data will be analyzed according to the PRISMA methodology.
This research aims to contribute to the ongoing debate about the role and measurement of the third mission in the context of higher education. This is especially relevant given the prevalence of academic performance evaluation processes in academia and the growing relevance of activities aligned with the third mission.

Keywords: *nan*

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[CLLC] Digital domains, discourses and mediations

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Design de jogos de tabuleiro: gestão da açãocriativa dentro do contexto de uma indústria cultural

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Abstract. O presente resumo refere-se a uma investigação que está na fase inicial de desenvolvimento, representando os seus primeiros passos de definição temática e teórica.
Os jogos de tabuleiro modernos definem-se, a partir dos anos 90, como objetos de design autorais, sendo cada vez mais concebidos como um meio artístico pelos jogadores. Apesar disto, o seu design e produção continuam a ser moldados pela sua condição enquanto objetos comerciais. É dentro desta tensão entre objetivos criativos do designer e os objetivos das empresas produtoras que se desenvolve esta investigação.
Através de uma metodologia qualitativa, com recurso a entrevistas, análise documental e observações, parte-se da perspetiva do designer para procurar a definição de quais são as formas de gestão dos condicionamentos à sua ação criativa, compreendendo a natureza destes condicionamentos e qual é a experiência de design e produção do jogo de tabuleiro do ponto de vista do designer. Abordam-se as linhas de poder subjacentes a esta atividade de produção, intercetando-as com o contexto sociodemográfico do designer, particularmente ao nível do género e da raça. A difusão do digital impactou significativamente esta indústria através da possibilitação de novas vias de financiamento na forma de plataformas de crowdfunding, que, ao lado do desenvolvimento de tecnologias de prototipagem como as impressões 3D, permitem novas modalidades de produção dos jogos. Identifica-se aqui a possibilidade do nascimento de uma tendência de democratização da produção, que se pode revelar como uma mudança de paradigma das abordagens narrativas dos jogos, pondo em causa o seu enquadramento enquanto uma indústria cultural.
Explora-se estas alterações estruturais nas formas de produção dos jogos de tabuleiro, que são articuladas com a conjetura geopolítica, de forma a compreender como é que o meio da produção dos jogos de tabuleiro está a evoluir durante o seu apogeu de popularidade a nível global.

Keywords: *Indústrias culturais, Jogos analógicos, Crowdfunding, Pós-digital*

[CLLC] Gender, Body and Power

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Gay sports associativism, leisure, and cultural resistance in brazil

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Abstract. Sport has historically been shaped as a heteronormative space, with masculinity occupying a central role in the practices and values of many athletic contexts. In opposition to this norm, gay sports associativism has emerged in Brazil as a growing movement that challenges traditional gender structures by creating inclusive teams that embrace LGBTQIAPN+ causes and advocate for visibility, belonging, and representation through leisure (Carmona, 2024; Laurindo ; Martins, 2023). This study explores how the social dynamics of a gay mens volleyball team contribute to the formation of personal and collective identities in a leisure context. Ethnography was adopted as the primary research method, employing participant and observant participation, semi-structured interviews, informal conversations, and document/artifact analysis. The analysis is based on three interdisciplinary fields, namely Leisure Studies, Cultural Studies and Gender Studies (Butler, 2003), which together provide a robust framework for understanding the complex social and cultural processes involved. Findings reveal that the teams dynamics are shaped by multiple factors: organizational structure, interactions on social media platforms (WhatsApp and Instagram), participation in LGBTQIAPN+ tournaments like the GayPrix, playful teasing among members, moments of socialization, and the intersectionality of race, class, sexuality, gender, and athletic performance. These dimensions foster the development of a unique sporting culture in which dominant gender norms are subverted and dissident identities are affirmed.Ultimately, gay sports associativism is framed as a counter-hegemonic cultural practice that expands the meaning of sport beyond conventional frameworks and positions diversity as a core social and political value.

Keywords: *LGBTQIAPN+, leisure studies, sports associativism, gender and sexuality, cultural resistance, volleyball, ethnography, counter-hegemony*

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Entre a seriedade e o humor - revisão conceptual dos termos etica e estetica rumo à inclusão artística no teatro.

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Abstract. Nesta comunicação dá-se conta dos desenvolvimentos no segundo ano da investigação Tensionalidades Da Disciplina no Ofício do Ator: Corpo, Performances e Público. Investigação dirigida ao desenvolvimento de vias epistemológicas e práticas que possibilitem maior inclusão de corpos, realidades e poéticas alheias às práticas artísticas teatrais vigentes.
No primeiro ano contemplado no plano de trabalhos, a partir da investigação-ação realizada no âmbito do projeto transnacional Time to Change, inserido no programa KA2 da Comissão Europeia, resultara o livro Manual de Qualquer Artista de Teatro. Este Manual, a partir de dados empíricos e investigação teórica preliminar, traçou as primeiras direções éticas de um trabalho inclusivo assim como mapeou possibilidades práticas para ações em contexto de criação neste âmbito.
No seguimento da publicação do livro apresentado, deu-se início ao segundo ano do plano de trabalhos que pretendeu desenvolver e aprofundar a discussão teórica suscitada neste primeiro output da investigação. Deste livro resulta uma intuição filosófica traduzida pela promoção de espaços criativos localizados Entre a Seriedade e o Humor (título do segundo capítulo). Intuição essa que se aprofundou dentro dos campos dos Estudos Culturais, Estudos Artísticos e Filosofia e que resulta no processo em construção dos capítulos da tese referentes ao Estado Da Arte e de Proposta Teórico-Prática da investigação.
Deste processo é nos já permitido a apresentação do índice provisório para o trabalho final e partilha de questões pertinentes para uma discussão no seio académico que retroalimentará a investigação. São estas questões centradas na definição conceptual dos termos "ética"e "estética"para que o teatro possibilite uma contraconsciência (Marcuse, 2018) dirigida ao pensamento instituído na sociedade contemporânea e, desta forma, se constituírem os mínimos qualitativos para o pensamento sobre outros mundos possíveis (Ferreira, 2024). Mundos esses que convertam definições sedimentadas sobre a inclusão num desafio permanente do foro Ético e Estético.

Keywords: *Práticas Teatrais Inclusivas, Teatro e Inclusão, Ética, Estética*

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Aborto em pauta: argumentos (de)coloniais sobre a criminalização da prática no brasil

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Abstract. Sob a perspectiva dos Estudos Culturais, esta pesquisa analisa como o Decreto-lei nž 2.848/1940, do Código Penal brasileiro, perpetua relações coloniais de poder sobre os corpos femininos ao criminalizar o aborto. O objetivo é identificar as dinâmicas de poder presentes nos argumentos favoráveis e contrários à descriminalização da prática, considerando o pano de fundo cristão que marca os debates com valores religiosos e moralizantes alinhados ao sistema capitalista. Nesse cenário, mulheres pobres, pretas e indígenas são especialmente prejudicadas.

Com a ascensão de um governo de extrema-direita em 2019, discursos antigênero ganharam força, restringindo direitos sexuais e reprodutivos e ressignificando o conceito de dignidade humana. A legislação vigente protege mulheres que se enquadram em estereótipos de feminilidade alinhados ao sexo biológico, enquanto corpos dissidentes são marginalizados. Ainda assim, há resistências: mulheres que recusam os papéis sociais vinculados à maternidade e questionam a governabilidade do aborto constroem práticas contra-hegemônicas.

A pesquisa analisa entrevistas em profundidade com líderes de duas organizações brasileiras uma favorável e outra contrária à descriminalização preservando o anonimato das instituições. A análise se apoia nas categorias de Chaïm Perelman (1992), como auditório universal, tópicos e estratégias argumentativas, observando também as comunicações verbais e não verbais nas redes sociais.

Os resultados revelam que a organização contrária recorre à persuasão psicológica baseada em valores religiosos, enquanto a favorável aposta em estratégias informativas e mensagens probatórias (Barthes, 1990) para convencer.

Keywords: *nan*

[CLLC] Language, cognition and communication

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Methodological approaches for building comparable corpora for the analysis of popular science texts in portuguese and chinese

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Abstract. In recent years, public interest in health-related scientific knowledge has grown significantly, alongside a rising demand for reliable and easily accessible information. Science dissemination plays a crucial role in bridging the gap between experts and the public. Despite growing research in this field, comparative studies across different linguistic contexts remain scarce. This study presents the construction of a comparable corpus comprising 100 Portuguese and Chinese popular science texts on health and diet, all published after January 2019. These texts were sourced from professional print and digital magazines, converted to Word format when necessary, and processed using Sketch Engine (Kilgariff et al., 2014) for analysis. To ensure comparability, variables such as text type, publication date, and length were controlled (Mikhailov ; Cooper, 2016). In addition to the written texts, a subcorpus was compiled for each language, consisting of automatically transcribed texts from 40 popular science videos focused on similar health and diet topics. These transcribed texts were generated using a Speech-to-Text web app. The analysis follows the methodology proposed by Cataldi (2003), covering three dimensions: lexical-semantic, discursive, and cognitive. The lexical-semantic analysis examines synonymy, lexical choices, their appropriateness within the context of science dissemination context, and patterns of frequency and variation. The discursive dimension explores the use of connectors, information organization, segmentation, and presentation. The cognitive dimension investigates metaphors, analogies, and conceptual structures that may vary across languages and cultures. Overall, the project contributes to Translation Studies and Applied Linguistics by addressing how language, discourse, and cognition interact in multilingual science communication.

Keywords: *Comparable corpora, science dissemination, health and diet, Sketch Engine*

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Register variation in translation: corpus-driven methodological consolidation in a multilingual study

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Abstract. This presentation outlines the current state of a corpus-based study examining register variation across English and German source texts and their translations into European Portuguese. At the interface of Systemic Functional Linguistics (SFL) and empirical Translation Studies, the research draws on theoretical frameworks by Halliday and Matthiessen (2014), Teich (2003), and Neumann (2014) to formulate and test hypotheses on registerial shifts in translation, particularly focusing on the phenomena of normalization and shining-through.

Two major advancements characterize the ongoing project. First, the corpus has been expanded to include a fourth functional register instructional texts (INSTR) alongside the previously studied registers: fiction, popular science, and TED talks. Second, the scope of contrastive translation analysis has been extended to include Portuguese translations from German, enabling a more refined examination of translation directionality.

The final corpus consists of 8 systematically structured subcorpora, organized by language and text status (original, translation, reference), comprising over 570,000 tokens. Each file is accompanied by detailed metadata and automatically parsed syntactic annotation using Universal Dependencies (UD) via Stanza.

Preliminary findings from the final phase of analysis will be presented, along with a discussion of the corpus design principles, the operationalization of SFL register parameters Field, Tenor, and Mode and the triangulation methods employed to detect registerial variation induced by translation. The study contributes to a refined methodology for contrastive and translational register analysis, building on insights from cross-linguistic corpora (Hansen-Schirra, Neumann, ; Steiner, 2012; Lapshinova-Koltunski, 2021).

Keywords: *register variation; corpus-based translation studies; systemic functional linguistics; multilingual corpus; contrastive analysis*

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Legal translation and comparative law in the context of extradition

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Abstract. This doctoral project aims to investigate the relationship between legal translation and comparative law, and how it supports the search for functional equivalents in legal translators decision-making. While both fields share overlapping interests, legal translators and legal scholars pursue distinct goals. As they rely upon each other to fulfil their purpose, their connection is one of interdependence (Engberg, 2020). The research focuses on international judicial cooperation in criminal matters, particularly on extradition (process by which a person charged with or convicted of a crime under the laws of one state is arrested in another state and returned to the former state for trial or punishment) (Joyner, 2002). Brazil, Germany, and the United States are the countries studied, with German and English as the source languages and Portuguese as the target language. Typical textual genres of extradition proceedings will be selected (e.g., arrest warrants, indictments, court rulings).
To bridge the gap between linguistic skills and legal knowledge, the project aims to develop a glossary of functional equivalents as a resource for legal translators and comparative jurists, along with a pedagogical model for legal translation and comparative law. The focus is on the contrastive analysis of legal genres and functional equivalence in legal translation, exploring conceptual incongruities (arevi, 1997) and the methodology of juritraductology (Monjean-Decaudin, 2022). Extradition cases will be analysed using a corpus-based approach. arevis (1997) degrees of equivalence constitute a framework for systematic comparative analysis. The methodology for legal translation is Monjean-Decaudins (2022) juritraductology, which integrates comparative law as one of its essential steps. Any ethical implications related to the confidentiality of personal and sensitive data will be carefully addressed throughout the project. The study seeks to advance understanding of the specificities of translation in criminal law, supporting professional, pedagogical, and research-oriented practices in both legal translation and comparative law.

Keywords: *Legal translation, Comparative law, Extradition, Juritraductology, Legal Genres, Criminal law*

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The soft power of translation: french institutions and translated algerian francophone works.

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Abstract. Soft power, first coined by Nye in 1990, is often understood in terms of politics, cultural diplomacy, and international relations. It refers to a country's power to influence others without resorting to coercive military force or deliberate economic pressure (Nye, 2004). Until now, relatively little has been explored about how translation can serve as a form of soft power in complex cultural and geopolitical contexts (Roig-Sanz et al., 2025). This research project will attempt to contribute to this ongoing novel discussion, bridging translation with fields such as international relations and cultural diplomacy to create new insights. This research will go beyond the technicality and textuality of translation to investigate how translation practices and discourses about translation can serve as tools of French soft power in the context of the circulation of francophone Algerian literary works. It will focus on institutional discourse and publication policy to study the role of literary translation in shaping international perceptions. Drawing on Bourdieu's sociological approach to translation, this project will study whether state and non-state French publishers, prizes, and state-funded translation programs influence the reception of Algerian narrative abroad. It will, furthermore, examine the success or failure of these instruments and the potential counter-strategies in the Algerian context. This research will transcend textual analysis and employ a mixed approach (qualitative/quantitative). It will analyse institutional translation discourses and practices (Carbo-Catalan, 2024), focusing on how French institutions frame translation as soft power. Additionally, it will conduct reader surveys to analyse public reception of translation politics, focusing on how critics and readers engage with translated Algerian francophone works. This research will demonstrate that translation is not neutral and, beyond language transfer, it can act as a soft power tool in complex geopolitical, diplomatic, and cultural contexts.

Keywords: *translation, soft power, international relations, cultural diplomacy, francophone works.*

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Exploring the effects of the prosyntax with children with developmental language disorder and autism spectrum disorder: preliminary results

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Abstract. Syntactic deficits are frequently observed in children diagnosed with Autism Spectrum Disorder (ASD) and Developmental Language Disorder (DLD), often interfering with academic and social functioning (Huang ; Finestrack, 2020; Bishop et al., 2017). Early and evidence-based intervention is crucial to reduce the long-term impact of such impairments (Sansavini et al., 2021). Despite the existence of international programs validated for this purpose, for the case of European Portuguese, intervention options are limited, with PROsyntax standing out as one of two structured approaches available (Azevedo et al., 2021). However, its efficacy had not yet been demonstrated.

This study aimed to examine the effectiveness of PROsyntax, a structured program targeting expressive and receptive syntax, in preschool-age children with ASD or with DLD. A non-randomized controlled design was employed, involving a convenience sample of 31 children, aged between 3 and 6 years. Participants were divided into two groups: an experimental group (EG, n=14), who received the intervention, and a control group (CG, n=17), who received the intervention later. Blind assessments were conducted at two time points (T1 and T2) using standardized instruments (SIN:TACS for expression and ALO for comprehension). The intervention comprised 24 school-based sessions delivered twice weekly by an SLT.

Statistical analyses revealed significant improvements in the EG relative to the CG in both expressive (F(1,27)=293.22; p<0.001; p2=0.92) and receptive (F(1,27)=293.22; p<0.001; p2=0.85) components. Effect sizes were large across groups and measures (SIN:TACS: d=4.07 (DLD); d=11.67 (ASD); ALO: d=3.29 (DLD) and d=4.31 (ASD)). Positive correlations between instruments were found. After the first stage, the CG also received intervention and demonstrated comparable gains. Families and educators reported high satisfaction.

Results point to the potential of PROsyntax as an effective tool in promoting syntactic development, while highlighting the need for further research with a large sample and including follow-up to analyse the maintenance of gains.

Keywords: *syntax; intervention; autism spectrum disorder; developmental language disorder; preschool-age children*

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[CLLC] Narratives and Hybridity

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Páginas de sal e maré: o mar na literatura infantil portuguesa contemporânea [pages of salt and tide: the sea in contemporary portuguese children's literature]

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Abstract. O projeto propõe a análise da representação do mar em livros-álbum ficcionais e não ficcionais da autoria de escritores portugueses contemporâneos, publicados entre 2000 e 2024. Considerando a relevância do mar na cultura portuguesa, constata-se que o espaço marítimo permanece subvalorizado nos estudos da ecocrítica aplicados à literatura infantojuvenil. Assim, esta investigação recorre às abordagens das Humanidades Azuis, Hidro-humanidades e do Hidroceno, interrogando de que modo o mar é construído como espaço afetivo, simbólico, cultural e identitário, significativamente enraizado no quotidiano e imaginário portugueses. Através de uma abordagem multimodal de obras verbo-pictóricas, analisar-se-ão as estratégias textuais e iconográficas do corpus selecionado, a partir das quais será também considerada a dimensão hidrossocial e sonora dos espaços aquáticos. O projeto contribui para a reflexão crítica sobre o papel da literatura infantil portuguesa na construção de uma sensibilidade ecológica, problematizando a representação do espaço aquático no contexto do Antropoceno e da emergência climática.
[The project aims to analyse the representation of the sea in fictional and non-fictional picturebooks by contemporary Portuguese authors published between 2000 and 2024. Considering the importance of the sea in Portuguese culture, it is clear that the maritime space remains undervalued in ecocritical studies applied to children's literature. Therefore, this research uses the approaches of Blue Humanities, Hydro-humanities and Hydrocene, questioning how the sea is constructed as an affective, symbolic, cultural, and identity space, significantly rooted in Portuguese daily life and imagination. Through a multimodal approach, the textual and iconographic strategies of the selected corpus will be analysed, from which the hydrosocial and sound dimensions of aquatic spaces will also be considered. The project contributes to critical reflection on the role of Portuguese children's literature in the construction of an ecological sensibility, problematising the representation of aquatic space in the context of the Anthropocene and the climate emergency.]

Keywords: *nan*

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Sob o signo de k.: da receção de kafka na literatura portuguesa contemporânea

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Abstract. A receção produtiva de Franz Kafka (1883-1924) em Portugal é um campo de investigação em grande parte inexplorado, razão pela qual se afigura especialmente oportuno cartografar os itinerários da receção e transformação criativa da sua obra no campo cultural e literário português contemporâneo. Assim, o presente projeto de investigação contemplará: i) uma breve cartografia histórico-literária da receção de Kafka em Portugal, que incluirá alguns marcos miliários da receção do autor. ii) o estudo de distintas abordagens transformativas da obra de Kafka na literatura portuguesa contemporânea. Este estudo partirá de uma seleção representativa de textos de distinta filiação genológica (romances, contos, microcontos, novelas gráficas e adaptações infantojuvenis) que documentam a natureza multímoda do diálogo intertextual e intermedial que estabelecem com a ficção kafkiana.

Keywords: *nan*

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E morreram felizes para sempre representacoes da morte no livro infantil portugues

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Abstract. Este estudo analisa as representações da morte em livros ilustrados destinados ao público infantil, com incidência num corpus de produção editorial portuguesa entre os anos 2000 e 2025. Partindo da crescente presença de temáticas fraturantes (Ramos, 2015) na literatura de receção infantil, investiga-se de que modo a morte é representada e ritualizada no livro ilustrado enquanto objeto multimodal (Nodelman, 1988). A investigação inscreve-se num enquadramento teórico pluridisciplinar, cruzando os estudos literários com contributos da antropologia e da crítica especializada em literatura infantil e estrutura-se em três eixos: (1) fundamentação teórico-metodológica, (2) constituição de um corpus representativo, (3) análise crítica das obras selecionadas. As hipóteses de investigação evidenciam que estas obras contribuem significativamente para a mediação simbólica da finitude e do luto junto do leitor implícito (Clement ; Jamali, 2018), promovendo espaços de elaboração emocional, perante a sensibilidade cultural pós-moderna.
Palavras-chave: Luto; Perda; Finitude; Fraturante; Literatura Tanatológica; Desaparecimento.

Keywords: *nan*

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Notebooks, deviations and places in transformation: hybridism and multimodality in ana pessoas young adultsnarratives

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Abstract. The current study, as mentioned in previous years, aims to analyse the young adults works written by Ana Pessoa, published in the Dois Passos e Um Salto collection by Planeta Tangerina. This is a PhD project supported by FCT (UI/BD/151283/2021), supervised by Ana Margarida Ramos and which is in its final stages. The aim of this thesis is to demonstrate the existence of a dialogical and exponential relationship between young adults literature and the concepts of hybridity and multimodality, but not only. It also aims to establish other inter-artistic relationships and analyses relevant to the works in question, such as, among others, reflections on the concepts of archive, urban wanderings or film noir. The thesis, which is still in the process of being finalised, also presents, of course, reflections on the exploration of literary procedures such as diary and epistolar forms, on the subjective and creative construction of memory, on the search for new forms and voices by these fictional adolescents. In this process of analysis, the verbal elements are not disconnected from the illustrative and the design components, so the different languages will be taken into account in the construction of a broader meaning of the works.

Keywords: *nan*

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Quem tem medo do decolonial? análise crítica das práticas arquivísticas, museológicase institucionais entre lisboa e tervuren - museu nacional de etnologia e musée royal de lafrique centrale.

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Abstract. A partir da pergunta provocadora - quem tem medo do decolonial? - segue-se a proposta de estudar a complexidade das práticas museológicas, éticas, políticas e sociais vertidas nos discursos que representam e enformam a realidade individual e colectiva humana. Através do posicionamento teórico-crítico dos Estudos Culturais e do exercício de novos horizontes epistemológicos, pretende-se escolher a estratégia certeira que conduza ao exame radiográfico das estruturas institucionais que produziram e produzem a linguagem do conhecimento. Mergulhar no arquivo das duas instituições museológicas eleitas - o Museu Nacional de Etnologia e o Musée Royal de lAfrique Centrale -; observar a orgânica de direcção, organização, execução e produção; participar no impulso de uma cultura viva e não preservada; pensar como abrir espaço à potencialidade transgressiva; estas são as acções fundamentais para lançar este projecto exploratório que pretende entrever quais os sujeitos, quais as palavras, quais as imagens que se têm que escavar para que se possa questionar o que entra em conflito, tanto na forma como na matéria e no que se respira entre ambas.

Keywords: *Museu; etnologia; património cultural; memória; identidade; epistemologias pós-coloniais e decoloniais; representação; racismo e etnicidade; transculturalismo; resistência.*

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Digital educational games to promote social emotional learning in preschool-aged children: trends and challenges in co-design

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Abstract. The integration of Digital Educational Games (DEGs) in preschool education offers new opportunities to foster Social-Emotional Learning (SEL) through engaging, adaptive learning environments. This systematic literature review, conducted following PRISMA 2020 guidelines, examines key game design features that support SEL competencies in preschool-aged children. A total of 18 studies published between 2020 and 2025 were analyzed, focusing on participatory design, the roles of educators and children, and methodologies to assess SEL outcomes. Findings highlight the prevalence of game mechanics targeting emotional regulation, responsible decision-making, and prosocial behavior, with insights into the inclusion of nutrition and autism-related interventions within the CASEL-5 framework. The study also explores the role of educators in facilitating DEGs and the digital literacy skills needed for effective integration. By aligning technological advancements with child-centered design principles, this review contributes to the discourse on smart learning ecosystems and the future of participatory digital learning tools.

Keywords: *Digital game-based learning, digital learning environments, social emotional learning, preschool-aged children*

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Inclusive design of information material: development of accessible flyers forpeople with disabilities

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Abstract. Accessible communication is a fundamental right and a central element for the inclusion of People with Disabilities (PwD) (Ferri, 2024). To ensure true inclusion, information must be not only technically accessible, but also easy to read, understand and remember (Matausch, Peböck, ; Pühretmair, 2014). Providing content in accessible formats helps reduce both social and technological barriers, promoting citizenship, access to services and active and informed participation in society (Chien ; Wu, 2024). The Convention on the Rights of Persons with Disabilities highlights the importance of accessible written and digital communications for personal development and social participation (Bernabé, 2020). Within this context, the inclusive design of information materials is essential to ensure equitable access for users with diverse abilities (Timpson, 2025).
This work proposed the development of two accessible flyers: one targeting the general public, containing information about different types of disability and available support resources; and another aimed at PwD, offering practical information on assistive technologies and inclusive initiatives and associations/institutions in Aveiro, Portugal and abroad. Both were designed following inclusive design principles, incorporating enlarged sans-serif fonts, clear and simple language, and high-contrast layouts (Grangaard, Hedvall, ; Lid, 2024). Each flyer includes a QR code to a digital version enhanced with full audio description and structured for screen readers. A braille version was developed to reach users with visual impairments.
The methodology adopted was based on universal design principles and international accessibility guidelines (WCAG 2.2), including graphic and content research, selection of relevant information on disability and assistive resources, application of accessibility standards, and final validation through a focus group with PwD and experts in special education, assistive technologies, and inclusive design.
The result is a set of fully accessible flyers, ready for distribution in schools, rehabilitation centres, and community outreach events, promoting effective and inclusive access to essential information.

Keywords: *inclusion, accessibility, inclusive flyer, accessible communication, inclusive design, universal design, information, digital inclusion*

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Designing digitalobs e-books: a collaborative approach to scientific communication

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Abstract. Effective scientific communication enhances public understanding and acceptance of research by making complex information accessible and relevant. It bridges the gap between scientists and the public, building trust and credibility (Jensen ; Gerber, 2020). Booklets serve as valuable tools for scientific communication, providing clear and accurate information that engages the general public and enables evidence-based decision-making (Holford et al., 2023). Through appealing design and visual elements, these materials spark curiosity and simplify complex concepts, thereby facilitating the effective dissemination of scientific knowledge (Holford et al., 2023). However, Kiprijanov et al. (2023) emphasize that effective design and communication strategies are essential for engaging diverse audiences, especially in digital contexts.

DigitalOBS, an observatory at the University of Aveiro, adopted e-books as a strategy to share scientific knowledge about digital media. The project involved students from the Students@DigiMedia initiative to develop innovative designs for the observatory's booklets. The project aimed to create a multidisciplinary team for e-book graphic editing and design, ensuring a cohesive, high-quality visual identity aligned with DigitalOBS's mission.

This study involved four main stages:

i) Identification of e-book development platforms and tools. After analysing various platforms, Figma was selected as the most effective for this content.

ii) Analysis of e-book best practices through literature review and Pinterest booklet examples. This research identified key strategies for visual hierarchy, typography, color schemes, and layouts to improve readability and engagement.

iii) Development of an e-book prototype, which involved creating sample layouts, testing different typography combinations, and incorporating feedback from both students and faculty.

iv) Development and publication of an e-book dedicated to the Students@DigiMedia initiative.

This project demonstrates how combining scientific accuracy with innovative design, along with student involvement, can enhance academic communication while providing hands-on experience in digital content creation.

Keywords: *e-Book, Science Communication, Design, Students@DigiMedia*

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Khanmigo nas aulas de matemática: uma ferramenta didática complementar

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Abstract. Khanmigo nas aulas de Matemática: uma ferramenta didática complementar
Nesta palestra, investigamos o impacto da Inteligência Artificial na educação, com especial enfoque na ferramenta Khanmigo, desenvolvida pela Khan Academy, e a sua aplicação no ensino da Matemática. A principal questão de investigação que orienta este projeto de doutoramento é: em que medida a utilização da ferramenta Khanmigo pode melhorar o desempenho e o envolvimento dos alunos nas aulas de Matemática?
Para dar resposta a esta questão, adotámos uma metodologia mista, baseada em análise documental e estudo de caso, com recurso a inquéritos e entrevistas semiestruturadas e observação participante em ambientes educativos simulados. A amostra é composta por alunos do ensino básico/secundário, selecionados através de amostragem intencional, envolvidos em duas fases principais: exploração e experimentação da ferramenta, seguida de avaliação crítica da sua utilidade pedagógica.
Após uma introdução à evolução da tecnologia e da IA na educação com especial atenção ao contexto português abordamos os conceitos-chave como os Grandes Modelos de Linguagem (ex. ChatGPT) e os Sistemas Tutoriais Inteligentes. A análise culmina numa apresentação detalhada da Khanmigo, destacando as suas funcionalidades, benefícios e limitações, sustentada por fontes primárias do seu criador e por avaliações críticas da sua implementação nos Estados Unidos.
Os resultados preliminares sugerem que a ferramenta Khanmigo potencia o acompanhamento personalizado dos alunos, melhora a motivação e pode, efetivamente, complementar a prática docente tradicional no ensino da Matemática. Espera-se que estes dados contribuam para a integração consciente da IA em contextos educativos portugueses, com base em evidência empírica e reflexão pedagógica.
Palavras-chave: Khanmigo, Khan Academy, Inteligência Artificial, Grandes Modelos de Linguagem, ChatGPT, Sistemas Tutoriais Inteligentes

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Keywords: *nan*

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Oficina de jogos digitais sobre educação financeira: impacto no envolvimento e na aprendizagem dos jogadores e criadores de jogos

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Abstract. Considerando a necessidade urgente de promover a consciencialização para a Educação Financeira e a Sustentabilidade em contexto educativo (República Portuguesa, 2018; OCDE, 2020; Plano Nacional de Formação Financeira 2021-2025), e da adoção de novas estratégias pedagógicas para motivar e ensinar os alunos, esta investigação procura analisar o impacto da utilização de jogos digitais na motivação e na aprendizagem dos alunos, centrando-se na integração dos jogos enquanto ferramenta pedagógica, tanto no seu uso lúdico como instrumento criativo. Neste enquadramento, propõe-se uma abordagem inovadora que posiciona os alunos não apenas como utilizadores, mas também como criadores de jogos digitais, fundamentando-se na teoria construtivista da aprendizagem, segundo a qual os alunos "aprendem fazendo"(Masson et al., 2012). A investigação assenta numa abordagem metodológica de investigação-ação, de natureza exploratória, orientada por princípios de investigação-ação. O estudo envolve a participação de 40 alunos do 3.ž ciclo do ensino básico e do ensino secundário profissional, bem como dos respetivos docentes. A intervenção é estruturada em duas fases distintas: Inicialmente, os alunos do ensino secundário desenvolvem jogos digitais que exploram conteúdos sobre Educação Financeira e a Sustentabilidade. Posteriormente, estes jogos serão implementados em sala de aula com os alunos do 3.ž ciclo. Na recolha de dados serão utilizadas várias técnicas: inquérito por questionário, observação direta e análise documental. Estas serão sustentadas pelos instrumentos: checklist para os criadores e professor, questionário (nas versões pré-teste e final) para os jogadores, diário de bordo, documentos produzidos pelos criadores e outros artefactos considerados importantes.A incidência sobre a procura de estratégias promotoras de aprendizagens significativas visa contribuir para um conhecimento mais aprofundado sobre a relação entre aprendizagem, motivação e utilização de jogos digitais em contexto educativo. Este contributo possibilita aos agentes envolvidos uma aprendizagem sobre a temática da Educação Financeira e uma reflexão sobre os 17 Objetivos de Desenvolvimento Sustentável (ODS).

Keywords: *Aprendizagem baseada em jogos, motivação, criação de jogos digitais, envolvimento, educação financeira e sustentabilidade*

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Social digital games in online communities to impact older adults digital competences: the case of digital hero

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Abstract. As the world ages (WHO 2021) and digital technology use rises (Eurostat, 2023), challenges emerge in developing solutions for digital competence acquisition. The European Commissions DigComp 2.2 framework (Lucas et al., 2022) highlights lifelong digital competences and current gaps in this area among older adults. Social digital games emerge as promoters of these competences, especially when embedded in socially intentional online communities, as they effectively support knowledge acquisition in training scenarios (Kaufman ; Sauve, 2019).
Based on multiple data collection activities conducted over four-years involving 550+ participants (older adults, experts, and professionals via convenience sampling) through questionnaires, game exploration sessions, two workshops, expert interviews, and a final prototype assessment the Digital Hero game was developed and integrated into the miOne online community. Focused on DigComp 2.2Safety, the game challenges participants to enhance password-creation skills through: (i) Passwordle, inspired by Wordle, involving common Portuguese passwords; (ii) Impossible password, introducing unusual rules to teach secure passwords; and (iii) Digital detective, a role-playing scenario for guessing passwords from fictional social media profiles. These are supported by social features like a discussion area and help requests.
An evaluation with 77 participants from senior institutions (convenience sample, aged 50+, literate, ICT-interested) divided into experimental (played the game) and control (viewed static game information in a miOnes blog) groups showed no statistically significant differences (MannWhitney U, p=0.071), though there was a trend toward greater improvement in the EG. A follow-up evaluation five-months later (36 participants) showed a similar trend (p=0.051), this time with clearer improvement in the CG, possibly due to a ceiling effect in the EGs initial high performance.
Overall, these results informed recommendations for designing social digital games for online communities targeting older adults digital competencese.g., using relatable contexts, clear scaffolding, accessible support mechanisms when player get stuck, and adapting familiar mechanics.

Keywords: *Social Digital Games, Online Communities, Older Adults, Digital Competences*

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Youth, news and social media - the news consumption practices of young people in portugal

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Abstract. The younger generations have grown up with full access to the Internet and social media, which now play a central role in their livesnot only socially and in terms of entertainment (Aichner et al., 2021), but also in news consumption, public opinion formation, and civic and political engagement (Klopfenstein Frei et al., 2022; Pérez-Escoda et al., 2021; Russmann ; Hess, 2020). However, this media environment presents challenges such as exposure to disinformation, algorithmic influence, echo chambers, and potential detachment from relevant current issues (Schulz et al., 2022; Vicario et al., 2016).
The purpose of this research is to exploremthe news consumption habits of young people in Portugal. This study adopts a quantitative approach, data was collected through an online survey distributed nationwide between September 2024 and January 2025. A total of 1,547 responses were collected from individuals aged 15 to 29 residing in Portugal.
Findings reveal that social media is the primary medium for news consumption among youth: 53.1% report using it daily for this purpose, while only 4.4% never do. Instagram emerges as the most popular platform, with a preference for short, visual content. Participants follow a variety of accounts for news, including newspapers or TV news outlets (71%), influencers (53%), and amateur sources (49.8%). This coexistence of professional and non-professional content blurs the line between information and opinion. Paradoxically, although traditional media are considered more credible for news consumption compared to social media, only 25.7% watch TV news daily and 17.7% read print or digital newspapers.
A pattern of multiplatform consumption was observed: higher engagement with social media news correlates with increased consumption of traditional media. Ultimately, the news practices of young people are shaped by a complex, saturated media ecosystem. Understanding these practices is crucial for developing strategies to mitigate disinformation and informational inequality among youth.

Keywords: *young people, news consumption, social media*

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A criação de jogos digitais como estratégia pedagógica para a melhoria da aprendizagem dos alunos do 1ž ciclo

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Abstract. A omnipresença da tecnologia e do digital lançou novos desafios aos sistemas educativos, levando-os a repensar as suas políticas. Perante essas mudanças, as metodologias de ensino e as estratégias pedagógicas necessitam de serem reconsideradas, para habilitar os alunos com novas competências e literacias. Consequentemente, devem serem criados ambientes que propiciam aprendizagens ativas e significativas, onde o aluno seja (co)autor e (co)construtor do seu processo de ensino-aprendizagem. A abordagem Game Design-based Learning (GDBL) possibilita a criação de ambientes inovadores e acentua o papel ativo do aluno. Os videojogos têm suscitado um interesse contínuo e, com o avanço das novas tecnologias e do digital, cresceram exponencialmente. A sua progressiva relevância e seu potencial no campo educacional têm sido amplamente investigados e seus benefícios no desenvolvimento de competências de aprendizagem têm sido referidos por vários autores (Gee, 2003; Burke ; Kafai, 2014). A abordagem GDBL, como novo paradigma em educação, combina a integração de conteúdos curriculares à visão construtivista da aprendizagem.

Este projeto pretende investigar, numa abordagem exploratória, o impacto que a implementação de uma estratégia pedagógica baseada na criação de jogos digitais, em contexto de sala de aula, pode ter no processo de ensino-aprendizagem dos alunos do 1ž ciclo. A estratégia visou promover uma aprendizagem ativa e colaborativa, bem como a integração de conteúdos curriculares. A estratégia baseou-se no recurso a uma toolkit, artefacto que auxilia os alunos no processo de criação da narrativa dos jogos, num processo que privilegia a sua autonomia. Os jogos criados foram realizados no programa Scratch.

Neste projeto, foram evidentes, no aluno, o envolvimento na tarefa, o desenvolvimento de competências transversais (autonomia, responsabilidade, colaboração e competências TIC) e de algumas competências para o século XXI ligadas à literacia digital e dos media. Quantos aos resultados na aprendizagem, não é possível ver uma correlação direta com a implementação do projeto.

Keywords: *Estratégia pedagógica, Game Design-based Learning, jogos digitais educativos.*

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A produção e a gestão da informação e dacomunicação audiovisual nos centros deinvestigação: o caso do ciimar

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Abstract. A comunicação de ciência enfrenta desafios crescentes na era digital, sobretudo em áreas como as ciências marinhas e ambientais, onde a complexidade dos temas exige estratégias inovadoras de divulgação. Esta investigação propõe um modelo de repositório audiovisual para centros de investigação, tendo como estudo de caso o Centro Interdisciplinar de Investigação Marinha e Ambiental (CIIMAR).

Os objetivos principais incluem: avaliar o estado atual da gestão de informação audiovisual no CIIMAR; propor melhorias que facilitem a produção, organização e acessibilidade de conteúdos audiovisuais; e contribuir para a disseminação eficaz do conhecimento científico junto da sociedade.

A metodologia combina abordagens quantitativas e qualitativas, incluindo a observação de boas práticas internacionais no domínio da comunicação de ciência audiovisual. A Noruega foi escolhida pela sua experiência consolidada nesta área, servindo como referência para avaliar se as práticas do CIIMAR estão alinhadas com padrões internacionais. Serão analisadas instituições como o Norsk senter for forskningskommunikasjon, o NINA e o Norsk Polarinstitutt. A parceria entre a Universidade de Stavanger e a Universidade de Aveiro permite integrar metodologias avançadas e abordagens colaborativas.

A inovação residirá na criação de um modelo específico para áreas como ciências naturais, literacia oceânica e alterações climáticas domínios onde a visualização é fundamental para a compreensão pública. Este estudo tem o potencial de gerar benefícios concretos para o CIIMAR, nomeadamente no que se refere à otimização da gestão de recursos audiovisuais, ao aumento da visibilidade da produção científica, à melhoria dos processos de catalogação e preservação, à eficiência na produção de conteúdos, e à disponibilização de análise especializada sem custos adicionais.

Os resultados incluirão um modelo de repositório audiovisual adaptado à realidade nacional e estratégias para potenciar a divulgação científica. Esta investigação pretende colmatar uma lacuna na gestão sistemática de recursos audiovisuais em contextos académicos, propondo soluções replicáveis que ampliem o impacto da comunicação de ciência.

Keywords: *nan*

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Shared and integrated support system for international higher education students: dimensions and functionalities guiding the sapiens model

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Abstract. Advances in Information and Communication on Digital Platforms have favored the creation of innovative solutions to support the internationalization of higher education. However, the scarcity of accessible, clear and reliable information on bureaucratic processes internal and external to the academic environment still represents an obstacle to academic mobility, negatively impacting the experience of international students.
Given this scenario, the following research question was formulated: what contribution do institutional digital platforms make to the processes of preparing, welcoming and integrating foreign students in the context of international academic mobility?
As a response to this problem, an infocommunication model is proposed with a focus on centralization, accessibility and clarity of information. The solution aims to optimize bureaucratic management and the dynamics of communication between students and institutions, promoting a more efficient and integrated experience. The model seeks to articulate institutional, legal and cultural data on a digital platform geared towards usability and user experience.
The research was conducted using the Design-Based Research (DBR) methodology, which integrates theory and practice in real contexts through an iterative process. Four methodological dynamics were used: literature review, interviews with stakeholders (16 participants), co-creation sessions (16 participants) and questionnaires (254 participants). These steps allowed us to understand the problem in depth and develop a contextualized solution.
The results indicate strong support for the creation of the SAPIEnS model Sistema de Acolhimento Partilhado e Integrado para Estudantes Estrangeiros do Ensino Superior which translates as Shared and Integrated Support System for International Higher Education Students, with a level of acceptance of 93% by the sample of international students. The model, made up of dimensions and functionalities that guide its structure and operation, offers a systematic approach to responding to the information and communication needs of international students, contributing to the strengthening of internationalization policies in Portuguese Higher Education Institutions.

Keywords: *Internationalization, academic mobility, infocommunication model, digital platforms, SAPIEnS*

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From efficiency to disruption: exploring designers perceptions of generative ai in visual identity design

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Abstract. Visual identity is one of the most tangible expressions of a brand, playing a central role in differentiation, recognition, and emotional engagement. Beyond aesthetics, it functions as a strategic tool that communicates coherence, cultural values, and brand purpose. In the current digital landscape, this field is being reshaped by the integration of Generative Artificial Intelligence (GenAI) into creative workflows.

GenAI enables the automated generation of adaptive and personalised visual content based on datasets, radically transforming how brand identities are conceived and implemented. This study developed as the first phase of a doctoral research project in New Media explores how professional designers perceive and integrate GenAI into visual identity design, and what implications this has for contemporary branding.

A mixed-methods approach was adopted using a single data collection instrument: an international online survey of 186 professionals in brand and graphic design. The sample includes respondents from diverse regions, predominantly aged 3544, with over one-third having more than 15 years of experience. The survey combined quantitative indicators (frequency of use, areas of application, perceived benefits and risks) with qualitative responses offering insight into emerging practices and strategic reflections.

Findings reveal that GenAI is already embedded in many designers workflows. It is used not only to increase efficiency and automate repetitive tasks, but also to support concept development, enable co-creation with clients, and generate dynamic visual systems. While benefits such as productivity, personalisation, and emotional resonance are widely recognised, concerns persist around originality, visual homogenisation, authorship erosion, and ethical uncertainty.

A generational divide is also evident: younger designers tend to embrace GenAI as a creative catalyst, while more experienced professionals voice concerns over its impact on human creativity. Ultimately, GenAI is repositioning designers as curators, co-creators, and strategic interpreters a shift that demands renewed educational and organisational frameworks to support responsible innovation.

Keywords: *Visual Identity, Branding, Generative Artificial Intelligence, Co-Creation*

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Eye-gaze interface design guidelines: development and validation through a musical education application for children with cerebral palsy

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Abstract. Children with Cerebral Palsy (CP) often face limited access to music education due to motor impairments. Eye-gazed interaction is a valid method to support their inclusion with musical performances, but there are none to help in their musical writting. The design for such applications are an underexplored area, and many studies excluded people with special needs to avoid results' distortion. This project aims to develop design guidelines for programmers and designers working with eye-gazed interfaces. In collaboration with a Music Conservatory, this work will validate emerging design patterns with professors, participants with CP and students, as well as create an accessible educational application to support music learning for children with CP. Solutions will be investigated with the Educational Design Research methodology conducted in three phases: (1) identify challenges through an Systematic Literature Review; (2) develop and evaluate prototypes that use different design approaches, as well as co-design the inclusive musical application with professors and participants with CP; and (3) produce the final program for classroom use and define design guidelines for similar applications. This work will contribute to the field by offering concrete design guidelines for developing musical eye-gazed-based educational tools and an application to assist children with CP or other motor impairments in their musical education, addressing the gap in the current literature.

Keywords: *Eye-Tracker, Accessibility, Motor Impairments, Application, Music, Human-Computer Interaction, Design, New Media*

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O consumo de conteúdos noticiosos: o papel das narrativas interativas no jornalismo digital

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Abstract. A informação jornalística assume actualmente um papel central enquanto mediadora da realidade social e agente promotora de cidadania ativa e crítica, contribuindo para a formação de públicos mais informados e participativos. Contudo, o consumo de notícias entre os jovens adultos nos meios de comunicação tradicionais tem diminuído, enquanto a preferência por conteúdos digitais dinâmicos e interativos regista um crescimento significativo. Neste contexto, esta investigação visa desenvolver uma arquitetura narrativa que, através da interatividade e da agência, permita ao utilizador escolher o seu percurso narrativo, aumentando o envolvimento no consumo de conteúdos noticiosos digitais. Para o efeito, foi formulada a questão de investigação: quais os contributos das narrativas interativas para o consumo de notícias digitais entre os jovens adultos em Portugal? Com base nesta questão, foi adotado um desenho metodológico de natureza sequencial mista, estruturado em três fases. Fase 1 (qualitativa e de carácter exploratório): entrevistas a investigadores, especialistas em tecnologias da comunicação e jornalistas (n = 12), seguidas de narrative research com jovens adultos (n = 20), com o objetivo de gerar requisitos de design. Fase 2: desenvolvimento de um protótipo funcional multimodal (texto-vídeo-dados; interface tátil/voz), com base na metodologia Design Thinking, integrando ciclos iterativos de teste de usabilidade. Fase 3 (quantitativa): ensaio experimental (n = 70) para avaliar o protótipo, com foco em três dimensões centrais: atenção visual (eye-tracking), atratividade percebida (AttrakDiff) e envolvimento narrativo nos percursos interativos, avaliado através de escala subjetiva de auto-relato. Para documentar todo o processo de investigação, será produzido um documentário. Como resultado, espera-se um maior envolvimento cívico no consumo de conteúdos noticiosos. O estudo deverá evidenciar o impacto das narrativas interativas no jornalismo digital, contribuindo para a inovação na experiência no consumo de notícias digitais e para o desenvolvimento de estratégias que promovam a cidadania ativa junto deste público mais jovem.

Keywords: *Narrativas Interativas, Interatividade, Jornalismo digital, Consumo de notícias, Interfaces interativas, Eye tracking, Jornalismo de dados, Cidadania digital, Agência*

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Learning by podcasting: podcast as a pedagogical intervention to promote student engagement in higher professional education institutions

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Abstract. This research project aims to present and analyze the development and implementation of a pedagogical intervention carried out with students and teachers in higher professional education in Portugal and Brazil. The intervention focuses on student-created podcasts as a strategy to foster engagement, autonomy, and active learning. It is grounded in the pedagogical approaches of active learning and learning by teaching, which posits that, by teaching others, students reinforce their own learning process while developing cognitive, communication, collaborative, creative, and critical thinking skills. By taking on the role of content producers in podcast format, students become active agents in their educational journey.
To support the creative and organizational process of podcast development, two physical pedagogical artifacts were introduced: a set of instructional cards, which guide each phase of podcast production using accessible language and practical examples, and an organizing board, which serves as a visual map of the projects stages. These playful resources played a key role in structuring the activities, promoting student autonomy and accessibility throughout the process.
The researchcurrently ongoinghas been conducted in real classroom settings, with the intervention applied in regular classes and data collected through systematic observations, participant interviews, and questionnaires.The results from the first evaluation cycle show that 85% of students perceived the activity as innovative and engaging, while 71% described as enjoyable. In terms of the teaching and learning process, 70% of students reported feeling a stronger connection to the podcast topic, which helped them develop critical thinking around the subject. Collaborative work and the opportunity to exercise creativity were also frequently highlighted by students.
Findings suggest that integrating digital technologies with physical materials, when combined with active learning principles, contributes to the creation of a more meaningful and engaging educational environment. The intervention emerges as a promising, replicable, and innovative educational practice.

Keywords: *Podcast, higher professional education, learning by teaching*

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O design da interfade do utilizador na mitigação da conduta incivil online

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Abstract. Fruto da mudança de paradigma iniciada com a Web 2.0 e do aumento de utilizadores da Internet, assiste-se ao crescimento do número de áreas de discussão online e do número de pessoas que nelas participa. Apesar das inúmeras vantagens que proporcionam, estas áreas não são imunes a problemas. Neste contexto, muitos comentários ofensivos e potencialmente perniciosos são publicados diariamente, sendo este apontado como um dos principais problemas destas áreas. O Design da Interface do Utilizador revela capacidade de persuadir comportamentos, e tem sido sobre esta perspetiva que tem respondido a esta problemática, tratando a incivilidade online como um comporto desviante a ser gerido, minimizado ou silenciado. Contudo, e sem retirar mérito a estas intervenções, estas continuam a ser intervenções reativas e numa lógica a curto-prazo.
Esta investigação, em contexto de tese de doutoramento em curso, procura explorar como é que o Design Especulativo pode revelar tensões culturais, emocionais e políticas incorporadas das discussões online, desenvolvendo propostas que não pretendem ser soluções, mas sim provocações que incitem à reflexão e desafiem pressupostos normativos sobre a incivilidade.
Será conduzido um estudo com uma abordagem exploratória, utilizando métodos qualitativos. Participantes serão recrutados e divididos em sessões de focus group; serão conduzidas entrevistas com representantes de jornais; serão conduzidas sessões de trabalho com especialistas em design, onde serão desenvolvidas propostas de design especulativo; serão realizados workshops com aplicação de abordagens de design especulativo associadas a técnicas narrativas.
No fim são esperados os seguintes resultados: obter uma compreensão aprofundada da temática do estudo; desenvolver uma framework que apoie a aplicação de design especulativo (associado à participação especulativa) como potencializadora de reflexão e preparação de futuro; e delinear um conjunto de recomendações de ações ou intervenções para práticas futuras.

Keywords: *Design Especulativo, Incivilidade Online, Participação Especulativa*

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Mapping interventions for women's digital health literacy: a collaborative scoping review project

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Abstract. Background
Digital Health Literacy (DHL) is a developing concept defined as the ability to access, understand, evaluate, and use digital health (DH) information and services in digital contexts, while managing the interplay of individual skills, technology, and environmental factors to enhance health outcomes for oneself and others' care(1,2). Women face disparities in DHL, limiting their effective use of DH technologies for personal and family well-being management(3,4). As primary health decision-makers, women's DHL is crucial for broader family health outcomes(5).
Objective
To develop a scoping review protocol that systematically maps interventions impacting women's DHL, pinpointing intervention types, implementation contexts, and outcomes.
Methods
Our developed scoping review protocol follows JBI methodology and PRISMA-ScR guidelines(6,7). Developed within the students@digimedia 2025 volunteer program, the study employs a comprehensive search strategy across seven databases (MEDLINE, WoS, Scopus, PsycINFO, ERIC, BVS, SciELO) in three languages (English, Spanish, Portuguese). Data screening was conducted using Rayyan.ai software(8). The Transactional Model of eHealth Literacy guides data extraction and analysis, examining individual factors, DH tools, and environmental influences(2). The collaborative approach involves two volunteer students in all phases, promoting research capacity building.
Current Progress
The review protocol is registered on OSF.io during data extraction. The study selection identified interventions including educational programs, community training, and digital health technologies across healthcare, education, and community settings. Direct interventions in digital health literacy and indirect effects from adopting digi
Expected Outputs
Two manuscripts are in preparation: a protocol paper and the full scoping review findings, both following scoping review reporting standards.tal health tools are being systematically documented.
<strong style="background-color: initial;»Impact
This research aims to provide the first comprehensive evidence map of women's DHL interventions, informing evidence-based interventions to address gender disparities in access to DHL. It also fosters research capacity building in interdisciplinary settings.

Keywords: *Digital health literacy, women's health, scoping review, health equity*

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JBR, JM, and DM are the primary research students conducting the review, whilst SAL and MJA are the senior researchers who provided critical methodological advice for the development of the project.

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Responsible artificial intelligence: ethics and social impact

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Abstract. The rapid advancement of artificial intelligence (AI) presents a range of societal challenges, including ethical concerns related to bias and discrimination in decision-making, privacy and data protection, job displacement, accountability and transparency, and potential threats to human autonomy and security. These challenges are further complicated by the increasing integration of AI systems into critical sectors such as healthcare, finance, and public safety.
In response to these concerns, this project aims to evaluate major AI platformsChatGPT, Gemini, and Copilotfocusing on their alignment with ethical principles, transparency, and social responsibility.
This research was conducted at DigitalOBS, a digital media observatory at the University of Aveiro, in collaboration with students from the Students@Digimedia initiative.
The study was conducted in four main phases:
i) A review of international ethical standards and guidelines (OECD, UNESCO, EU);
ii) An analysis of how ChatGPT, Gemini, and Copilot incorporate these standards into their systems;
iii) Practical testing of each platform using a 12-question ethical assessment, covering areas such as privacy, transparency, accountability, bias mitigation, and social impact;
iv) Evaluation of responses using the Chatbot Evaluation Framework (Silva, 2025), which assesses five dimensions: Dialogic Coherence, Utility, Language Complexity, Ethical Appropriateness, and Credibility.
Results show that while ChatGPT, Gemini, and Copilot have made notable progress in implementing ethical guidelines, their levels of ethical compliance vary significantly. Key gaps remainespecially in handling sensitive topics, such as recommending a political party to vote for in the recent elections in Portugal. This highlights the ongoing need for robust regulatory frameworks and enhanced ethical practices. Moving forward, these platforms must address their weaknesses while preserving their strengths to ensure AI technology truly serves society's interests. These are further complicated by the increasing integration of AI systems into critical sectors such as healthcare, finance, and public safety.

Keywords: *AI platforms; Chatbot; Ethical guidelines; Privacy; Data protection*

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Gamified web-platform to engage families in act-based coping skills

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Abstract. The research team includes students and researchers from different academic backgrounds and skills, such as web programming, design of user interfaces and psychology. They work collaboratively in the design and development of a gamified, user-centered digital platform for delivering the ACT2ParenTeens psychological intervention. Rooted in the principles of Acceptance and Commitment Therapy (ACT), the intervention is designed to support adolescents in managing anxiety by strengthening their psychological flexibility.
The project began with a thorough review of effective gamified features in digital mental health. Drawing from this research, students collaborated to create a compelling narrative that anchors the platforms gamified elementsensuring the experience is not only evidence-informed but also meaningful and motivating for adolescents and their parents.
The project evolved across two central streams of work: (1) project a visual design tailored to convey the narrative and connect emotionally with the intended users; and (2) incorporate it in a Web platform and develop the necessary programming to support the paced delivery required by therapeutic interventions.
The students have continuously engaged in continuous feedback cycles with coordinating researchers, to build a product that is intuitive, emotionally engaging, and aligned with therapeutic goals.
In the final phase, students will conduct pilot testing with adolescents and parents to gather feedback on the platforms usability, attractiveness, and features. This phase is essential to fine-tune the platform and ensure its readiness to host the ACT2ParenTeens intervention.
This initiative represents an important step in bridging psychological science and digital innovation, while offering students the opportunity to collaborate and put their skills to use within an applied context. The resulting project will also represent a stepping-stone for the continued development of the ACT2ParenTeens research project

Keywords: *Gamification, web-plataform, design, usability*

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Olha (de novo) para o digimedia

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Abstract. A imagem é, atualmente, uma das mais poderosas formas de comunicação. A divulgação de conteúdos de uma instituição em diferentes formatos, físicos ou digitais, exige uma uniformização que permita à audiência identificar-se de imediato. Partindo deste pressuposto e de uma necessidade cada vez maior de mostrar o trabalho realizado pela Unidade de Investigação (UI) DigiMedia (Digital Media and Interaction Research Centre), surgiu a ideia de propor um projeto na iniciativa students@Digimedia#04.

Este projeto tem, assim, como objetivo criar um conjunto de recursos com uma identidade visual coesa e representativa da UI, que fortaleça o seu envolvimento e a ligação com o público-alvo, promovendo uma melhor e mais abrangente divulgação de conteúdos, bem como o aumento de interessados nas nossas atividades.

Em conjunto com uma equipa com conhecimentos na área de audiovisual, comunicação e design, pretende-se desenvolver recursos visuais para difundir informações diversas, em diferentes plataformas, de forma mais apelativa e dinâmica, uniformizando as cores, as imagens e os textos.

Assim, está a ser criado um conjunto de templates adaptáveis, com base nas cores e logotipo do DigiMedia, que facilitem a sua utilização recorrente, em diferentes ações de divulgação de eventos, calls, publicações, notícias, apresentações, entre outros. Estes recursos serão utilizados nas diferentes plataformas do DigiMedia (páginas web, newsletter, redes sociais, e ecrãs do DeCA).

Dar a conhecer a investigação e as atividades do DigiMedia a um maior número de pessoas, especialmente estudantes dos três ciclos de ensino, e potenciar o interesse pela nossa área de trabalho e possíveis contributos e colaborações, é o nosso compromisso com este projeto.

Keywords: *Imagem; conteúdo visual; divulgação;*

Acknowledgements. Este projeto é apoiado por fundos da FCT - Fundação para a Ciência e Tecnologia, no projeto UID/05460 - DigiMedia - Centro de Investigação em Média Digitais e Interação.

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Creation of a web page to record data from the observation and analysis of videos, collected in immersive web environments for education

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Abstract. The objective of this study is to develop a web page to disseminate the analysis of interactions that occurred in an Immersive Web Environment in an educational context.
This work was designed based on the analysis of videos of 12th-grade students from the science and technology course who participated in an immersive experience in a Portuguese language class, utilizing one IWE about José Saramago, available at: https://framevr.io/josesaramago.
The students, represented by avatars, participated in activities for 70 minutes in this IWE, focusing on the work of the writer and the Nobel Prize for Portuguese Literature. This experience was recorded in 46 videos, each approximately one hour long.
From the need to record all the data observed in these videos, a data repository was born with 12 related tables: Session, Participant, Courses, Events, Objects, Object types, Video. The Interactions table is the main one, where data such as the avatar's name, the name of the object that the avatar handled, what type of event it developed on the object, the start and end time of the interactions, the time spent on each activity, the conversations between the avatars, both orally and in writing (chat), the images of the avatars, the drawings made by the students on the whiteboard, and a notes field, where the researcher can write some notes about the observed Interaction. 3165 interactions were collected in approximately 300 hours of video observation and annotation of interactions.
For the students, this experience was an enriching opportunity that allowed them to explore new areas, exchange experiences, expand their knowledge and collaborate as a team with people from different areas of expertise. They discovered, in a practical way, how different areas can work together on a project and, thus, acquired knowledge that goes far beyond what is found in the classroom.

Keywords: *Immersive Web Environments, Education, Video Analysis, web page development*

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Let the microorganisms speak: integrating scientific illustration and impact assessment in microbiology communication

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Abstract. Science communication remains a critical yet complex challenge, particularly in disciplines such as microbiology, where public awareness often lacks scientific relevance. The Let the microorganisms speak project, conducted under the Students@DigiMedia#04 initiative, explores the intersection of visual creativity and methodological rigor to enhance the communication of microbiological concepts to non-specialist audiences, while also addressing a frequently overlooked dimension: the evaluation of communicative impact.

The first phase of the project involved the conceptualization and development of an original scientific illustration with the aim of introducing different forms of microbial life. The resulting product - a scientifically based strip cartoon - follows an extraterrestrial microorganism who, driven by loneliness, travels to Earth in search of a compatible microbial match via a dating application. Through humorous narrative and engaging visuals, the cartoon introduces the viewer to a diverse array of microbial life forms, each accompanied by a brief and accessible scientific description. This format serves a dual purpose: to inform and to enhance memorability by using narrative and affective engagement.

In parallel, the second phase of the project focused on the development of practical tools for evaluating the effectiveness of science communication initiatives, which were pilot-tested and refined for broader applicability.

The Let the microorganisms speak project embraces collaboration across student profiles - from science to design - and proves that when biologists and media specialists join forces, the results can be unexpectedly lively.

Altogether, this work aligns with DigiMedias and CESAMs missions: to combine creative media, scientific content, and empirical evaluation for more effective and meaningful science communication practices.

Keywords: *science communication; microbiology; strip carton; impact evaluation*

Acknowledgements. The authors acknowledge Fundação para a Ciência e a Tecnologia for the financial support of Digital Media and Interaction (DigiMedia) + UIDB/05460/2020 ; UIDP/05460/2020 and of UID Centro de Estudos do Ambiente e Mar (CESAM) + LA/P/0094/2020

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Mapping jobs in the multimedia sector

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Abstract. This project systematically maps and categorises job advertisements in the multimedia sector, both nationally and internationally, to identify emerging trends, skills, and qualifications sought by employers. By collecting and analysing data from diverse sources including LinkedIn, company websites, and analogue channels we aim to construct a comprehensive taxonomy of job offers, categorised by function, industry sub-sector, required skills, working conditions, and location. This initiative directly addresses the need for up-to-date labour market intelligence, as highlighted by recent studies on multimedia careers (Cheng et al., 2022; Lee ; Kim, 2021), and supports curriculum development and career planning within the Communication Sciences and Technologies domain. Through the application of robust data analysis and visualisation techniques, the project seeks to uncover patterns in job market demand, with particular emphasis on roles related to human-computer interaction, interactive media, audiovisual, game design and development and intelligent systems areas identified as growth sectors (World Economic Forum, 2023; Wang et al., 2020). The findings will be disseminated via a visual map and report, contributing actionable insights to both the academic community and industry stakeholders. Furthermore, the project aligns with Digimedias mission to foster responsible and sustainable human-computer relationships, exploring how such values are reflected in current job advertisements (Fernández-García et al., 2023). Ultimately, this research empowers students to make informed career decisions and enhances the universitys capacity to adapt training offers to the evolving demands of the multimedia industry.

Keywords: *nan*

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Lets talk about students@digimedia #04

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Abstract. The project Lets Talk About Students@DigiMedia draws inspiration from William Demings principle: You cant manage what you dont measure; you cant measure what you dont define... Using a mixed-methods approach, the project aims to analyze and evaluate the first three editions of the event. Its goal is to generate actionable insights and create tools that enhance planning, execution, and long-term impact.
The projects findings will be presented through a scientific poster, focusing on results from satisfaction surveys and focus groups. These data sources provide insights into participant motivation, perceived value, and the overall experiences of both students and proposers. The study also identifies best practices and key limitations, establishing a foundation of knowledge to support the continuous improvement of the event.
Final outputs include a qualitative insights report and scientific dissemination materials. A sustainability plan will accompany these deliverables to ensure that the knowledge and tools developed remain accessible, relevant, and reusable in future editions, strengthening institutional memory and fostering ongoing learning and innovation.

Keywords: *nan*

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Audiovisual communication of the research project "almeidar"

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Abstract. Within the scope of cultural tourism, information and communication technologies have enabled novel approaches to experience cultural heritage, thus enriching the overall tourist experience and appealing to a diverse visitor profile (Di Pietro et al., 2018). In particular, mobile applications incorporating gamification elements and/or augmented reality are increasingly used to provide experiences that are both educational and engaging (Xu et al., 2017). Although several studies have examined the use of such applications in cultural tourism contexts (Malegiannaki ; Daradoumis, 2017; Ribeiro et al., 2021; Silva et al., 2023, 2024), further studies are necessary to identify the most effective engagement components and to establish guidelines for improving their design. Based on the theoretical framework of Zagalo's Engagement Design Model (2020), the authors developed the Cultural Engagement Digital Model (Silva et al., 2025), which aims to promote the tourists active participation in the co-construction of their experiences. In alignment with this model, the AlmeidAR application was designed, targeting a younger demographic and seeking to promote an engaging cultural visit to Almeida by integrating interactive activities such as a quiz, a treasure hunt, traditional recipes, and themed selfies.
This research, conducted under the Students@DigiMedia#04 initiative, aimed to produce a video about the AlmeidAR application, in order to make it accessible and engaging to a broader audience, thereby contributing to the demystification of science communication in scientific research projects. The tasks defined for this process were: i) analysis of the projects objectives; ii) creation of guidelines for science communication in audiovisual format; iii) development of the script for the project video; iv) implementation of a focus group for script validation; and v) audiovisual production. The guidelines and the final video production will be presented during the final event of Students@DigiMedia#04.

Keywords: *nan*

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[GOVCOPP - CIS] Competitiveness, Innovation and Sustainability

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Proposta de guidelines para uma implementação eficaz e eficiente do modelo acsa em unidades de saúde portuguesas

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Abstract. A Qualidade em Saúde tem vindo a afirmar-se como uma área de investigação promissora, que pode contribuir significativamente para a melhoria da eficácia das unidades de saúde, aumentando a segurança e satisfação dos utentes. A certificação de sistemas de gestão da qualidade ou a acreditação de unidades de saúde por diferentes entidades, são mecanismos utilizados para esse fim. No entanto, é de notar que estes mecanismos correspondem habitualmente a um grande investimento económico, humano e de tempo, o que levanta questões sobre a forma mais eficaz e eficiente de os implementar.
Em Portugal, desde 2008 que a responsabilidade pela Qualidade em Saúde é da Direção Geral da Saúde, a qual adotou oficialmente o modelo de Acreditação da Agencia de Calidade Sanitaria de Andalucia (ACSA). É neste âmbito que surge a presente Proposta de Projeto de Tese, que tem como objetivo geral de investigação, a elaboração de guidelines que forneçam orientações sistemáticas a seguir para a implementação do Modelo ACSA em unidades de saúde Portuguesas. Este objetivo geral desdobra-se em três objetivos específicos: i) identificação das motivações, benefícios, desafios e fatores críticos de sucesso subjacentes à implementação de referenciais de certificação ou acreditação; ii) diagnóstico da situação em Portugal no que se refere às motivações, benefícios, desafios e fatores críticos de sucesso subjacentes à implementação desses mesmos referênciais; iii) elaboração e validação empírica de guidelines para a implementação eficaz e eficiente do Modelo ACSA em unidades de saúde em Portugal. Metodologicamente, a investigação apoia-se numa metodologia mista, que combina uma revisão sistemática da literatura com a aplicação de um inquérito por questionário aos responsáveis de projetos de certificação ou acreditação em unidades de saúde Portuguesas e a realização de entrevistas semiestruturadas junto desses mesmo responsáveis. Os principais resultados da investigação serão publicados sob a forma de 3 artigos que correpondem aos 3 objetivos específicos.

Keywords: *Qualidade; Modelo ACSA; Unidade de Saúde; Guidelines*

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O papel das fintechs na transformação do ecossistema financeiro angolano.

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Abstract. Este artigo investiga o papel das FinTechs na transformação do ecossistema financeiro angolano, destacando seu potencial para promover inovação, inclusão financeira e sustentabilidade no setor bancário. O estudo combina abordagens qualitativas e quantitativas, analisando dados de 23 bancos comerciais angolanos (20192024), com foco em bancos sistémicos e não sistémicos. As FinTechs, impulsionadas por tecnologias como IA, blockchain e pagamentos digitais, estão revolucionando os serviços financeiros, reduzindo custos operacionais, ampliando a base de usuários e melhorando a eficiência. O artigo explora ainda a intersecção entre FinTech e práticas ESG (Ambientais, Sociais e de Governança), argumentando que a adoção de tecnologias financeiras pode fortalecer a transparência e a responsabilidade corporativa. Espera-se que os resultados sugerem que as FinTechs têm um impacto positivo na inclusão financeira, especialmente em economias emergentes como Angola, onde soluções como dinheiro móvel (ex.: M-Pesa) podem beneficiar populações não bancarizadas. No entanto, desafios como regulamentação, desconfiança digital e baixa educação financeira limitam seu potencial. Espera-se que o estudo conclui que a colaboração entre bancos tradicionais e FinTechs ("coopetição") é crucial para impulsionar a inovação sustentável. Recomenda-se políticas que incentivem a interoperabilidade, a regulação proporcional (ex.: sandboxes regulatórios) e a capacitação digital para maximizar os benefícios das FinTechs no ecossistema financeiro angolano.

Keywords: *FinTech, ESG, setor bancário, ecossistema financeiro, Angola.*

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Methodological approaches in systematic literature reviews: examining the proknow-c and ordinatio methods, a literature review.

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Abstract. Background: Reviewing and studying previous scientific research can help identify gaps, theoretical and structured frameworks to support future contributions. Given the growing academic research and increasing demand for reproducible methods (Marzi et al., 2025). The Proknow-C method (Process Approach to Knowledge Development - Constructivism) focuses more on a structured and constructivist approach. This method reviews and analyzes the literature by interacting with it, employing steps such as article filtering, relationship analysis, and bibliographic evaluation (Haro-Aragú ; García-Mestanza, 2024; Sousa et al., 2024). In contrast, the Ordinatio method is based on an arrangement technique for scientific articles based on a normalized score. This score includes various influential factors, such as the number of citations, year of publication, and journal impact factor, which is used as a quantitative alternative by creating a standardization for the selection of texts (Steffen et al., 2024). Despite using both methods in scientific research, limited research is available to guide researchers in their choice, where methodological accuracy still strongly depends on the selected framework and its function.
Objectives: This study aims to critically review, analyze, and compare the Proknow-C and Ordinatio methods as tools for systematic literature review (SLR) in Marketing research. It also examines and evaluates their process effectiveness in identifying and prioritizing research articles and their relevance.
Methodology: This study applies a qualitative and comparative literature review approach, analyzing academic journals from 2015 to 2025 that use either the Proknow-C or Ordinatio methodologies. Using a systematic search of central academic databases, selected articles were reviewed through thematic content analysis to assess methodological processes, strengths, limitations, and application areas.
Originality: This study reviews the Proknow-C and Ordinatio methods, compares them in the framework of systematic reviews of the texts, and highlights their theoretical foundations, practical applications, and methodological effectiveness.

Keywords: *Comparative Analysis; Methodological Framework; Ordinatio Methodology; Proknow-C; Research Methodology; Systematic Literature Review (SLR).*

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Proposal of a framework for the implementation of quality 4.0 in small and medium sized enterprises

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Abstract. In the era of digital transformation, Quality 4.0 marks a significant evolution in quality management (Maganga and Taifa, 2022; Souza et al., 2022). Despite increasing academic attention, practical insights into its implementationparticularly within small and medium sized enterprises (SME)remains scarce. To address this gap, a systematic literature review was conducted (Oliveira et al., 2025), alongside a case study in a Portuguese ceramics company operating under the Industry 4.0 paradigm. The findings from these two studies, combined with existing ones using questionnaires across various organisational contexts, supported the development of a questionnaire to assess the implementation of Quality 4.0 in Portuguese companies (Oliveira et al., 2024).

The questionnaire consists of 23 closed questions covering four main areas: i) Industry 4.0 context; ii) quality management practices; iii) competencies required for Quality 4.0 professionals; and iv) motivations, success factors, and implementation challenges. It serves as a versatile instrument for assessing Quality 4.0 maturity across different organisational realities.

Preliminary results of the questionnaire application to a sample of Portuguese companies in 2024 indicate that most of them are still at an early stage of Industry 4.0 and Quality 4.0 implementation, characterised mainly by a focus on digitalisation and IoT. The adoption of advanced technologies such as AI and machine learning remains limited. Moreover, and although the workforce shows strong adaptability and collaborative skills, gaps persist in digital literacyparticularly in data analyticswhich hinders the full potential of Quality 4.0 implementation.

In the next phase of this research, the insights gathered from the questionnaire application, along with all previously collected information, will serve as the basis for designing of a practical framework to support SME in overcoming implementation challenges and enhancing their quality management strategies in alignment with the principles of Quality 4.0.

Keywords: *Quality 4.0, Industry 4.0, SMEs, digital transformation*

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How to manage the digital transformation/ journey in smes, considering leadership, company culture as well as technology.

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Abstract. Building upon the theoretical foundation of a systematic literature review and empirical insights from qualitative expert interviews, this third study introduces an iterative solution model designed to support small and medium-sized enterprises (SMEs) in navigating their digital transformation/ journey. While previous research has emphasised the importance of leadership, culture and technology, their interdependencies have remained underexplored in practical frameworks tailored to SME contexts. The proposed model follows a four-phase structure: (I) Analysis, where organisations assess their internal digital environment using triad-specific attributes; (II) Evaluation, which interprets the collected data to identify priority areas; (III) Status Mapping, a visualisation phase that replaces traditional action planning by locating the organisations position across key transformation areas using a Metro Plan (lane-and-station structure); and (IV) Impact Measurement, which monitors progress over time using feedback loops and performance indicators.
Each of the models three core categoriesleadership, culture and technologyis mapped across specific attributes and four progress stages. Through structured self-assessments and tools such as spider charts and metro-inspired diagrams, organisations can reflect on their current status, align strategies accordingly and iterate their transformation efforts. Rather than prescribing predefined actions, the model fosters orientation, adaptability and continuous organisational learning.

Keywords: *SMEs; Digitalisation; Transformation Roadmap; Culture; Technology; Leadership; Industry 4.0*

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Digitalization maturity models in public institutions: a comparative analysis

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Abstract. Digital transformation in the public sector has taken on a central role in modernization strategies, covering central and local administration and all public institutions. In this context, various models have been proposed to assess the stages of maturity of government digitalization, making it possible to understand where institutions stand and the potential paths for their evolution.
This study has adopted a systematic literature review as its methodology. It develops a comparative analysis of different digitalization maturity models in government to identify the most complete and comprehensive, provides a solid basis for future research, and guides strategic decisions. Models are explored that range from the initial stages, generally characterized by simply making information available online, to the most advanced stages, where so-called smart services emerge, integrating tools such as artificial intelligence, big data analytics, and sensor systems. The analysis includes a detailed description of the technologies, tools, and practices associated with each stage of digital maturity in the different models analyzed.
The findings indicate that the most complete model identified in the literature review comprises five stages of digital maturity, which reflect an integrated and strategic vision of digital transformation in the public sector. This model differentiates technological and organizational aspects, making it particularly useful for a holistic approach to government digitalization. The conclusion is that an in-depth understanding of these models makes it possible to accurately assess the level of digital maturity of public institutions and provide concrete guidelines for defining sustainable administrative modernization strategies. These strategies must be aligned with the objectives of innovation, efficiency, and proximity to the citizen, promoting an inclusive, ethical, and results-oriented long-term digital transformation. In addition, identifying technological gaps at each stage can serve as a basis for future research and public policies to accelerate the digital transition in a structured and effective way.

Keywords: *Digitalization, maturity models, e-government, smart government, public administration*

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Improving the well-being of people and the planet: a delphi study

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Abstract. This study addresses the urgent need for a paradigm shift from traditional economic models towards approaches prioritizing human well-being and environmental sustainability, as new theories like post-growth, degrowth and doughnut economics emerge (Savini, 2024). Recognizing the challenge in translating these concepts into actionable policy (Trebeck, 2024) and inspired by previous Delphi studies on well-being (Buettner et al., 2020), this research uses the Delphi method to gather expert consensus. It aims to identify strategies that simultaneously enhance subjective well-being (SWB) and environmental quality, moving beyond the often-questioned link between relentless economic growth and improved life satisfaction (Easterlin, 1974). The study involved a two-round process with 16 experts from diverse fields to evaluate both policy measures and individual actions.

The main findings highlight that, at the policy level, top-rated measures include prioritizing human well-being and environmental sustainability, implementing well-being-based cost-benefit analysis for externalities, ensuring good national governance, and reducing car use. Notably, the pursuit of economic growth was rated as the least effective policy for achieving these dual goals. At the individual level, the most effective actions identified were cultivating social relationships, engaging in pro-social voluntary activities, and reducing conspicuous consumption. Conversely, actions such as practicing meditation or adopting pets were considered less effective for improving well-being and sustainability.

The importance of this study lies in its pioneering effort to integrate happiness economics and environmental sustainability through a structured expert consensus method. It provides actionable guidance for policymakers and individuals, challenging traditional economic indicators and emphasizing a multidimensional framework that incorporates quality of life and environmental quality. The research underscores that a shift towards a well-being-centered economy is crucial.

Keywords: *Well-being, environmental sustainability, policy advice, Delphi method, economics of happiness*

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The effect of employee (dis)satisfaction on sustainable supply chain management

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Abstract. Over the past decades, Sustainable Supply Chain Management (SSCM) has gained increasing attention from researchers and industry professionals for its role in helping companies achieve long-term goals related to the environment, economy, and society (Bubicz, Barbosa-Póvoa, and Carvalho 2019). While many studies have focused on the economic and environmental dimensions, the social dimension, particularly the role of employees, has received comparatively less attention. Recent literature highlights that employee dissatisfaction leads to decreased motivation, higher absenteeism, and increased turnover, which can result in delays and disruptions across the supply chain(Wang, Hill, and Hwang 2023).

This study addresses this gap by proposing a conceptual framework that explores how employee dissatisfaction affects all three dimensions of SSCM: economic, environmental, and social. Specifically, it introduces Human Resource Management (HRM) as a mediating mechanism that alleviates dissatisfaction through strategies such as job redesign, employee engagement, and well-being enhancement (Ullah et al. 2021). Technological capabilities are also incorporated as a moderating factor that strengthens organizational agility and reduces dependency on labor intensive processes (Lin and Fan 2024).

Methodologically, the study conducts a systematic literature review following PRISMA protocols, coupled with a directed qualitative content analysis of peer-reviewed studies published between 2015 and 2025. Findings indicate that although all three pillars of SSCM are negatively affected, the social dimension appears to be the most directly and immediately impacted by employee dissatisfaction, while HRM and technological interventions help mitigate these risks and reinforce supply chain sustainability.

This research contributes both theoretically and practically by demonstrating how greater attention to employee-related factors can enhance sustainability outcomes. The proposed framework supports organizations in strengthening resilience and redefining HR strategies as an integral part of their long-term sustainability roadmap.

Keywords: *Employee dissatisfaction, Sustainable supply chain management, Human resource management, Technological moderation, Organizational resilience, Sustainability*

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Sustainable luxury: design innovations in eco-friendly metallic accessories

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Abstract. This research explores the integration of sustainable product design practices within the production of luxury metallic accessories, with a focus on balancing environmental responsibility and high-end craftsmanship. Through the lens of Eco Design, the study investigates how recycled metals, eco-friendly coatings, and low-impact production processes can be incorporated without compromising the aesthetic and qualitative standards that define luxury. A comprehensive literature review sets the theoretical foundation, analysing current trends, materials, and sustainability frameworks relevant to the luxury sector. The core of the research consists of a comparative analysis between two accessory designs, evaluated using Life Cycle Assessment (LCA), Life Cycle Inventory (LCI), and a detailed impact matrix. These tools will quantify and contrast the environmental impacts of each design, aiming to identify the less harmful alternative. By merging scientific analysis with the values of traditional savoir-faire, the study seeks to demonstrate the necessity and feasibility of embedding Eco Design principles into the luxury industry. Ultimately, it advocates for a transition toward sustainable innovation that honours both environmental commitments and artisanal excellence.

Keywords: *nan*

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De que forma as políticas públicas na área do empreendedorismo em portugal têm promovido o modelo da tripla hélice?

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Abstract. O empreendedorismo em Portugal tem vindo a obter um papel mais relevante no país, através do modelo da tripla hélice, ligando a inovação produzida pelas universidades aos desenvolvimentos industriais e legislativos vigentes. As instituições de ensino superior têm tido uma capacidade crescente de participação nos desenvolvimentos económicos do país, com uma aposta na comercialização da sua investigação, sendo considerado um ponto positivo nos índices de inovação do país, bem como a capacidade da promoção de empresas, melhorando as condições existentes.
Para consolidarmos este tema, utilizámos uma metodologia baseada numa revisão de literatura, com o objetivo de analisar as políticas que levaram a este crescimento, relatando as mudanças existentes, bem como as formas de implementação e avaliação destas políticas. Este trabalho pretende promover a comunicação de políticas empreendedoras em Portugal, como tal, consideramos a questão norteadora: De que forma as políticas públicas na área do empreendedorismo em Portugal têm promovido o modelo da tripla hélice?, fazendo a análise subjacente das mesmas, preenchendo o gap existente na literatura, conhecendo o levantamento e os destinatários destas mesmas políticas.

Keywords: *Empreendedorismo; Tripla hélice; Inovação; Políticas públicas*

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A cooperação transfronteiriça e a política regional da união europeia: o papel das euro-regiões

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Abstract. Na nossa investigação, temos vindo a olhar as consequências das políticas de cooperação transfronteiriça da União Europeia na implementação de políticas regionais, e abordando mais concretamente o papel que as Euro-Regiões podem vir a ter nesse contexto.
Efectivamente, temos observado como, num contexto de governação multi-nível, se torna central envolver agentes de múltiplos níveis e proporcionar a sua interacção. Nesse contexto, as Euro-Regiões apresentam-se como entidades que permitem essa coordenação, enquanto simultaneamente fomentam a cooperação transfronteiriça. A cooperação transfronteiriça é essencial não só na política de coesão, mas também na política regional da UE. Estas Euro-Regiões apresentam-se igualmente uma política territorial que permite abordar discrepâncias e sobreposições que surgem no âmbito de políticas comunitárias, pois diversos programas referem-se a questões transnacionais e, por isso mesmo, exigem uma solução que o seja, perfilando-se as Euro-Regiões como potenciais soluções nestes casos. Diversas Euro-Regiões que apresentam um percurso relevante, incorporando a governação multi-nível da UE e fomentando a cooperação Transfronteiriça, demonstram alinhamento com as direcções das políticas públicas europeias, com um papel importante ao nível da política de coesão, por exemplo através da participação na atribuição/utilização de fundos europeus.
Assim, esta investigação tem vindo a focar-se progressivamente em casos particulares, de forma a poder desenvolver conclusões baseadas em estudos de caso.

Keywords: *nan*

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Determinants of the financial inclusion social contract in sub-saharan africa

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Abstract. Abstract
Financial inclusion (FI) is a central concern of global development agendas. It has prompted widespread policy adoption across Sub-Saharan Africa (SSA), where over 30 countries launched National Financial Inclusion Strategies (NFIS) between 2010 and 2020. Yet, despite this convergence, FI outcomes remain highly uneven. Existing research has not adequately explained which combinations of policy design and governance contexts lead to success or failure.
This research addresses that gap by conceptualizing NFIS as normative social contracts between the state and financially excluded citizens. It draws on an original synthesis of modern Social Contract Theory and African communitarian political thought to analyze the policy orientations embedded in NFIS, including contractarian or market-based, contractualist or rooted moral obligation, and communitarian or collectively grounded orientations. This framework facilitates a deeper understanding of how different configurations of policy content and context co-produce FI outcomes.
The methodological approach will employ fuzzy-set Qualitative Comparative Analysis (fsQCA) across 30 SSA countries alongside a directed content analysis of NFIS documents. Conditions include policy orientation, regime type, the strength of the fiscal social contract, and the level of patrimonialism. A novel financial inclusion index tailored to the African context will serve as the outcome measure, incorporating not only formal financial access but also mobile money usage and other African-relevant indicators of financial behavior.
Although data calibration is ongoing, this study aims to identify the causal combinations most associated with high or low financial inclusion. In doing so, it contributes to scholarship on financial inclusion, state-citizen relations, and development policy design in developing countries. More broadly, it offers a new lens for understanding how normative commitments and governance realities intersect to shape inclusive development trajectories in SSA.

Keywords: *Financial inclusion, social contract theory, African communitarianism, QCA.*

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Transformação urbana para a sustentabilidade através da avaliação ambiental estratégica: o papel da agência nos processos de tomada de decisão

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Abstract. As cidades enfrentam desafios crescentes (alterações climáticas, desigualdade social e perda de biodiversidade), exigindo uma transformação estrutural e sistémica rumo à sustentabilidade nos sistemas urbanos. A governação local eficaz é essencial, mas modelos tradicionais top-down revelam-se insuficientes. É necessário adotar arranjos de governação holísticos e integrados para promover a capacidade de transformação urbana em diversas escalas e domínios.

O interesse académico em compreender melhor os processos de tomada de decisão que impulsionam a transformação rumo à sustentabilidade urbana tem vindo a crescer. No entanto, persistem lacunas sobre ao funcionamento desses processos na prática e em diferentes contextos. Particularmente, como a agência e as interações entre atores podem promover mudanças sustentáveis ou reforçar trajetórias insustentáveis e injustas.

Esta pesquisa visa compreender como os fatores de agência e interações entre atores podem alavancar ou restringir a transformação para a sustentabilidade urbana. A pesquisa investiga os fatores de agência nos processos de Avaliação Ambiental Estratégica (AAE) dos Planos Diretores Municipais (PDM) em Portugal. A AAE é uma ferramenta que promove e integra a sustentabilidade na tomada de decisões através de uma abordagem sistemática, estratégica e participativa.

A investigação recorre à análise temática qualitativa, utilizando o modelo conceptual COMPASS, desenvolvido em estudo anterior (Ponte et al., 2025), para a análise de entrevistas semiestruturadas com representantes dos principais grupos de atores envolvidos nos processos de AAE dos PDM em Portugal. Os resultados mostram como os fatores da agência influenciam os processos de tomada de decisão orientados para a transformação rumo à sustentabilidade urbana.

A investigação avança o conhecimento sobre o papel da agência na transformação para sustentabilidade urbana e contribui para o debate sobre o desenvolvimento sustentável ao promover cidades mais inclusivas, seguras, resilientes e sustentáveis (ODS 11), apoiar a proteção ambiental (ODS 15.9) e fomentar a tomada de decisão inclusiva e participativa (ODS 16.7).

Keywords: *Agência; Avaliação ambiental estratégica; Desenvolvimento sustentável; Governança local; Sustentabilidade; Transformação urbana*

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A avaliação de desempenho na administração pública: um estudo comparativo entre portugal e espanha

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Abstract. A avaliação de desempenho permite aferir o nível e qualidade do desempenho dos trabalhadores num organismo público ou privado. Através deste processo é possível medir e comparar as avaliações e analisar as atividades nas quais o trabalhador teve um melhor ou pior desempenho durante o período de avaliação.
A avaliação de desempenho, enquanto instrumento de gestão, é reconhecida como sendo essencial para que os organismos atinjam os seus objetivos estratégicos, não estando, contudo, este processo isento de limitações.
Partindo da relevância do sistema de avaliação de desempenho enquanto instrumento de política pública de recursos humanos, esta investigação pretende propor sugestões de alteração ao modelo de avaliação de desempenho na Administração Pública Portuguesa, com vista à sua melhoria.
A metodologia desta investigação é qualitativa, permitindo uma análise profunda dos fenómenos estudados. Para aferição dos pontos fracos do sistema de avaliação em vigor e discussão das características que um bom sistema de avaliação de desempenho deveria ter, considera-se importante obter as perceções dos atores envolvidos no processo de avaliação da Administração Pública. Assim, em termos empíricos, o estudo consubstancia-se em três etapas: i) análise documental; ii) realização de entrevistas semiestruturadas; e (iii) realização de focus groups. A amostra será constituída por um conjunto selecionado de stakeholders (trabalhadores, dirigentes e decisores políticos), com diferentes interpretações e ambições relativamente ao sistema de avaliação, mas que têm em comum a sua participação no processo, ainda que em diferentes fases.
A presente comunicação centra-se no estudo comparativo entre as avaliações de desempenho dos trabalhadores das Administrações Públicas Portuguesa e Espanhola, consubstanciada através da análise documental da legislação e documentos de política pública referentes à avaliação de desempenho em ambos os países, tendo como intuito a construção de um benchmarking de boas práticas.

Keywords: *nan*

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Integrated fire management: disentangle whos who and their do's

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Abstract. The effectiveness of rural fire management systems depends on a clear institutional set-up and coordinated action among multiple entities. In Portugal, the complexity and multiplicity of stakeholders involved in the system could contribute to overlapping responsibilities and uncoordinated efforts. This study aims to analyze how the main legal instruments underpinning the Integrated Rural Fire Management System (SGIFR) define, assign, and articulate responsibilities among entities.
A comparative document analysis was conducted, adapting longitudinal coding to the selected legislative instruments. This approach allowed for the disentangling of how the roles and responsibilities were modified, expanded, reduced, maintained, or redefined across time, providing a diachronic perspective on Portugals rural fire governance.
Responsibilities were mapped across temporal legal instruments according to the six phases of the fire management cycle: planning, prevention, preparation, pre-suppression, suppression and relief, and post-event. Findings indicate that responsibilities and roles have changed across these legal instruments, highlighting the importance of clarity and mutual recognition of each entity's role within the system and the associated risks when this does not happen.

Keywords: *Integrated Fire Management; Legal instruments; Responsibility allocation; Longitudinal coding*

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Políticas públicas no enfrentamento da violência doméstica contra as mulheres: a comunidade brasileira em portugal

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Abstract. A violência doméstica representa uma séria violação dos direitos humanos, afetando mulheres de diversas origens em todo o mundo, e as imigrantes enfrentam desafios adicionais ao buscar proteção (Orozco et al., 2023). Em Portugal, segundo o Serviço de Segurança Interna (2025), esse é o crime com o maior número de registros, com mulheres representando cerca de 70% das vítimas.

Alinhado ao objetivo 5 da Agenda 2030, que visa alcançar a igualdade de gênero (Organização das Nações Unidas [ONU], 2015), este projeto tem a premissa de que políticas públicas com abordagem interseccional e que utilizam metodologias de co-criação, permitem a identificação de lacunas e o aprimoramento das estratégias adotadas para assegurar proteção a mulheres vítimas de violência doméstica em Portugal (McCarry et al., 2018; Nixon ; Humphreys, 2010).

Nessa conjuntura, as redes de apoio que atuam em áreas como saúde, segurança, justiça e assistência social são essenciais para a proteção de mulheres vítimas de violência doméstica. Portanto, o reconhecimento da interdependência entre políticas públicas e redes é essencial para garantir a eficácia das ações e a proteção contínua das vítimas (Silva, et al., 2024). Assim, o estudo tem como foco identificar e compreender a articulação e o ajuste das políticas públicas e redes de apoio, no contexto da violência doméstica, às necessidades de proteção das vítimas imigrantes brasileiras.

A metodologia possui design exploratório e descritivo, de natureza mista. Serão aplicados instrumentos de coleta de dados (questionários para as vítimas e entrevistas com os profissionais das redes), entre outras abordagens metodológicas que permitam revelar necessidades importantes a serem consideradas pelas políticas públicas e redes de apoio com o fim de contribuir com elementos que proporcionem o aprimoramento de estratégias institucionais de enfrentamento da violência doméstica, com foco na proteção e no apoio das mulheres imigrantes brasileiras em Portugal.

Keywords: *nan*

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Higher education policies in china (19802025): a multidimensional policy text analysis

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Abstract. This study investigates the evolution of higher education (HE) policies in China from 1980 to 2025, seeking to identify their structural dynamics, key actors, instruments, and effectiveness. Grounded in Historical Institutionalism, Policy Instrument Theory, and Social Change Theory, the research adopts a mixed-methods design that integrates both qualitative and quantitative approaches. The methodology includes content and discourse analysis, Latent Dirichlet Allocation (LDA) for topic modeling, Social Network Analysis to map actor relations, and the Policy Modeling Consistency Index (PMC-index) to assess internal coherence.

Over one hundred national-level HE policy documents were selected from authoritative sources such as CNKI and Chinese government portals. Preliminary findings reveal thematic shifts linked to China's socioeconomic goals, the strategic deployment of policy tools over time, and increasingly complex stakeholder networks shaping the policy process (Huang et al., 2015). These results suggest a shift from ideological discourse to governance-oriented reforms in recent decades.

The study contributes to public policy research by combining computational and interpretive techniques to explore under-researched dynamics in Chinese HE policymaking. It also aims to offer practical insights for enhancing future education policy design, particularly in contexts marked by rapid digital transformation and institutional expansion. By providing a systematic and theory-informed evaluation, this research helps bridge empirical analysis and normative reflection on policy quality and evolution.

Keywords: *Higher Education Policy; Policy Text Analysis; Discourse Analysis; China*

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Políticas da saúde para retenção de médicos em zonas carenciadas em portugal

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Abstract. Esta proposta de projeto apresenta uma monografia de abordagem metodológica mista, simultaneamente qualitativa e quantitativa, centrada na análise das políticas de saúde para retenção de médicos em áreas carenciadas em Portugal e em entrevistas a médicos a exercer nestas áreas. A escolha do tema decorre do interesse académico pelas desigualdades territoriais no acesso à saúde e pela eficácia das políticas públicas de recursos humanos (Dussault, 2014). Apesar das iniciativas existentes, persistem dificuldades na fixação de médicos em áreas rurais e urbanas com sobrecarga assistencial e condições laborais desadequadas (Marchand ; Peckham, 2017). A investigação combina a análise de legislação e dados administrativos sobre vagas carenciadas (20152025) com entrevistas semiestruturadas a médicos internos de formação específica, grupo acessível e representativo da experiência recente nessas áreas (Temido ; Dussault, 2012). A seleção dos participantes será realizada de forma progressiva, guiada pela necessidade de aprofundamento conceptual e teórico emergente ao longo da investigação, contando com o apoio de colaborações institucionais locais, essenciais para assegurar o acesso aos dados e a validade contextual (Russell et al., 2021). A estrutura da tese compreende cinco capítulos: introdução e quadro teórico, metodologias, resultados, discussão e conclusões, incluindo propostas de intervenção. Com esta investigação, pretende-se contribuir para o debate académico sobre equidade em saúde, planeamento de recursos humanos e coesão territorial, oferecendo recomendações fundamentadas em evidência empírica para o desenvolvimento de políticas mais eficazes e sustentáveis no âmbito do Serviço Nacional de Saúde (Buchan et al., 2013).

Keywords: *nan*

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[GOVCOPP - SAD] Decision Support Systems

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Swimming in a sea of fishy concepts: public policy and harder soft governance

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Abstract. Some concepts have guided public policy over the past decades, even as they increasingly risk becoming empty signifiers (Laclau, 1996). Territorial cohesion is one such concept; subsidiarity is another. Both are closely tied to European governance and underpin educational policy, particularly when it intersects with subnational and supranational spheres in centralized states such as Portugal.

This study aims, on the one hand, to explore understandings of territorial cohesion within educational policy, and on the other, to examine subsidiarity as an unevenly applied concept. We conducted a document analysis of local, national, and European strategies, investigating how they address territorial cohesion and frame the multilevel governance of education, including the roles assigned to various governance levels. This analysis was complemented by numerous semi-structured interviews with local, intermunicipal, national, and European decision-makers and officials.

Our findings reveal that the multiple, and often conflicting, meanings of territorial cohesion are difficult to avoid. Subnational and supranational actors tend to emphasize divergent interpretations that frequently clash with one another. The multilevel governance of education often masks underlying power imbalances, with policy design increasingly shaped by supranational strategizing. This dynamic effectively transforms soft governance into harder soft governance (Schoenefeld ; Jordan, 2020), thereby steering public policy toward a TINA (There Is No Alternative) trajectory.

We argue that principles commonly accepted at face value must be critically examined to reveal the gap between discursive prominence and ineffective action. While our work employs contemporary scientific methods, it also draws from the Socratic tradition, aiming to raise more questions than it answers. As evidence-based policymaking becomes increasingly central, we emphasize that meaningful policies are equally vital, especially in a time when the proportion of so-called left-behind populations is growing. This may stem from the persistent gap between lofty discursive principles and unresolved socio-economic asymmetries masked by blurry policy frameworks.

Keywords: *educational policy; territorial cohesion; harder soft governance; multilevel governance*

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Analyzing financial literacy: determinants, challenges, and solutions

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Abstract. Financial literacy is the set of competencies and skills in the financial area, assuming an understanding of financial products and concepts, and the ability to identify risks and make informed decisions. There is no concrete method for measuring financial literacy, but it can be measured as financial knowledge, behaviors, and attitudes (Vidoviová, 2021).
Financial illiteracy is more common among less-educated individuals, particularly women, and those aged 1829 or over 60, while financial well-being peaks between ages 3059. In Portugal, financial literacy is higher than risk awareness, and business education is linked to better financial knowledge. The creation of financial literacy educational programs has been identified as the main solution to overcome illiteracy (Huston, 2010), and these programs should be included from an early age in educational institutions (International Survey of Adult Financial Literacy, 2020). Although financial education is seen as a solution, it is important to note that individuals behave according to their personal preferences (Goyal ; Kumar, 2021) and according to the culture of their country (Faulkner, 2022). The digitalization of financial services has created opportunities for individuals to manage their finances (Banco de Portugal, 2023), but there is a lack of knowledge to take full advantage of these opportunities (Aziz ; Naima, 2021), thus giving rise to digital financial illiteracy. A higher level of digital skills positively influences the level of financial literacy (Kumar et al., 2022).
Of the determinants of financial literacy that have already been studied, the following stand out: Level of education (Jappelli, 2010); Academic background in economics/finance (Pang, 2010); Gender (Grimes et al., 2010) and Age (Monticone, 2010).Factors such as motivation, political ideology, region, marital and professional status, ethnicity, and work experience show contradictory results regarding their impact on financial literacy. This study aims to address this gap in the literature.

Keywords: *nan*

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Dilemas da coesão territorial em regiões portuguesas de fronteira

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Abstract. Esta investigação aborda a coesão territorial em regiões portuguesas de fronteira, incidindo sobre as dinâmicas de governação local e intermunicipal que moldam as políticas à escala sub-regional. A revisão da literatura identificou os principais desafios, com défices estruturais que alimentam sentimentos de marginalização junto das comunidades locais e potenciam o crescimento de movimentos de contestação.
Consideram-se as seguintes questões de investigação:
- Que dilemas emergem nas regiões portuguesas de fronteira?
- Em que medida persistem desequilíbrios e assimetrias regionais que implicam perceções de marginalização junto das comunidades locais?
- Como se poderá explicar o desfasamento entre os objetivos de coesão territorial proclamados pelas políticas públicas e os efeitos sentidos nas regiões portuguesas de fronteira?
- Qual o papel da governação multinível e da atuação das Comunidades Intermunicipais (CIM) na promoção da coesão e do desenvolvimento sustentável em regiões fronteiriças?
A investigação abarca 39 municípios fronteiriços de 11 Comunidades Intermunicipais e 4 regiões. Será aplicada uma abordagem metodológica mista, que inclui revisão sistemática da literatura e análise documental, considerando também a literatura cinzenta, análise empírica com dados municipais e dados estatísticos do INE e da PORDATA, entrevistas semiestruturadas e aplicação de análise multicritério para construção de cenários de apoio à decisão. Estes métodos articulam-se com as estruturas de governação local, permitindo compreender os desafios da coesão e identificar soluções contextualizadas.
Os resultados esperados incluem a identificação de lacunas nas políticas e formulação de propostas adaptadas a estas regiões.
O projeto alinha-se com a Agenda 2030 (ODS 9, 10 e 11), apurando as causas da fragilidade territorial e propondo respostas de política pública que promovam o desenvolvimento territorial, inclusivo e sustentável.

Keywords: *Regiões Fronteiriças, Coesão Territorial, Governação Local, Desenvolvimento Territorial, Políticas Públicas.*

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A hybrid optimization-based decision support system for cost-efficient pump scheduling in water supply systems

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Abstract. The rising global water demand, driven by population growth and urbanization, is increasing pressure on existing Water Supply Systems (WSS) (Burrow ; Newman, 2020). Addressing this demand requires not only infrastructure expansion but also enhanced operational efficiency to reduce the high energy costs associated with water extraction, treatment, transport, and distribution. Pump operations constitute the largest share of energy consumption in WSS, accounting for up to 65% of total operational costs (Chen et al., 2021), making energy-efficient scheduling a key optimization challenge.

This study evaluates the performance of Smart Dynamic Local Search (Smart-DLS), a hybrid optimization framework proposed by Brás et al. (2025) as a decision support system for minimizing energy costs in WSS. The method integrates deterministic local search with an intelligent shaking mechanism, designed to improve solution robustness and avoid local optima in dynamic operating conditions.

The framework is applied to a five-day case study involving a real WSS in Portugal. The optimization model, based on a duty-cycle formulation proposed in (Brás et al., 2024), considers operational constraints such as water tank levels, pump switching, and variable energy tariffs. Results indicate that Smart-DLS achieves substantial cost reductions, up to 24% daily and 19% overall, when compared to the real system operation, while maintaining compliance with all constraints.

The proposed methodology demonstrates flexibility in supporting different operational objectives, such as prioritizing cost efficiency or minimizing pump activations, and shows potential for real-world application, as daily optimized solutions are generated in under 10 minutes. These findings highlight Smart-DLS as a viable and scalable decision support approach for sustainable and energy-efficient pump scheduling in WSS.

Keywords: *Nonlinear programming, Water Supply Systems, Pump Scheduling Problem, Decision-Making*

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A instabilidade da estrutura de capital corporativa e a teoria trade-off: uma revisão sistemática snowballing

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Abstract. This systematic review of the literature investigates the trade-off theory, seeking to understand, from the seminal article by DeAngelo and Roll (2015), "How Stable Are Corporate Capital Structures?", the instability of the corporate capital structure, its implications, and contributions that expand or contest the findings of DeAngelo and Roll, who postulated that the instability of corporate leverage is a rule and not an exception. The snowballing methodology (Wohlin, 2014) was adopted, with backward snowballing to identify key works they cited and forward snowballing to track later research that referenced them. Only scientific articles published in peer-reviewed journals, indexed in the Scopus or Web of Science databases, or working papers in the Social Science Research Network (SSRN) database will be considered for inclusion. This strict indexing criterion aims to ensure the quality and impact of the studies analyzed. It is hoped that this review will consolidate current knowledge on the dynamics of capital structure, identify the influence of DeAngelo and Roll's (2015) work on subsequent research, and highlight gaps and directions for future investigations on leverage stability and the validity of trade-off theory in the context of dynamic capital structure.

Keywords: *Estrutura de Capital, Instabilidade da Alavancagem, Teoria do Trade-Off, Revisão Sistemática, Snowballing.*

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[GOVCOPP - TD] Tourism and Development

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Senior lifestyle mobility opportunity fordeclining rural wine regions? a dão case study

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Abstract. This research project aims to explore the opportunities and challenges of healthy ageing with a spotlight on senior lifestyle tourism and migration (SLTM) in the context of the Dão, a rural wine region in Portugal.
SLTM is becoming a rising and attractive segment, part of a continuum of lifestyle mobility, which provides opportunities for rural regions to attract visitors beyond peak periods and potentially capture lifestyle, seasonal, or permanent migrants, contributing to the regions social, economic, and cultural enrichment.
Wine regions are facing the impact of declining wine consumption but rising wine tourism. The Dão wine region, in the heart of Portugal, does not stand out nationally or internationally as a wine-producing region nor as a rural wine tourism destination. This context raises a need for wine producers (WP) and destination marketing organizations (DMO) to change their current product-centric approach towards a people-centric one.
The plan for this research is to review the literature, learn from case studies, interview the regions stakeholders, and survey the real and potential SLTM population using the People and Planet First place branding model. A review of the body of knowledge suggests that this approach is innovative in being applied to rural areas, specifically to wine regions, and combining this perspective with the senior segment, in an increasingly mobile lifestyle context.

Keywords: *senior; ageing; mobility; rural regions; Dão wine region*

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[I3N] Research into Nanostructures, Nanomodelling and Nanofabrication

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Development of novel carrier selective passivating contacts for flexible thin-film solar cells

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Abstract. The urgent need to mitigate greenhouse gas (GHG) emissions has intensified research into renewable energy technologies, particularly photovoltaics (PV). Although emerging PV technologies offer long-term promise, their development timelines are often extensive. In the near term, improving the efficiency of commercially available PV systems remains a priority. Currently, the highest power conversion efficiency (PCE) for single-junction solar cells is 27.1%, achieved with crystalline silicon (c-Si), while thin-film technologies such as Cu(In,Ga)Se (CIGS) have reached efficiencies of up to 23.6%.

Despite their slightly lower efficiency, CIGS thin-film solar cells offer substantial advantages over c-Si, including reduced material consumption and lower energy requirements during fabrication. Recent advances in c-Si technology, particularly the incorporation of passivating contacts and carrier selective contacts (CSCs), have led to significant improvements in device performance by minimizing recombination losses and enhancing carrier extraction.

In contrast, research on CIGS has predominantly focused on mitigating bulk recombination. However, the demonstrated benefits of CSCs in c-Si suggest that similar strategies could be employed for CIGS. Transition metal oxides (TMOs) have emerged as promising candidates for dopant-free CSCs due to their tunable electronic properties, low parasitic absorption, and potential for interface passivation.

This work provides a comprehensive overview of contact strategies in high-efficiency c-Si solar cells, with a focus on TMO-based CSCs. The underlying principles of carrier selectivity, energy band alignment, and interface passivation are discussed in detail. Moreover, advanced characterization techniques to study the metal/semiconductor interface and evaluate key contact performance metrics prior to device integration are outlined. Considering the insights and methodologies developed for c-Si technologies, this project aims to study the configuration of effective dopant-free CSCs for next-generation CIGS solar cells.

Keywords: *crystalline silicon, Cu(In,Ga)Se2, dopant-free carrier selective contacts, transition metal oxides, passivation*

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Monitoring lithium-ion batteries using optical fiber sensors: revealing external and internal parameters

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Abstract. Ensuring the safety, reliability, and performance of lithium-ion batteries (LiBs) requires accurate knowledge of physical conditions during operation. In this context, this research explores the development and application of advanced optical fiber sensing technologies for real-time monitoring of critical parameters such as temperature, pressure, and strain in commercial LiBs.

Different sensor configurations were investigated throughout this work. Fiber Bragg grating (FBG) sensors inscribed in polarization-maintaining PANDA fibers were implemented in a multipoint surface arrangement to simultaneously discriminate radial strain and temperature at distinct locations across the battery shell. This enabled the identification of thermal gradients and mechanical deformation during charge/discharge cycles, especially under high C-rate conditions[1,2].

In parallel, a novel hybrid optical sensor combining an FBG and an intrinsic FabryPerot interferometer (FPI) was developed and integrated at the tip of a single optical fiber. This compact sensor was embedded inside 18650 cylindrical cells to enable simultaneous, minimally invasive measurement of internal temperature and pressure. The hybrid sensor demonstrated excellent sensitivity (ś0.5řC and ś0.04bar) and rapid response time, with robust performance in the harsh electrochemical environment of the cell interior[3,4].

Battery cycling experiments were conducted under varying conditions, and operando measurements obtained from the sensors were analyzed in conjunction with electrochemical diagnostic techniques. In particular, differential voltage analysis (DVA) was applied to correlate pressure and temperature fluctuations with electrode-level phenomena such as lithiation and delithiation. The analysis revealed consistent breathing-like profiles in pressure response, tightly linked to electrochemical activity[5].

Specific data treatment processes through the MATLAB software were developed in order to accurately discriminate multiple parameters.

Altogether, this research highlights the potential of optical fiber sensors as powerful tools for in-situ battery diagnostics. The results contribute to the foundation for next-generation battery management systems capable of leveraging real-time physical data to improve safety, extend battery lifetime, and enable predictive maintenance strategies.

Keywords: *Optical fibers sensors, Li-ion batteries, Battery management system, Data analysis, Battery safety*

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Surface chemistry of fluorescein-functionalized silica nanoparticles investigated by xps

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Abstract. The functionalization of silica nanoparticles with organic dyes has received significant scientific interest due to their strong luminescence and biocompatibility potential. However, optimizing the chemical process to be both environmentally friendly and efficient, while achieving the desired physical properties, remains a challenge. In particular, establishing a precise and predictive relationship between the final nanoparticle characteristics and the various protocol parameters is a research gap that this work aims to address.

In this work, silica nanoparticles were functionalized with fluorescein under varying protocol conditions, particularly in terms of dye concentration and nanoparticle size. The resulting optical properties were found to change with both parameters, suggesting a link to differences in surface characteristics. To investigate this effect more deeply, a comprehensive study using X-ray photoelectron spectroscopy (XPS) was performed. The analysis of XPS spectra for the constituent elements - oxygen (O 1s), carbon (C 1s), and nitrogen (N 1s) - enabled the identification of specific chemical bonds and their relative abundances across the different samples. These results provide preliminary evidence of a correlation between surface chemical composition and optical behavior. The presence of NH bonding is indicative of successful conjugation between APTES and fluorescein, with its relative abundance increasing proportionally with fluorescein concentration. Conversely, the intensity of COOR bonding is associated with the amount of unbound fluorescein in the sample, exhibiting a declining trend as fluorescein concentration decreases.

Keywords: *Sustainable and biocompatible nanoparticles; Surface chemical analysis; Organic dye conjugation; Luminescence.*

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A novel approach for the treatment of aggressive forms of breast cancer

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Abstract. Despite the advances in the diagnosis and treatment, cancer remains one of the deadliest diseases worldwide(Katsura et al., 2022; Won ; Spruck, 2020). Recent advances in the nanotechnology field have been a major key to develop new nanoparticles-based therapy for cancer treatment (Liu et al., 2024). Magnetic hyperthermia (MH) treatment is an alternative that has proven its efficiency when combined with chemotherapy/radiotherapy. Firstly described by Gilchrist et al. in 1957, this techniques uses Magnetic Nanoparticles (MNP) to selectively kill cancer cells, by the elevation of the tumor temperature to 40-46. By adjusting the size, shape and composition of MNP it is possible to obtain a better magnetic performance (Cao et al., 2021; Szwed ; Marczak, 2024).
The main objective of this work is to explore an innovative hybrid therapy that comprises chemotherapy and magnetic hyperthermia in the same nanoparticle, to treat aggressive forms of breast cancer. Therefore, multifunctional Fe3O4 MNP loaded with a chemotherapy drug with a coating of Polyethyleneglycol (PEG) and modified with a peptide that specifically binds to the surface of breast cancer cells will be studied.

Keywords: *Breast Cancer; Chemotherapy; Magnetic Hyperthermia; Magnetic Nanoparticles*

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Engineering high-quality cigs absorbers via precursor design and post-deposition modification

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Abstract. This study aims to develop and enhance CIGS thin-film absorbers for second-generation photovoltaic technologies. With a tunable direct band gap of 1.0 to 2.4 eV (Turcu et al., 2002) and a high absorption coefficient, CIGS is a promising material for efficient, cost-effective thin-film solar cells, offering chemical stability and suitability for various applications.
In this work, CIGS precursors were deposited using an in-house RF/DC magnetron sputtering system. The deposited films were then subjected to two distinct annealing strategies: in-situ thermal annealing within the chamber and ex-situ rapid thermal processing (RTP) (Karg et al., 1993). The effects of these thermal treatments on film morphology, phase composition, and crystallinity were evaluated using Scanning Electron Microscopy with Energy Dispersive X-ray Spectroscopy (SEM-EDX), X-ray Diffraction (XRD), and Glow Discharge Optical Emission Spectroscopy (GDOES). RTP enhanced grain growth and film compactness but required careful control to prevent substrate warping and film degradation (Karg et al., 1993).
Alkali doping was implemented via post-deposition treatment (PDT) using sodium fluoride (NaF). Efficiency improvements of 12% were achieved, particularly when NaF was applied to the molybdenum back contact before CIGS deposition. This approach not only improved device performance but also simplified the process (Malitckaya et al., 2017).
GDOES depth profiling revealed gallium accumulation at the rear of the absorber, forming a graded band gap that facilitates charge carrier separation and suppresses recombination losses (Bär et al., 2004).
Present research utilises silver(Ag) as a dopant through sequential deposition. Previous studies show that Ag alloying in co-evaporated CIGS films enhances grain size, energy band alignment, and optoelectronic properties (Keller et al., 2024). We apply Ag via sequential deposition in a sputtering precursor framework. Preliminary results indicate improved absorber crystallinity and optoelectronic properties, suggesting further potential for improvement.
Overall, this study outlines an approach for high-performance CIGS absorbers for scalable solar cells.

Keywords: *CIGS, Doping, Solar cells, Thin-film deposition.*

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Bioskinglass: development of modified bioactive glass for skincare and skin regeneration applications

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Abstract. The skin, as the bodys largest organ, is essential for protection against external threats and significantly impacts self-esteem. With the global skincare market projected to reach USD 196.2 billion by 2030, there is an urgent demand for advanced and multifunctional solutions. 45S5 Bioglass (BG), recognized for its biocompatibility and regenerative capabilities, emerges as a promising material when doped with cerium (Ce) and gallium (Ga) ions. These ions allow to increase and add new properties do the bioglass, such as antioxidant, antibacterial, and regenerative one, making it highly suitable for next-generation skincare applications (GrandViewResearch, 2022), (D.Stan et al., 2021).
This project aims to develop facial creams incorporating Ce- and/or Ga-doped BG, targeting anti-aging, acne treatment, and wound healing. Unlike conventional skincare formulationswhich often suffer from rapid, unstable release of active ingredients and reduced efficacy due to light and temperature sensitivityBG enables controlled, sustained ion release. This not only prevents irritation and concentration spikes but also preserves long-term stability and efficacy. The release kinetics can be tailored through particle size and morphology, optimizing the performance of the cream (D.Stan et al., 2021), (J.S.Regadas et al., 2023).
The natural bioactivity of BG supports tissue regeneration by releasing essential ions (Calcium, Phosphorous, Silicon), which activate cellular pathways critical for angiogenesis and cell proliferation. Doping with Ce and Ga enhances these effects, providing additional antioxidant, antibacterial, and anti-inflammatory benefits. These multifunctional formulations address key dermatological challenges: promoting collagen synthesis and skin elasticity for anti-aging, reducing inflammation and bacterial growth for acne, and accelerating tissue repair for wound healing (Ren Z. et al, 2025).
The incorporation of Ce and Ga ions into BG represents an innovation, creating a multifunctional biomaterial that not only treats symptoms but also addresses the underlying causes of various skin conditions.These formulations present a significant potential for industrial application.

Keywords: *45S5 Bioglass, Cerium, Gallium, Antibacterial, Antiaging, Wound healing*

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Tailoring plasmonic nanostructures to optimize photonic and electronic properties in perovskite solar cells

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Abstract. Despite the outstanding progress achieved in the performance of perovskite solar cells (PSCs) in recent years, some limitations, such as low absorption in the infrared (IR) region, still need to be addressed [1]. Several approaches have been developed to enhance both the optical and electrical performance. Among these, incorporating metallic nanoparticles (NPs) into the device architecture has emerged as one of the most promising approaches. The light-harvesting enhancement provided by NPs, primarily attributed to near-field effects around their surface, can significantly boost the performance of ultra-thin perovskite layers [1]. Parallel efforts have focused on enhancing the electrical performance of the electron transport layer (ETL) in PSCs. Planar ETL configurations with embedded NPs have demonstrated substantial improvements in both electron conductivity and charge extraction efficiency [2].

In this work, numerical simulations have been implemented in Ansys HFSS to predict the MAPbI3 perovskite absorption in realistic n-i-p architectures embedding Au nanorods, a suitable shape to fine-tune the optical properties. Optimal outcomes are achieved with the vertical orientation of the nanorods, parallel to the stacking direction of the solar cell films, with a photocurrent enhancement of over 5 %. Experimental approaches were also conducted to optimize the electrical performance of a sandwiched TiO2 spherical Au NPs TiO2 structure as ETL. This optical configuration led to an increase of over 1.5 mA.cm-2 in the short-circuit current density (Jsc), highlighting its potential for practical application.

Keywords: *Perovskite solar cells, Plasmonics, Metallic nanoparticles, FEM-based simulations*

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Plasmonic optical fiber sensor for creatinine detection with molecularly imprinted polymers: towards integrated point-of-care hypertension monitoring

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Abstract. Known as the silent killer, hypertension (HT) is a chronic condition characterized by persistently elevated arterial blood pressure. When undiagnosed or poorly managed, HT becomes a major risk of severe cardiovascular and renal complications, including heart failure, stroke and chronic kidney disease. Early diagnosis and intervention are crucial to mitigate these risks. Currently diagnosis relies mainly on occasional blood pressure measurements and biomarkers laboratory analysis in blood and/or urine, which are time-consuming and delay early intervention, particularly in primary care settings (World Health Organization, 2023).

This PhD research work aims the development of an innovative biosensing platform featuring dual optical/electrochemical transduction, combining an optical fiber tip (OFT) with printed electrodes, for detection of multiple cardiac and renal biomarkers in urine, namely creatinine (CRE), N-terminal pro-brain natriuretic peptide (NT-proBNP), uric acid, albumin and electrolytes (Claure-Del Granado et al., 2023). A key feature of this system is the use of molecularly imprinted polymers (MIPs) as synthetic biorecognition layer, offering enhanced selectivity, stability and cost-effectiveness compared to traditional biological receptors (Yang et al., 2022).

The first task in this work plan focuses on the detection of CRE, an important biomarker of renal function, using a miniaturized plasmonic OFT sensor. The OFT, with a 600 ţm core diameter, is coated with a gold (Au) film by sputtering and functionalized with a MIP layer of methacrylic acid (MAA) synthesized using CRE as the template (Assunção et al., 2024). Preliminary results of CRE detection with the MIP-Au-OFT sensor are presented for the clinical range (10-300 mg/dL), showing a red-shift with increasing CRE concentrations in aqueous solutions.

Although in the first steps, this work demonstrates the potential of the MIP-Au-OFT sensor for CRE detection. The next stage is the MIP layer thickness optimization and its incorporation in an electrochemical cell.

Keywords: *MIPs, Optical biosensor, Optical fiber tip, SPR, Surface plasmon resonance*

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Laser-induced formation of electrically conductive pathways on zinc oxide ceramic surfaces

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Abstract. Laser technologys ability to deliver high quantities of energy in a focused, precise, and localized makes it ideal for several interesting applications, such as the local modification of the surface properties of ceramic materials. In particular, the application of this technology to zinc oxide (ZnO) is especially interesting due to its unique physical properties that combined with its non-toxicity and low cost, make it useful for a wide range of applications (Lee et al., 2012; Özgür et al., 2005). In this work, the viability of using laser technology to promote electrically conductive pathways on the surface of ZnO was studied. A 55 W pulsed CO laser (= 10.6 m) was used to irradiate the surface of sintered ZnO ceramic pellets, to generate electrically conductive pathways along the laser tracks. The effects of laser power and speed on the morphological and electrical characteristics of the created pathways were investigated. Optimizing the laser parameters, a maximum pathway width of 0.72 ś 0.02 mm and depth of 0.195 ś 0.004 mm were achieved, along with a maximum electrical conductivity of 8.4 ś 0.9 S/m that corresponds to an increase of three orders of magnitude when compared to the conductivity of the ceramic base. This study opens avenues for further exploration of laser technology to create localized electrical pathways on non-conductive oxide surfaces, which can be useful for developing ceramic sensors of different types.

Keywords: *Laser surface treatment, Surface property modification, Ceramic oxides, Electrically conductive pathways, Zinc oxide (ZnO)*

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Nanotechnology before the hype: tracingearly definitions

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Abstract. In 2000, the European Commission published a news article titled "Nano: the new buzzword in science and technology", introducing nanotechnology as the science of the small. [1] The article highlighted that, by then, nanotechnology had already been recognised as a strategic scientific priority both by the European Commission and by the United States of America, having marked a significant milestone in the formal establishment of nanotechnology within the global research agenda.
However, despite this growing institutional recognition, the term nanotechnology still lacked a clear and universally accepted definition. Discrepancies in its interpretation reflect the evolving and interdisciplinary nature of the field. As early as 1974, Taniguchi described nanotechnology as the processing of separation, consolidation and deformation of materials by one atom or one molecule, focusing on atomic-level precision in materials science [2,3]. Two decades later, in 1994, the Royal Society and Royal Academy of Engineering Working Group offered a broader definition: the design, characterisation, production and application of structures, devices and systems by controlling shape and size at the nanometre scale. These differing perspectives underscore the ambiguity and multiplicity of meanings that have surrounded the concept since its inception [4].
This conceptual fluidity gives rise to several fundamental questions: What exactly constitutes nanotechnology? When and in what context did the term originate? Can it be considered a novel scientific discipline, or is it a reconfiguration of pre-existing research areas? And how has it come to be associated with such a wide range of scientific and technological fields?
This study aims to address these questions by analysing how the term nanotechnology was introduced, defined, and disseminated in scientific literature between 1974 and 2000. The findings offer insights into the early formation of the field and lay the groundwork for further research, particularly through the exploration of additional sources and disciplinary intersections.

Keywords: *Nanotechnology, Scientific Practices, History of science*

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A novel fiber-integrated nanoprinted hollow-core waveguide for nanoparticle tracking

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Abstract. The integration of functional components into flexible photonic platforms is a fundamental research area in integrated photonics, particularly for sensing applications in nanoscience and bioanalytics, where minimizing sample volumes and device footprints is essential [1]. One promising strategy involves the use of hollow-core waveguides (HCWs) to enhance lightmatter interactions, which is especially valuable for the characterization of nanoparticle ensembles [2].
Unlike previous approaches that relied on performing nanoparticle tracking analysis (NTA) inside silica hollow-core fibers [2,3] or employing nanoprinted structures on chips [1], our method achieves seamless fiberwaveguide integration through high-precision 3D nanoprinting. This novel design removes the need for intermediary platforms, thereby enhancing system stability, ensuring alignment-free coupling, and enabling nearly aberration-free imagingestablishing a new benchmark in lab-on-fiber devices for high-precision NTA.
We fabricated a square hollow-core waveguide directly onto the tip of a polarization-maintaining (PM) fiber using layer-by-layer direct laser writing with a commercial 3D nanoprinter (GT2, Nanoscribe GmbH). The resulting antiresonant HCW features an 8 ţm-wide hollow square channel with a side fluidic access at its base. For testing, gold nanoparticles (100 nm diameter) were suspended in an aqueous solution and inserted into a microfluidic chamber aligned with the waveguide. Monochromatic light (532 nm), horizontally polarized (x-direction), was coupled into the PM fiber, and the light scattered by the nanoparticles within the HCW was collected using a microscope-camera setup.
This integrated photonic device enabled precise and stable tracking of nanoparticles, achieving long acquisition sequences (>3000 frames), which are critical for robust statistical analysis of the particle size. Our system measured a hydrodynamic diameter of 108.6 nm with a coefficient of variation (CV) of 0.13, demonstrating both high accuracy and precision.

Keywords: *3D-printing, antiresonant waveguide, nanoparticles, NTA*

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Real-time aquaculture monitoring with liquid crystal-based immunosensors: stress and food safety assessment

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Abstract. Aquaculture is a crucial global food production sector facing challenges in water quality management, food safety, and stress-related health concerns in aquatic species (Martos-Sitcha et al., 2020). Recirculating Aquaculture Systems (RAS) offer a sustainable alternative by improving environmental control and water reuse. However, effective monitoring tools are needed to assess fish welfare and ensure food safety (Lindholm-Lehto, 2023). Additionally, bivalve mollusks Escherichia coli (E. coli) contamination in estuaries is a major concern, as these filter-feeding organisms accumulate pathogens from their environment, posing significant risks to human health (Castello et al., 2024). Cortisol, a key stress biomarker in fish, and E. coli contamination in bivalves are critical indicators requiring sensitive and real-time detection methods.

Liquid Crystal (LC)-based immunosensors have emerged as a promising solution for detecting biological analytes due to their high sensitivity, rapid response, and label-free optical detection capabilities (Niu et al., 2017). This work explores the development and application of LC-based immunosensors for cortisol detection in artificial and real RAS samples, and E. coli in contaminated water and clams samples through depuration processes of bivalves. The sensors exhibited high sensitivity of (11.58 ś 1.72) Œ 105 a.u./log(ng/mL) for a cortisol concentration range of 0.1 to 50 ng/mL, and specificity to cortisol when tested against interfering substances like testosterone, glucose, and cholesterol. Furthermore, it was possible to correlate cortisol concentrations in different filtration stages and track E. coli contamination during depuration.

To enable portable and in situ analysis, two prototypes were developed inspired by a polarized optical microscope (POM), commonly used to analyze these sensors. The first prototype indicates only a negative or positive result. The second was improved to quantify E. coli, yielding a sensitivity of 1.01% ś 0.17%/log10 (CFU/mL).

The results confirm the feasibility of LC-based immunosensors as a user-friendly, portable, and efficient diagnostic tool for aquaculture applications.

Keywords: *Aquaculture, Cortisol, Escherichia coli, Immunosensor, Liquid Crystal, Prototype*

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Beneath the medals: unraveling the injury experiences of portuguese olympic athletes

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Abstract. Sustaining an injury is widely recognised as an inherent risk of elite sports participation, presenting significant challenges for athletes, sports teams, federations and National Olympic Committees. Data from Periodic Health Evaluations reveal that 50% elite athletes report at least one current or recent musculoskeletal issue; one in three athletes are undergoing treatment and 20% experience current pain (Prien et al., 2020). At the other end of the career spectrum, more than 50% of retired athletes meet the MRI criteria for Hip and Knee osteoarthritis and report related symptoms (Palmer et al., 2021). Long-term surveillance programmes are recommended to mitigate some of the mentioned problems (Bahr et al., 2020). Although these systems have been implemented since the 2004 Olympic Games, existing reports focus solely on injuries sustained during the Games, covering only a 1017-day window. As such, injury patterns and health dynamics outside this period remain poorly understood (Clarsen et al., 2021). In Portugal, despite a growing number of athletes competing at the highest level, little is known about their health status during Olympic preparation cycles. Addressing this gap is critical to improve injury prevention strategies and support athlete well-being. This research project, developed in collaboration with the Portuguese Olympic Committee, will begin with the translation, cultural adaptation, and validation of the most widely recommended tool for prospective health monitoring in elite sport (Clarsen et al., 2020). In parallel, a mixed-method cross-sectional study will assess the current health status of retired Portuguese Olympic athletes and explore their experiences with injury management during their careers. These studies will inform a 24-month prospective cohort study involving athletes preparing for the 2028 Olympic Games, who will complete monthly questionnaires. Injured athletes will be invited to provide additional data through semi-structured interviews, enabling a detailed and multidimensional understanding of injury experiences in elite sport.

Keywords: *Sports injury, Olympians, Injury Surveillance, Athlete monitoring, Athlete Retirement, Oslo Sports Trauma Research Centre*

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A cohort-based approach to thyroid nodule diagnosis: from clinical data to the promise of ftir metabolomics

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Abstract. Nodular thyroid pathologies (NThyPs) are among the most prevalent endocrine disorders, and cytologically indeterminate nodules, classified as Bethesda III/IV, pose significant diagnostic challenges. Despite the widespread use of fine-needle aspiration biopsy (FNAB), its limited specificity often leads to overtreatment. Metabolomic approaches, including Fourier-Transform Infrared (FTIR) spectroscopy, have shown promising potential in cancer diagnostics by identifying biochemical alterations associated with malignancy. This study aims to explore the metabolomic profiles of cytological and plasma samples from patients with NThyPs to identify spectroscopic biomarkers that differentiate benign from malignant lesions.
We conducted a prospective cohort study at Centro Hospitalar do Baixo Vouga. Patients presenting with thyroid nodules and undergoing FNAB were non-consecutively recruited over a 34-month period. At baseline, structured interviews were conducted to collect sociodemographic, lifestyle, and clinical history data. Ultrasound reports provided information on nodule characteristics. Cytology and plasma samples were collected prior to definitive diagnosis and stored for subsequent FTIR analysis.
The cohort includes 311 patients (57.41ś13.75 years; 83.6% female). Most nodules were benign (63.3%) or indeterminate (22.8%); only a small proportion were malignant (1.3%). Current analyses focus on comparing benign and indeterminate cases in terms of sociodemographic, clinical, and sonographic characteristics. Preliminary findings suggest that the indeterminate group has lower intake of vegetables and meat (p=), reduced tea consumption (p<0.05), and less frequent physical activity (p=0.001). These patients also present higher TSH levels (2.98ś8.74 ţIU/mL) and larger nodules (26.70ś14.68 mm). A secondary analysis will assess predictors of malignancy within the indeterminate group to identify potential early diagnostic markers.
In the next phase, FTIR spectroscopy will be applied to stored samples to assess biochemical profiles associated with benign vs malignant diagnoses. By identifying metabolomic signatures of malignancy, this project aims to improve diagnostic accuracy in indeterminate nodules and reduce unnecessary thyroidectomies, contributing to more personalized and safer clinical management.

Keywords: *Nodular Thyroid Pathologies, Cytologic Thyroid Diagnosis, Liquid Biopsy, Spectroscopic Biomarkers*

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Unveiling early neuronal responses to injury: exploring regeneration-associated genes

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Abstract. Spinal cord injury (SCI) is a devastating condition with no effective treatments, largely due to the limited regenerative capacity of central nervous system neurons (Tran et al., 2018). In contrast, peripheral nerve injury (PNI) triggers a robust regenerative response, offering a valuable model to identify molecular drivers of successful repair (Chandran et al., 2016; Fink et al., 2017). To explore the early genetic programs that distinguish regenerative from non-regenerative outcomes, we analysed the transcriptomic responses of rat motor and sensory neurons following SCI and PNI (Bosse et al., 2006). Neurons were isolated 24 hours post-injury using laser capture microdissection, and gene expression profiles were generated through high-throughput RNA sequencing.

Differential expression analysis revealed distinct transcriptional responses between the two injury models, with regenerating neurons displaying broader and more dynamic gene regulation. A subset of genes was commonly regulated across both injuries, reflecting a general response to axonal damage. However, over 100 genes were selectively regulated only in the regenerative condition, suggesting their potential role as early regeneration-associated genes (RAGs) (Ma ; Willis, 2015). These candidate genes include several with known roles in neural development, signalling, and axon growth, as well as novel genes not previously linked to regeneration. To prioritize genes with higher therapeutic potential, a subset of candidates was functionally tested in a differentiating sensory neuron cell line, revealing that some are essential for promoting neurite outgrowth.

Together, these findings reveal critical differences in the molecular response to injury between peripheral and central neurons and highlight potential genetic targets for enhancing regeneration in the context of SCI. Ongoing functional studies aim to validate the relevance of these genes and their therapeutic potential.

Keywords: *spinal cord injury; neuroregeneration; gene therapy; regeneration-associated genes*

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Brain-machine interfaces for spinal cord injury: neurophysiological effects and clinical trends

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Abstract. Spinal cord injury (SCI) is a highly debilitating neuropathology that causes impairment of sensory, motor and autonomic functions, and often other manifestations (e.g. chronic pain)(Ahuja et al., 2017). Despite currently having no cure, brain-machine interfaces (BMIs) allow the control of devices using brain activity and can bypass the limitations imposed by SCI (Nicolelis ; Lebedev, 2009). Also, they have promoted clinical improvements in pain, quality of life and even in some lost sensory and motor functions (Lorach et al., 2023). These are thought to stem from neuroplasticity elicited by the engagement with brain tasks coupled with sensory feedback (Nizamis et al., 2021). However, the neural mechanisms that underlie such improvements and how the interaction user-BCI shapes ones brain information transfer networks are still unclear.

To characterise BMI applications in SCI and associated neurophysiologic data analysis, we conducted a systematic review addressing clinical studies where SCI patients controlled BMIs. Here, we identified the main clinical outcomes that were measured, and if studies implemented measurements of brain activity or neuroplasticity.

A total of 87 studies were included from 5 different scientific databases after screening for duplicates and selection according to the eligibility criteria. Our preliminary results show that BMIs were mostly non-invasive and operated with motor attempts or imagery to control robotic prosthesis and exoskeletons. Functional scores, such as FIM/SCIM and GRASSP, as well as patient reported experiences/outcomes (PREM/PROM) were the most frequently employed measurements. Although many studies analysed brain activity, few were those that measured it in different timepoints to assess neuroplasticity. Furthermore, none analysed molecular markers related to the SCI clinical status nor neuroplasticity.

Accordingly, BMIs can help people with SCI recover some independence during daily living, but analysis of neurophysiologic data in future studies may help predict and better promote clinical improvement, besides monitoring BMI effects on brain networks.

Keywords: *Spinal cord injury; Brain-machine interface; Brain information transfer; Biomarkers*

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Aerobic physical exercise under sustained obesogenic conditions can reverse body weight gain and glycemia increase and partially mitigate sperm quality loss in a mouse model

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Abstract. Obesity is a well-established factor in male infertility, impairing testosterone production and sperm quality [1]. Physical exercise may offer a strategy to mitigate or reverse reproductive health in adulthood, preventing lifelong obesity and its reproductive consequences, even without discontinuation of an obesogenic diet [2]. To investigate the potential mitigating effects of exercise initiated in adulthood following early-life obesity, without dietary correction, we used a Mus musculus model (n=12/group) to establish a sedentary group fed with standard diet (CTRL; standard diet: 60% carbohydrates, 21% proteins, 8% fat), a sedentary group fed with high-fat diet (HFD: 36% carbohydrates, 21% proteins, 36% fat), and exercised group fed with high-fat diet subjected to a treadmill protocol (HFD_EX; 60-75 % of maximal speed, 0% inclination, 1 hour/day, 5 days/week). The diets of each group were maintained throughout 200 days post-weaning. The exercise protocol started after a 60-day sedentary period and continued through day 200 post-weaning. Biometric characterization included total body weight, glycemia, and plasma testosterone levels. The testis and epididymis were collected for sperm analysis following WHO guidelines for concentration, motility, vitality, and morphology. HFD increased body weight and glycemia and tended to decrease plasma testosterone. It also decreased all sperm quality parameters - motility, vitality, concentration, and normal morphologywhile increasing middle piece morphological abnormalities. Starting a treadmill regimen after 60 days of HFD and sedentarism reduced body weight and glycemia and improved all sperm parameters, even without changing the diet. However, these improvements were not sufficient to restore these parameters to control levels. Our findings suggest that adopting aerobic physical exercise under sustained obesogenic conditions can reverse body weight gain and glycemia increase and partially mitigate sperm quality loss. While exercise is an effective strategy to counteract reproductive impairments caused by persistent obesogenic diets, additional interventions may be necessary to achieve full recovery.

Keywords: *Lifestyle, Obesity, Physical exercise, Sperm parameters, Testosterone*

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What is an informal carer? a qualitative study on the representation of people with chronic respiratory diseases, their informal carers, and healthcare professionals

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Abstract. Chronic respiratory diseases (CRD) lead to a progressive decline in daily activities. Informal carers (IC) of people with CRD can be formally defined as anyone providing unpaid support to a person with a CRD with whom they have a significant relationship (OECD, 2019). Despite being a key support (Farquhar, 2022), the representation of what an IC entails is still unclear, hindering the development of carer-friendly societies (Eurocarers, 2023). We aimed to explore how people with CRD, IC and healthcare professionals (HP) represent IC. In this qualitative study, individual semi-structured interviews focusing on What is an informal carer? were conducted with people with CRD, IC, and HP. Audios were transcribed, translated and analyzed to identify the most reported words/expressions [higher frequency reflecting a greater significance (Moscovici, 1988)]. Forty people with CRD (15 Chronic Obstructive Pulmonary Disease, two severe asthma, eight lung cancer, two bronchiectasis, and 13 Interstitial Lung Disease; 68% male; 67ś10 years), 38 IC (16% male; 59ś13 years; 71% partners), and 24 HP (42% male; 41ś10 years; 42% physicians) participated. In total, 28, 31, and 34 expressions were found for people with CRD, IC, and HP, respectively. The most prevalent was take care for people with CRD and IC, and person in need for HP. Other commonly reported words included help and family member for people with CRD, person in need and family member for IC, and take care and legislation for HP. The representation of IC was similar in all groups, following the components of the formal definition: who are informal carers, who do they help and what their role is. In conclusion, people with CRD, their IC, and HP seem to align their definition of IC with the literature. They highlighted both practical and emotional domains, reflecting the wide range of support and importance of this hidden workforce.

Keywords: *Chronic respiratory diseases, Informal carer, Representation, Qualitative study*

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Establishing physical performance test thresholds for functional status and mortality risk in interstitial lung disease

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Abstract. Assessing functional status (FS) is essential in interstitial lung disease (ILD), as its decline is associated with poorer outcomes, including increased mortality. The Physical Performance Test (PPT), which replicates daily activities, offers a practical approach to evaluating FS. However, the absence of defined thresholds limits its clinical application. This study explored the PPT cut-offs for impaired FS and mortality risk, using the six-minute walk test (6MWT) as an anchor in ILD.
A cross-sectional study was conducted. FS was assessed with the short (PPT-28) and long (PPT-36) PPT versions and the 6MWT. Impaired FS was defined as 6MWT% predicted <70%. Mortality risk thresholds for the 6MWT (250, 330, 350 m) were also examined. Optimal cut-off values were determined based on the highest Youden Index in receiver operating characteristic (ROC) analysis.
Ninety-seven people with ILD were included (67ś10 years; 52% male; FVC%pred 80ś21; DLCO%pred 57ś19). For PPT-28, a score <19.5 identified impaired FS (AUC [95%CI]: 0.76 [0.610.92]) and predicted mortality risk across 6MWT cut-offs: <250 m (0.84 [0.681.00]); <330 m (0.76 [0.630.90]); <350 m (0.79 [0.670.90]). For PPT-36, <28.5 detected impaired FS (0.87 [0.740.99]); and mortality risk was predicted by <28.5 (6MWT<350 m: 0.86 [0.760.95]), <26.5 (6MWT<330 m: 0.85 [0.740.95]) and <24.5 (6MWT<250 m: 0.96 [0.921.00]).
In ILD, PPT-28 <19.5 and PPT-36 <28.5 may identify impaired functional status and stratify mortality risk across 6MWT thresholds, supporting targeted and individualised interventions.

Keywords: *Interstitial Lung Disease, Functional Status, Physical Performance Test, Mortality Risk*

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Elevated il-6 levels lead to synaptic changes in hippocampal neurons

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Abstract. The relationship between cytokines and the central nervous system (CNS) plays a crucial role in maintaining body homeostasis, as evidenced by the involvement of various cytokines in key neural processes such as neurodevelopment, synaptic plasticity, and neuroprotection. Interleukin-6 (IL-6) is a pleiotropic cytokine that plays a crucial role in regulating health and diseases (Hunter and Jones 2015). In the nervous system, IL-6 is crucial for the development, differentiation, and regeneration of neurons (Storer et al. 2018). Under physiological conditions, IL-6 is detected at low concentrations in the brain, but in diseases of the CNS, IL-6 and other neuroimmune factors are present at elevated levels (Waage et al. 1989), leading to astrocytosis and neurodegeneration (Campbell et al. 1993). IL-6 is also involved in molecular mechanisms underlying cognitive processes and synaptic plasticity (McAfoose and Baune 2009). However, IL-6 imbalance in synaptic plasticity and cognitive function is poorly understood. Hence, this work aims to evaluate the impact of IL-6 dysregulation on CNS neurons. Mature low-density cultures of rat hippocampal neurons were stimulated with high concentrations of IL-6 and the number of synaptic clusters, and the expression of N-methyl-D-aspartate glutamate receptors (NMDARs) were analyzed. Our results demonstrate that, under non-physiological concentrations, IL-6 induces an increase in axodendritic synapses. Furthermore, we observed changes in synaptic NMDARs, indicating that synaptic plasticity, particularly long-term potentiation (LTP), may be dysregulated. We have also observed that IL-6 signaling alters signaling pathways related to neuronal function. Together, these results suggest that IL-6 plays a role in the modulation of neuronal plasticity, possibly contributing to the cognitive decline associated with CNS diseases.

Keywords: *Cognitive impairment, IL-6, synaptic plasticity, NMDARs, long-term potentiation (LTP)*

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Peroxisomes as central hubs in the cellular antiviral response: insights into morphology, metabolism, and organelle crosstalk

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Abstract. Upon viral infection, host cell organelles are targeted by both the virus and the immune system. Peroxisomes have recently been recognized as critical platforms in antiviral defense, owing to the localization of the mitochondrial antiviral signaling adaptor protein (MAVS) at their membranes. Cytosolic viral RNA is recognized by RIG-I-like receptors (RLRs), which activate MAVS at both peroxisomes and mitochondiramitochondria, triggering a signaling cascade that leads to the production of interferons (IFNs) and interferon-stimulated genes (ISGs).

Different viruses have been shown to modulate peroxisome dynamics to evade the cellular antiviral response and/or promote their propagation. Viruses likely interact differently with peroxisomes at distinct stages in their infection cycle, resulting in, e.g., the reduction of peroxisome biogenesis early in infection to inhibit antiviral signaling, and the stimulation of peroxisome metabolism and biogenesis in a later phase to increase lipid metabolism and support virus particle formation. Despite these observations, the molecular mechanisms underlying virus-peroxisome interactions and their functional outcomes remain poorly understood. To explore the role of peroxisomal biogenesis in antiviral immunity, we manipulated peroxisome elongation and fission by altering the expression of key regulatory proteins via RNA interference, overexpression, and knock-out approaches. Using a viral RNA mimic, we observed that peroxisome proliferation and distribution are crucial for mounting an effective peroxisome-dependent immune response.

We further discovered that the interaction between peroxisomes and the endoplasmic reticulum (ER), mediated by the acyl-CoA binding domain-containing protein 5 ACBD5, is essential for a robust antiviral response. Disrupting this peroxisome-ER tether in cells with stimulated peroxisomal fission revealed that ER contact is required for the immune-enhancing effects of peroxisome proliferation.

Altogether, our findings highlight the importance of peroxisome morphology, biogenesis, and inter-organelle communication in shaping innate antiviral responses. These insights shed light on organelle-specific immune mechanisms and reveal potential new avenues for antiviral therapeutic strategies.

Keywords: *Peroxisomes, viruses, antiviral signalling*

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Exploring novel peroxisome-dependent mechanisms as targets for the development of innovative host-directed antiviral therapeutics

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Abstract. Upon infection, host cell organelles are manipulated by both the virus and the cellular immune system. Peroxisomes have emerged as important antiviral and pro-viral platforms in the context of viral infections. Different viruses modulate peroxisome dynamics to evade the cellular antiviral response and/or promote virus particle formation and propagation (1,2). Nevertheless, research in this field is incomplete and mechanistical details are scarce.
We are currently performing different systematic studies to investigate peroxisome-dependent mechanisms that influence infection by different respiratory viruses and/or the antiviral defense. To that end, we use genetically modified cultured lung epithelial cells lacking specific peroxisomal proteins, as well as patient-derived epithelial cells from individuals with rare genetic peroxisome biogenesis disorders. Organotypic 3D in vitro models of lung tissue will be developed in the scope of the project, to validate our findings in more complex setups, with different cell layers and closer to in vivo tissue scenarios.
Our ultimate aim is to discover novel cellular targets that can be exploited for the development of host-directed broad-spectrum antivirals.

Keywords: *virus, peroxisomes, antiviral response, peroxisome biogenesis disorders, organotypic 3D in vitro models*

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Retinoid signalling minimises aproduction and rescues mitochondrial function in models of alzheimers disease

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Abstract. Alzheimers Disease(AD) is marked by the accumulation of amyloid beta (A) plaques and metabolic imbalances. Retinoic acid receptors (RARs) are described neuroprotectors, influencing key cellular processes, including proteostasis and mitochondrial homeostasis; however, their precise role in AD pathology and potential as therapeutic targets remains unclear and of vast potential (1-2). This study explores the protective potential of retinoid signalling in AD, with a focus on promoting non-amyloidogenic amyloid precursor protein (APP) processing and A accumulation and restoring mitochondrial health.
Using SH-SY5Y neuronal cell models, the effects of isoform-specific RAR activation on mitochondria and APP processing were evaluated. Live-cell confocal imaging was employed to analyse mitochondrial function and dynamics, with an in-house developed automated analysis (3).
A treatment decreased mitochondrial membrane polarization and dramatically affect mitochondrial dynamics, sturdily reverted by isoform-specific RAR activation. The production of Reactive Oxygen Species, increased in AD and a product of ageing-associated metabolic disfunction, was investigated using CellRox staining. Data highlights increased ROS production with A incubation, comparable to that the effect of an external oxidative agent, protected by co-treatment with RAR agonist, directly affecting mitochondria-related ROS production. These results establish a new cellular link, with possible relevance for pathology.
To confirm pathological significance, amyloid processing of APP and A secretion were investigated. Treatment with RAR agonists were found to drastically reduce A secretion, in wild type and in SH-SY5Y cells transfected with the gene coding for APP containing the Swedish mutation, with increased -secretase APP cleavage. RAR modulation appears to be acting by modulating APP secretase levels and activity, suggesting a potential regulatory mechanism.
Addressing both APP processing, A production and metabolic dysfunction is a crucial challenge in AD therapy. This study emphasises the multitarget potential of retinoid modulation, promoting non-amyloidogenic APP processing and reducing amyloid deposition, while promoting energy homeostasis and alleviating oxidative stress.

Keywords: *APP Processing; Retinoid Signalling; Mitochondria; A peptide; Alzheimer's Disease.*

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K48 polyubiquitination and syntenin-i regulate presynaptic differentiation

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Abstract. Presynaptic differentiation is a complex process that requires accurate regulation of protein turnover and scaffolding to ensure the assembly of functional presynaptic machinery (Pinto ; Almeida, 2016). Polyubiquitination in lysine 48 (K48 polyubiquitination) is a post-translational modification that targets proteins for proteasomal degradation. K48 polyubiquitination plays a role on presynaptic differentiation by controlling synaptic vesicle clustering and modulating presynaptic assembly (Pinto, Alves, et al., 2016; Pinto, Pedro, et al., 2016). Concurrently, syntenin-I, a PDZ protein, has been implicated in orchestrating key protein interactions during synapse formation (Ko et al., 2006; McClelland et al., 2009). In vitro studies show that it co-localizes with ubiquitinated proteins (Rajesh et al., 2011) and it is involved in the organization of active zones (Ko et al., 2006). Furthermore, syntenin-I contains ubiquitin binding domains (UBDs), and its interaction with ubiquitin is well characterized (Okumura et al., 2011; Rajesh et al., 2011). However, the role of this interaction between syntenin-1 and ubiquitin on presynaptic sites remains elusive. Here, we explore the interplay between syntenin-I and K48 polyubiquitination in the regulation of presynaptic differentiation. Firstly, we show that syntenin-I is present at presynaptic sites. Next, we demonstrate that expression of syntenin-I triggers presynaptic differentiation. Subsequent, we observe that the loss of syntenin-I disrupts presynaptic assembly, as evidenced by reduced levels of synaptic vesicle proteins and impaired active zone formation. Then, we show that syntenin-I co-localizes with K48-polyubiquitinated proteins at presynaptic sites, corroborating an interaction between ubiquitin and syntenin-I. Finally, we prove that the interaction between syntenin-I and ubiquitin is necessary for presynaptic assembly. These results suggest that syntenin-I may serve as a mediator between polyubiquitin and downstream signaling mechanisms that regulate synaptic differentiation.

Keywords: *K48 Polyubiquitination; Syntenin-1; Presynaptic Differentiation; Ubiquitin-proteasome System*

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Assembling mouse cells into 3d fluorescent mammospheres

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Abstract. Triple-negative breast cancer (TNBC) accounts for approximately 15% of the 2.3 million annual breast cancer diagnoses. Due to the lack of hormone receptors, TNBC is unresponsive to targeted therapies, and only a subset of patients benefits from immunotherapy. Chemotherapy remains the gold standard treatment; yet, tumor resistance underscores the need for drug discovery. Conventional preclinical models of TNBC exhibit however poor correlation with patient responses, upholding the need to develop improved in vitro models to investigate resistance mechanisms and enhance therapeutic outcomes. In this study, we aimed to assemble a 3D simple, reproducible and traceable model, with potential for diverse applications, namely real-time imaging and tracking.

Murine E0771 TNBC cells were cultured in ultra-low attachment plates using a modified Liquid Overlay Technique to generate 3D mammospheres. Cells were seeded at a density of 5,000 per well and aggregated by gentle centrifugation. To enable real-time cellular visualization and support future studies with extracellular matrix components, E0771 cells were transduced to express GFP. Retroviral particles were generated using HEK293T cells co-transfected with pBabe-GFP or pBabe-Empty (control) and pCL-Ampho packaging plasmids. E0771 cells were transduced in monolayer culture, selected with puromycin, and subsequently characterized by fluorescence microscopy and flow cytometry.

Transduction efficiency reached ~65%, and GFP expression was retained in both 2D and 3D culture conditions. Fluorescent mammospheres were successfully formed and monitored over time. Anti-cancer drug testing showed that low doses of doxorubicin, effective against early-stage spheroids, did not significantly impact larger mammospheres cultured for more days, while higher doses remained effective throughout the culture period, suggesting an emerging resistance or reduced drug penetration in more developed structures.

This model offers a simple, fluorescently traceable 3D system that more closely resembles in vivo tumor architecture than traditional 2D cultures, providing a useful platform for future studies on drug resistance in TNBC.

Keywords: *Breast cancer, 3D Mammospheres, Drug resistance, GFP-expressing tumor models*

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Finding the mechanisms underlying cell intrinsic resistance to oncogenesis

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Abstract. Oncogenesis arises from genetic and epigenetic changes that stimulate the uncontrolled growth of cells. However, different types of cells react differently to oncogenic stimuli. In Drosophila eye precursor epithelium, differentiated epithelial cells proliferate in response to oncogenic stimuli, while the progenitor cells resist transformation.
Our hypothesis is that the progenitor cells might possess state-specific resistance mechanisms to avoid excessive response to mitogenic signals.
To test this hypothesis, we determined the transcriptome of the progenitor cells and identified genes exclusively expressed in the progenitor domain. After this identification, we performed a genetic screen using CRISPRa and identified optix as a possible regulator of cancer cell proliferation.
Interestingly, Optix levels impact differently on oncogenesis. In the differentiated domain, ectopic expression of Optix closer to its physiological levels results in a considerable reduction of the hyperplasia, while higher levels of Optix promote tumour growth. We are currently evaluating the role of Optix on the balance of cell proliferation and differentiation to understand how Optix function can control cell transformation according to the cellular context.
Our results highlight optix as a crucial element in the relationship between cell differentiation state and oncogenesis, emphasizing the relevance of understanding these mechanisms to explore new therapeutic approaches against cancer.

Keywords: *nan*

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Initial pharmacological treatment of asthma from 2010 to 2021 in the netherlands: real-world evidence from the pharmo data network

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Abstract. Suboptimal asthma care contributes to poor disease control; however, real-world data on general practitioners' prescribing patterns are limited. This study examined trends in the initial pharmacological treatment of asthma in Dutch primary care from 2010 to 2021. In this repeated cross-sectional study, adults newly diagnosed with asthma were categorised by their first prescription within 90 days: short-acting 2-agonists (SABA) without inhaled corticosteroids (ICS), ICS without long-acting 2-agonists (LABA), dual therapy with ICS and LABA, or triple therapy with ICS, LABA, and long-acting muscarinic antagonists (LAMA). Age- and sex-standardised proportions by asthma treatment were calculated and analysed using joinpoint regression. A total of 95,523 adults with asthma were included in the study (40% male; median age 45 years [IQR 3159]). The most prescribed initial treatment was SABA without ICS (25.2%), followed by ICS-LABA (23.9%), ICS without LABA (14.5%), and triple therapy (ICS-LABA-LAMA; 0.7%). Approximately 35.6% either had no asthma-related prescriptions or received other treatment combinations. After 2018, prescriptions for SABA without ICS decreased from 29.5% to 26.1% [APC: 3.4% (95% CI: 7.2 to 1.3)], while prescriptions for ICS-LABA increased significantly from 22.1% to 30.6% [APC: 12.0% (95% CI: 8.3 to 15.1)]. There was a significant decline in ICS without LABA from 2019 onwards [APC: 14.9% (95% CI: 20.9 to 8.0)]. Prescriptions for triple therapy remained stable at around 1% [APC: 2.8% (95% CI: 0.9 to 6.6)]. The proportion of patients without any asthma prescription decreased from 34.2% to 25.0% [APC: 3.4% (95% CI: 4.1 to 2.8)]. The observed changes in the initial asthma treatment over the last decade in the Netherlands seem to result from revisions to treatment guidelines; however, many patients were still prescribed SABA without ICS or were not given inhaled medication by their general practitioner, suggesting opportunities to improve asthma care.

Keywords: *Asthma; Primary Health Care; Drug Therapy*

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The role of er stress and mechanosensing in pdc-mediated fibrosis in systemic sclerosis

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Abstract. Systemic sclerosis (SSc) is a rare autoimmune disease characterised by immune dysregulation, vasculopathy, and fibrosis of the skin and internal organs (Jimenez et al.,2025). Among autoimmune rheumatic diseases, SSc has the highest morbidity and mortality, mainly due to interstitial lung disease development, marked by extensive pulmonary fibrosis (Ferreira et al.,2025). Plasmacytoid dendritic cells (pDCs) are innate immune cells implicated in fibrosis development in SSc patients, although the underlying mechanisms are still not fully understood. These cells are present in affected tissues of SSc patients, and their depletion ameliorates fibrosis in murine models (Silva et al.,2023). Activated pDCs contribute to type I IFN (IFN-I) elevated levels in SSc, associated with fibrosis progression and poor prognosis (Ferreira et al.,2025). However, how pDCs sense and respond to mechanical changes in fibrotic tissues remains largely underexplored. Interestingly, dysregulated endoplasmic reticulum (ER) stress signalling has been observed in circulating pDCs from SSc patients and linked to fibroblast activation (Ferreira et al.,2025). However, the exact mechanisms linking pDCs and ER stress to fibrosis in SSc remain unclear. To address this question, a pDC cell line and a lung fibroblast cell line were co-cultured on substrates with different stiffnesses, replicating healthy and fibrotic tissue, and gene expression was analysed by RT-qPCR. HA15 (a synthetic thiazole benzenesulfonamide)-induced ER stress increased IFN-I expression by CAL-1 cells, an effect amplified by TLR7 co-stimulation. Additionally, ER stress increased alpha smooth muscle actin and fibronectin expression in fibroblasts, with a higher effect in co-culture. Stiffer substrates further enhanced both IFN-I and extracellular matrix-related gene expression. These findings suggest that ER stress in pDCs contributes to fibrosis progression in SSc by promoting IFN-I production and fibroblast activation, effects that are modulated by the mechanical properties of the microenvironment. Understanding these mechanisms may uncover novel therapeutic targets to mitigate fibrosis in SSc.

Keywords: *Fibrosis, Systemic Sclerosis, ER stress, Mechanosensing, plasmacytoid Dendritic Cells, Interferonopathies*

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Trends in initial pharmacological treatment for chronic obstructive pulmonary disease in dutch primary care, 2010-2021: a repeated cross-sectional study

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Abstract. In the Netherlands, general practitioners (GPs) oversee most initial COPD diagnoses and treatment. Despite recognised gaps between guidelines and practice (Buhl et al., 2022; Halpin et al., 2023; Larsson et al., 2021), data on primary care prescribing remain limited, hindering insight into changes in routine care and potentially perpetuating suboptimal treatment. This study analysed prescribing trends in newly diagnosed COPD patients in Dutch primary care, 2010-21.

A repeated cross-sectional study was conducted with adults aged 40 years diagnosed with COPD by their GP (2010-21) using the PHARMO GP Database. Initial treatment was defined as the first ATC R03 prescription within 90 days of diagnosis and classified as reliever-only (SABA, SAMA, or SABA-SAMA) or maintenance (LABA, LAMA, LABA-LAMA, LABA-ICS, LABA-LAMA-ICS). Annual proportions were age- and sex-standardised, log2-transformed, and analysed using joinpoint regression.

Data from 54,628 individuals with COPD (65 [57-73] years; 53.7% men) were analysed. A total of 36.4% received no prescription, while 4.2% received other therapies, mostly ICS monotherapy. LAMA monotherapy rose from 13.4% in 2010 to 15.1% in 2015 (2.2%; CI 0.1, 6.9), then declined to 11.0% by 2021 (-4.7%; CI -10.5, -2.7). LABA monotherapy increased from 2.6% in 2010 to 5.7% in 2021 (4.1%; CI: 0.6, 7.3). LABA-ICS fell from 17.6% to 8.5% between 2010-2018 (-8.5%; CI -11.9, -7.1), then stabilised (6.5%; CI -5.5, 20.8). LABA-LAMA increased sharply from 0.6% in 2010 to 4.9% in 2016 (47.6%; CI 39.5, 63.6), followed by a slower rise (12.1%; CI 3.2, 18.7) to 9.6% in 2021. LABA-LAMA-ICS remained stable (-2.3%; CI -11.6, 1.8). SABA rose from 8.5% in 2010 to 14.3% in 2018 (7.6%; CI 6.6, 9.0), then plateaued (-3.7%; CI -11.9, 0.8). SAMA (0.7%; CI: -1.5, 2.6) and SABA-SAMA (-2.6%; CI: -3.3, 8.4) stayed low and stable throughout.

Prescribing trends likely reflect changes in management strategies and new single-inhaler therapies.

Keywords: *Chronic obstructive pulmonary disease; Primary health care; Drug therapy*

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Exploring the proteome of pericardial fluid in search of coronary artery disease biomarkers

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Abstract. Cardiovascular diseases (CVDs) are the leading cause of mortality worldwide, with coronary artery disease (CAD) representing the most common manifestation [1]. CAD arises from atherosclerotic plaque accumulation within the intimal layer of coronary arteries, potentially compromising myocardial perfusion [2]. Its progression is typically asymptomatic, often eluding detection until advanced stages, thereby underscoring the urgency for early diagnostic tools [3]. Biomarkers offer a promising complement to conventional diagnostics (e.g., coronary angiography), by capturing early molecular alterations during disease development [4]. This study explores pericardial fluid (PF), a plasma ultrafiltrate with lower systemic interference and in direct proximity to coronary vessels, making it particularly suitable for identifying CAD-relevant biomarkers. A cohort of 13 individuals with CAD and 13 without was matched for key comorbidities including age, sex, hypertension, BMI, type 2 diabetes, and dyslipidemia. Due to the fluids high protein dynamic range and elevated albumin content, we assessed various fractionation strategies to optimize protein identification and quantification. Albumin/IgG depletion columns were selected for their superior performance in minimizing albumin masking effects, enabling the separation of albumin-rich (ALBR) and albumin-poor (ALBP) fractions. MS-based proteomic profiling identified hundreds of unique proteins per fraction (593 in ALBR and 849 in ALBP). Six candidates stood out as potential CAD biomarkers: S100A12, SOD3, FSTL1, PLOD1, PNP, and SERPINC1, demonstrating statistically significant differences between groups (p < 0.05), large effect sizes (Cohens d > 0.8), and strong discriminatory capacity (AUC > 0.7). Functional enrichment analysis linked these candidates to processes highly relevant to CAD pathology, including inflammation (S100A12), oxidative stress (SOD3), extracellular matrix remodeling (PLOD1, FSTL1), and vascular stability (SERPINC1, PNP). These results point to the diagnostic potential of PF-based biomarkers in detecting CAD, with future steps including biomarker translation into plasma and respective validation in an independent cohort.

Keywords: *nan*

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Hands on, to think and grow: contributos do design para a capacitação emocional de jovens entre os 14 e os 19 anos em contexto escolar.

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Abstract. As últimas décadas assinalam o crescente protagonismo dos transtornos mentais que, tanto pelo aumento da sua prevalência como pelas implicações em todas as esferas da vida, se afirmam como um problema de saúde pública transversal a todas as gerações um fenómeno amplamente reconhecido por entidades como a Organização Mundial de Saúde (OMS, 2002) e o Programa Nacional para a Saúde Mental (PNSM, 2021).

A adolescência é um período especialmente crítico, marcado por profundas transformações a nível emocional, cognitivo, social e físico, durante o qual muitos jovens experienciam desafios significativos. É neste contexto que a escola se evidencia como um lugar privilegiado para uma intervenção preventiva, através do desenho de abordagens inovadoras e interdisciplinares que favoreçam o bem-estar subjetivo, a autonomia emocional e a literacia em saúde mental.

A presente investigação procura compreender de que forma o Design, enquanto prática colaborativa, sensível e ética, pode contribuir para a promoção da saúde mental dos adolescentes dos 14 aos 19 anos, em contexto escolar. As metodologias utilizadas neste estudo exploratório serão de natureza qualitativa, incidindo em métodos etnográficos de observação participativa em escolas e no desenvolvimento de um estudo de caso em colaboração com uma equipa multidisciplinar responsável por um concurso criativo, a ser lançado às escolas secundárias portuguesas com o apoio da Fundação Calouste Gulbenkian.

Esta parceria oferece um terreno fértil para observar e testar, em contexto real, o impacto do Design enquanto mediador de processos de escuta, expressão emocional, de criatividade e envolvimento juvenil.

A investigação-ação dará origem a um Toolkit de apoio aos participantes, concebido para sustentar o processo criativo proposto pelo concurso e, simultaneamente, promover a capacitação emocional. Este trabalho pretende contribuir para o debate sobre o papel do Design em contextos educativos e de saúde mental, propondo soluções sensíveis, participativas e ajustadas às realidades vividas pelos jovens.

Keywords: *Design para a saúde mental; Design para o bem-estar subjetivo; Design para a educação; Design participativo; Adolescência*

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Nota: O regulamento do concurso será disponibilizado no website oficial da Manifestamente, atualmente em preparação: https://www.manifestamente.org

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Co-criação artificial: artificialização e automatização da criatividade no projeto em design industrial.

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Abstract. A integração da Inteligência Artificial (IA) no design industrial está a transformar profundamente os modos de pensar e desenvolver projetos. Ao intervir em fases tradicionalmente criativas como a pesquisa, a ideação, a variação formal e a visualização a IA desafia a separação entre ferramenta e autor, exigindo uma reavaliação do papel do designer e da própria noção de criatividade.

Este estudo tem como principais objetivos: compreender de que forma a IA afeta as etapas criativas do design, investigar as implicações epistemológicas da criatividade híbrida e analisar o impacto da IA na agência e autoria do designer. Parte-se da hipótese de que a IA não substitui o humano, mas pode atuar como parceiro colaborativo na prática projetual.

A investigação adota uma abordagem qualitativa e exploratória, combinando revisão teórica e histórica com prática projetual. Foram analisados casos de estudo em que modelos generativos, algoritmos evolutivos e redes neuronais são integrados em processos criativos. A metodologia baseia-se na comparação entre abordagens convencionais e processos assistidos por IA, com foco nas transformações nas funções do designer e nas características dos resultados.

Os resultados preliminares indicam que a IA expande o espaço de possibilidades formais e conceituais no design. Surgem formas imprevistas e abordagens mais abertas, centradas na experimentação iterativa. Observa-se uma transição do designer de autor singular para curador e mediador de possibilidades algorítmicas.

Conclui-se que a colaboração com IA reformula a prática do design e introduz uma nova ecologia criativa, exigindo dos profissionais competências éticas, interpretativas e técnicas. Esta transformação também implica rever os modelos epistemológicos da disciplina, à luz da crescente presença de sistemas inteligentes nos processos criativos.

Keywords: *Design, Projeto, Inteligência Artificial, Colaboração Artificial*

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Firefighter tactical-athlete: a response to the protection vs. comfort dichotomy through the design of personal protective equipment"

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Abstract. Wildland firefighting is among the most hazardous occupations, demanding intense physical effort in extreme environments. Current Personal Protective Equipment (PPE) used by the Unidade Especial de Proteção e Socorro (UEPS) lacks adequate breathability and ergonomic design, leading to thermal stress, microclimate saturation, and increased risk of injury.
This research-through-design project aims to respond to the protection vs. comfort dichotomy, while also exploring the symbolic dimension of a new firefighter tactical-athlete identitysimultaneously a public authority agent. The objective was to develop a jacket and trousers system that improves thermal protection, mobility, and ventilation to reduce heat strain.
The design process involved drawing-based ideation, hotspot analysis to locate functional zones, and iterative prototyping of targeted solutions. Key innovations include the integration of textile spacers and internal air pockets to create insulating layers without significantly increasing weight, while preserving tactile sensitivity (natural sensor).
The ergonomic configuration features a tapered fit and pre-shaped limbs that support natural movement. Additionally, expansion pleats and a venting system allow for forced convection: body motion actively expels hot air through strategically placed exhaust vents. This system is currently protected by patent and registered design.
Preliminary tests suggest that the proposed system performs in accordance with the design objectives. However, the comfort level of the textile spacers requires further validation. A conceptual fire shelter alternative was also explored: an escape poncho with an integrated air mask stored in a cargo pocket, although regulatory compliance remains an issue. A hydro-cooling pouch was tested but failed performance thresholds.
By combining commercially available materials with novel construction methods, this project proposes a viable, user-centered PPE alternativeoffering enhanced thermal management, usability, and symbolic coherence for the modern wildland firefighter.

Keywords: *Personal Protective Equipment; UEPS; Firefighter Tactical-Athlete; Protection vs. Comfort Dichotomy; Design Project*

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Memória transparente: vidro e tecnologias aditivas na preservação e reconstrução da identidade

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Abstract. Oliveira de Azeméis é uma cidade com tradição enraizada na indústria do vidro, que teve início em 1528. Existe um conhecimento tácito entre a população, as entidades públicas locais, as escolas e os empresários que, o berço da principal indústria da localidade, a dos moldes e da injeção plástica, provém dos saberes ligados aos artesãos vidreiros que permaneceram na região e nas fábricas de vidro até ao final do século passado. No entanto, há uma notável escassez de estudos ou registos escritos sobre o assunto.
A influência do vidro ainda se faz sentir na cultura local, mantendo-se presente nos laços familiares, memórias e tradições. Dada a idade avançada dos últimos vidreiros e a falta de registos, compreender o papel do saber vidreiro na transição do artesanato para a indústria e tecnologia é uma oportunidade de investigação em design.
Nesse contexto, o projeto visa a pesquisa histórica e etnográfica para compreender práticas e características das peças ligadas ao sopro do vidro, de modo a preservar os objetos já conhecidos e a contribuir para o inventário das peças produzidas pela fábrica do Côvo (1528-1924).Através da reinterpretação das técnicas ancestrais e dos materiais utilizados, associadas à indústria vidreira deste território, pretende-se investigar se é passível de serem aplicados avanços tecnológicos na replicação destas mesmas peças. Espera-se compreender o contexto cultural e social da produção de vidro, reproduzindo as peças originais e disseminando e replicando os resultados para a comunidade científica, profissional e para a esfera pública.
Os resultados esperados incluem a criação de um inventário digital acessível e a replicação de peças históricas em contextos museológicos e educativos. A bem-sucedida conclusão deste projeto terá um impacto significativo na preservação e promoção do património vidreiro, fortalecendo a identidade cultural e impulsionando o desenvolvimento regional e da própria indústria vidreira.

Keywords: *: design, identidade cultural, saber vidreiro, manufatura aditiva, Oliveira de Azeméis.*

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Moldes mutantes - variação em série

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Abstract. O design industrial contemporâneo tem sofrido alterações nos seus paradigmas tradicionais; novas formas ganham força, abrindo espaço para abordagens mais flexíveis.
Esta investigação parte da necessidade de responder aos desafios de uma sociedade fluida, onde a rigidez da lógica linear problema-solução se revela insuficiente para a prática criativa do design.
O modelo normalmente utilizado reside na limitação imposta pelos métodos tradicionais de produção seriada, que privilegiam a repetição e a homogeneidade, afastando o designer do processo produtivo e, dessa forma, esvaziando a singularidade dos objectos. Esta investigação propõe como solução a adoção de estratégias de autoprodução e experimentação, centradas numa metodologia flexível e dinâmica na criação de moldes mutantes, capazes de gerar peças únicas a partir de um mesmo molde.
A metodologia adotada baseia-se na prática exploratória e na experimentação direta com os materiais e os processos de conformação, incorporando a intuição, a serendipidade e a interação entre corpo, ferramenta e matéria.
Os moldes desenvolvidos incorporam estratégias, tais como: montagem aleatória, articulação flexível, ligações, uso de novos materiais, possíveis multiposições e movimento induzido, permitindo deste modo uma variação em série.
Os resultados demonstram o potencial do molde como agente dinâmico no processo de design, promovendo uma prática centrada no "fazer"e na imprevisibilidade produtiva. Ao recentrar o foco no processo, em vez do produto final, contribui para uma reconfiguração do papel do designer, aproximando-o da figura do autor-produtor e sublinhando o valor do gesto, da decisão e da materialidade no processo criativo. Este contributo tem implicações significativas para o design de produto contemporâneo, abrindo espaço a novas estéticas, metodologias e formas de produção.

Keywords: *Processos de conformação; autoprodução; variação em série; experimentação; erro*

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From systems to experiences: designing digital product passports for sustainable manufacturing (acronym: design-dpp)

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Abstract. This research proposes a design-led exploration of how systemic and human-centred approaches can mediate the complexities of the Twin Transitions (green and digital) in Portugals industrial landscape, with a specific focus on the furniture and mattress sectors. Aligned with Industry 5.0 principles and the new Ecodesign for Sustainable Products Regulation (2024), the study frames these transitions not as purely technical challenges but as cultural and systemic transformations. Partnering with Aquinos Upholsterya leading Portuguese manufactureras a case study, the project applies Systemic Service Design (SSD) and User Experience Design (UXD) methods, combined with speculative prototyping, to develop and test a more human-centred model of a Digital Product Passport (DPP). The goal is to support more ethical, transparent, and participatory implementations of DPPs, fostering traceability, circularity, and sustainable innovation. Methodologically, the research follows an iterative design research approach, including literature review, field research, stakeholder co-design, and participatory evaluation of prototypes. The expected outcomes include strategic design contributions to the green and digital transitions in manufacturing, as well as practical tools and frameworks for implementing DPPs as culturally meaningful systemic infrastructures.

Keywords: *Twin Transitions; Sustainable Manufacturing; Digital Product Passport; Systemic Service Design; User Experience Design; Speculative Prototyping;*

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Designing desire: contributions of design to new social constructions of sexuality among people with disabilities

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Abstract. The sexuality of people with disabilities has historically been marginalized by stigmas oscillating between desexualization and hypersexualization, generating both symbolic and material barriers to the full exercise of their rights. There is, therefore, a lack of approaches that address the specificities of these individuals in relation to pleasure, identity, and affection. This thesis aims to understand how positive design can support the construction of affective-sexual experiences for adults with physical disabilities. It seeks to develop strategies that, through design, promote well-being, autonomy, and quality of life, drawing on existing models of positive design. Methodologically, this is a participatory, qualitative investigation that includes literature review, interviews with people with disabilities, and co-creation processes of design proposals. The scientific contribution lies in the articulation between critical disability theory, design for inclusivity, and positive design, proposing a model for design mediation in processes of affective-sexual development and appreciation, recognizing the subjectivities and desires of this historically marginalized population. At the conclusion of the investigation, the aim is to establish a collaboration within the field of design, with a focus on project-based practice, through the development of a product, service, or experience co-created with the research participants. This process will serve as a foundation for the review, adaptation, and expansion of positive design models, while also offering a theoretical contribution to the broader field of design.

Keywords: *Inclusive Design, Positive Design, Sexuality and Disability, Affective-Sexual Rehabilitation, Inclusion*

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Adn do design português: identidade nacional nos objetos

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Abstract. Perante a inexistência de um museu dedicado à investigação e exposição do Design Português, é legitimo que se levantem dúvidas sobre as razões que levam a produção nacional a imitar ou importar frequentemente o design internacional em vez de desenvolver o seu próprio. A sua condição de país periférico com baixo custo de mão-de-obra, parece contribuir para que Portugal se venha afirmando como um país de fabricantes, desvalorizando o que é projetado no país. Apesar do reconhecimento do Design Português através de prémios, exposições e recolhas como Best of: 180 produtos de design português (Pimentel ; Rios, 2003) ou a coleção Design Português (Bártolo, 2015), a escassez de sistematização e caracterização das suas referências tem contribuído para que não exista uma resposta clara à definição da sua identidade.
Para se promover o que é projetado em Portugal, é necessário compreender aquilo que o define. Nesse sentido, torna-se fundamental estudar os processos utilizados por países de referência internacional, principalmente nos cassos em que o Design de Produto tem uma identidade sólida e um forte envolvimento na economia, como nos casos dos países nórdicos e Alemanha. Este trabalho procura, a partir de uma observação às metodologias utilizadas por estes países, desenvolver um modelo que permita analisar o contexto português.
O planeamento obedece a duas fases fundamentais: compreender os processos de construção ou identificação das identidades nacionais dos casos de estudo; adaptar ao caso português e aplicar aos seus produtos. Esta investigação tem como principal objetivo analisar, discutir e identificar características que possam contribuir para a definição da identidade do Design de Produto Português. Ao preencher um segmento do seu ecossistema, o resultado contribuirá para a observação do Design Português, podendo fornecer guias de apoio à produção das empresas nacionais, solidificando o papel do Design nas suas estratégias de valorização e competitividade.

Keywords: *ADN; Identidade; Design Nacional; Design Português; Design de Produto*

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Interface, digitação e criação

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Abstract. Nas últimas duas décadas assistimos a uma mudança significativa, no desenvolvimento e produção de instrumentos e interfaces para a criação musical. Este fenómeno está intimamente ligado aos avanços tecnológicos, à digitalização e a uma crescente consciência ambiental. Assiste-se também a uma presença crescente do Design. Se por um lado se observa uma democratização da atividade musical, por outro percebe-se um estabelecimento de fórmulas, condutas e padrões dessa atividade e da abordagem aos instrumentos. E se novas formas (desenho), tipos e meios de digitação, sons e potencial acústico forem disponibilizados aos grupos e comunidades de músicos (profissionais, amadores e entusiastas) e não-músicos?
Para os músicos profissionais a procura por novos sons, formas de os produzir, instrumentos e individualidade é incessante. O mundo das coisas e das não coisas serve-lhes de tela e/ou riscador por forma a traduzir autoexpressões. Mas não só este grupo de indivíduos poderá ajudar a descobrir e testar novos sons e instrumentos. A colaboração com músicos amadores e entusiastas será igualmente importante, tanto para gerar espaço para a serendipidade como para criar territórios que cativem estas comunidades e promovam a participação, livre de estigmas e receios.
A inclusão de diferentes disciplinas e a reconfiguração dos instrumentos para que se adaptem a diferentes necessidades anatómicas e fisiológicas abrem novas oportunidades para a inovação, tanto na música como no design. Este novo paradigma permitirá a emergência de alternativas materiais e novas interfaces musicais, proporcionando novas vozes, formas e experiências.
Ao desobedecer aos padrões e fórmulas instituídos, os resultados (da atividade musical e do design) poderiam ser diferentes, novos e maiores.

Keywords: *Design; Improviso; Digitação; Instrumentos Físicos*

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Herança cultural e atores coletivos no design de sistemas identidades visuais: contributos para a pedagogia em design

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Abstract. Em grupos de atores coletivos, uma identidade visual tende a ser construida de forma participativa e orgânica, frequentemente com um grau elevado de envolvimento direto de participantes sem formação em Design Gráfico.
A literatura académica vigente na área do design de identidades visuais caracteriza, genericamente, meios com estruturas sociais mais formalizadas, resultando em Sistemas de Identidade Visual (SIV) estáveis e em papéis laborais e sociais firmes para o designer e o design gráfico enquanto disciplina. Em contextos mais informais caracterizados no âmbito deste trabalho como grupos de Atores Coletivos, denominação derivada da área da Inovação Social a investigação em Design tem sido menos aprofundada.
Acredita-se, posto isto, que um estudo aprofundado da perspetiva específica do Design poderá contribuir com inovações para o conhecimento e sistemas subjacentes às práticas atuais de desenvolvimento de SIV.
Através de trabalho de campo assente no método de constructivist grounded theory, faz-se uma análise detalhada e multifacetada de casos de estudo de grupos de Atores Coletivos. Procura-se mapear as suas Heranças Culturais e as influências que estas exercem sobre os seus SIV, assim como as práticas laborais e sociais que diferenciam, neste meio, o design gráfico das suas descrições mais tradicionais, na literatura procedente de meios compostos por Atores Corporativos.
Em paralelo, problematiza-se o enraizamento teórico nesse mesmo contexto da generalidade do ensino em design gráfico em Portugal, explorando em contexto pedagógico os resultados do trabalho de campo com Atores Coletivos, adaptando criticamente métodos de design studio pedagogy.

Keywords: *Design gráfico; Identidade visual; Herança Cultural; Design Studio Pedagogy; Inovação Social*

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Design as a mediator of relationships with the living world: microalgae as a solution to improve air quality

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Abstract. As the boundaries between design and biotechnology continue to dissolve, this research proposes a design practice that engages directly with the challenge of indoor air pollution a pervasive, often overlooked condition in which contaminant levels frequently exceed those outside, silently threatening human health and the integrity of inhabited environments.
In this context, design operates in close collaboration with microbiology through the agency of microalgae, which are photosynthetic organisms capable of absorbing carbon dioxide (CO), volatile organic compounds (VOCs), and formaldehyde, while releasing oxygen (O). The project aims to develop bioactive platforms for indoor applications, designed to improve air quality and increase occupants well-being, engaging with the principles of biophilic design.
Grounded in a Research Through Design methodology, the process unfolds through practical activity, experimentation, and critical reflection, conducted along two complementary paths: the first, of a biotechnological nature, involved the research and selection of four potential species of microalgae; the second, and more significant, design-oriented path involved the analysis of case studies, iterative drawing, modelling, and digital prototyping, culminating in the development of devices tested in real-life contexts.
Preliminary results show that chromatic variations in algae cultures, induced by changes in environmental conditions, constitute a relevant design element, revealing their potential as biological indicators. This has led to the formal exploration of devices capable of mediating interactions between humans, algae, and indoor air quality through the exhibition of biological activity. Changes in colour and texture propose new modes of semiotic intercommunication between species. Future developments will explore how these devices can inhabit human spaces, fostering ecological awareness and well-being.

Keywords: *Product Design, Biotechnology, AQI, Microalgae, Indoor spaces, Bioactive platforms*

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The role of technique as a mediator in the evolution of the discipline of design

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Abstract. Man distinguishes himself from other species by thinking and questioning both his surroundings and his own ontology (Heidegger, 2008). Translating thoughts into tangible existence always requires a technological meansa tool that materializes the conceived. From this perspective, the present work aims to reflect on how the evolution of technique has shaped design thinking and practice throughout history, identifying the challenges and opportunities of today's technological context.
Through a qualitative bibliographic review of key authors, this study addresses questions such as: 1) How has technique influenced the act of designing over time? 2) What are the risks and opportunities of each technical advancement for design thinking? 3) How technique is currently at the disposal of Design?
To explore these questions, a historical analysis was carried out, aiming to trace the evolution of technique by relating the tools available in each period to the prevailing modes of creation and concepts of authorship in Design.
From rudimentary means of representation, such as the cave figures of Vila Nova de Foz Côa, to tools specifically developed for drawing, painting, or sculpture, we observe a progressive understanding of the matter, that allowed humans to refine their tools and thinking through embodied experience. In contrast, more recently, the digital age imposed software as a tool, shaping both creative processes and outcomes (Flusser, 2010), while also enabling new forms of expression. Today, emerging digital toolsparticularly AInot only influence creation but also generate responses independently, without the designer fully understanding the mechanisms behind the decisions (Nicenboim et al., 2022).
Whereas traditional design processes focused on isolating key decisions through deduction and iteration, we are now prompted to question whether technique represents a new opportunity for co-decisionor the transformation of authorship into technological monitoring.

Keywords: *Technique; Design; Design Ethics; Design Tools; Artificial intelligence*

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Postphenomenology, media literacy and heritage landscapes: a framework for designing hybrid atmospheres

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Abstract. Digital technologies reshape human experience, perception, and societal practices by mediating and co-constituting reality. As information and communication technologies (ICTs) become increasingly embedded in daily life, they raise ethical concerns regarding their impact on democratic processes and public discourse, demanding renewed approaches to media literacy.

Contemporary media literacy has evolved beyond technical proficiency to encompass a critical understanding of digital media's role in society, its production processes, and its broader influence on individuals and communities. This shift prioritizes critical thinking, civic engagement, and participatory culture within complex digital ecosystems, particularly in response to AI systems, algorithmic content curation, and immersive media formats.

This research follows a post-phenomenological and post-humanist approach to investigate the interplay between spatial design, embodiment theory, immersive media, and media literacy. Posthumanism refers to a post-anthropocentric, and post-dualist approach to understanding the human subject, which is always-in-relation and is continually constituted through a complex, interrelated network of relations. This ontological stance demands a paradigmatic shift in media literacy as an emergent, distributed capacity, shaped through affective, ecological, and technological relations.

The research adopts the Grounded Theory methodology to develop a multidimensional, practice-oriented, grounded framework comprising actionable design guidelines, spatial and visual representation techniques, and embodied interaction models for designing hybrid atmospheres for media literacy development.

The frameworks transferability is assessed through multimodal qualitative methods, including interviews, visual analysis, and participant feedback, within a digital exhibition developed under the CULTURALITY project, addressing sustainable development goals through immersive visualization of climate change impacts on crafting and heritage landscapes.

Keywords: *Spatial Design; Postphenomenology; Media Literacy; Hybrid Atmospheres; Embodied Immersion.*

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Rethinking design methodologies: redefining the design process with ai integration

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Abstract. Artificial Intelligence (AI) is an emerging and rapidly evolving technology that has found applications across various industries, such as medicine, engineering, marketing, and energy. In the design field, AI is introducing new tools and methodologies that are reshaping how products are developed (Tiwari ; Patel, 2024). Despite its potential, applying AI in product design and development remains a challenge, with resistance and difficulty in fully integrating it into traditional design processes.
AI offers tools that allow designers to explore new possibilities, automate repetitive tasks, and optimize decision-making. In product design, it can assist in ideation, material selection, performance prediction, and product personalization (Cooper, 2024). These capabilities present an opportunity to improve efficiency and sustainability, reduce time-to-market, and enhance product performance.
Despite these advantages, integrating AI into the design process presents several challenges, including resistance rooted in fears of losing creative control, misconceptions about the potential of AI, and difficulties in adapting new technologies to established workflows (Elfar ; Dawood, 2023). Emerging perspectives increasingly frame AI not as a replacement but as a co-creator, capable of enhancing human creativity and innovation (Tholander ; Jonsson, 2023).
Despite growing research on AIs application in design, most current approaches remain fragmentedfocusing on isolated stages of the process and lacking accessible, practice-oriented methodologies. This research aims to address these gaps by developing and validating a holistic methodology for humanAI co-creation throughout the entire product development cycle. Grounded in a Research-through-Design approach, the methodology combines a systematic and exploratory literature review, experimentation with existing AI tools and participatory workshops with designers and engineers. The expected outcome is a replicable and intuitive workflow that enables designers to integrate AI tools more effectively, supporting the development of sustainable, creative, and technically robust solutions.

Keywords: *Design Research; Artificial Intelligence; Human-AI Collaboration; Creative Process; Collaborative Design.*

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Design participativo para o desenvolvimento turistico sustentavel em territorios costeiros

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Abstract. Esta investigação propõe o desenvolvimento e validação de um framework de Design Participativo para promover o turismo sustentável em territórios costeiros. Parte-se do reconhecimento de um problema crescente: a intensificação da atividade turística tem gerado tensões entre o desenvolvimento económico, a preservação ambiental e a continuidade dos modos de vida locais. Estudos recentes apontam a necessidade de estratégias voltadas à transição ecológica, inclusiva e territorialmente centrada, contexto em que autores como Manzini (2008), Liburd et al. (2020) e Dolnicar (2020) destacam o design participativo como abordagem promissora para envolver comunidades locais na criação de soluções contextualizadas. O estudo tem como ponto de partida um caso-piloto nas praias da Barra e Costa Nova (Portugal), território marcado por pressões turísticas e fragilidade ecológica. Posteriormente, o modelo será adaptado e testado em contextos contrastantes de países lusófonos do Sul Global, considerando especificidades culturais e territoriais.
Com enfoque transdisciplinar, a investigação articula saberes do Design, Turismo e Desenvolvimento Territorial. A metodologia baseia-se no modelo Da realidade à mudança (Franqueira et al., 2019) e combina métodos qualitativos e participativos, como entrevistas, observações, mapeamentos colaborativos, grupos focais e oficinas de cocriação. O processo é estruturado em seis fases iterativas: [Re]interpretar, [Re]engajar, [Re]definir, [Re]imaginar, [Re]experimentar e [Re]implementar.
Entre os objetivos estão: diagnosticar necessidades locais; desenvolver e testar um framework participativo adaptável; e avaliar sua eficácia com base em indicadores de justiça social, resiliência territorial e sustentabilidade ambiental.Como contributo teórico-prático, o estudo reforça o papel do design como mediador de processos de regeneração territorial e propõe um modelo replicável com potencial de aplicação em políticas públicas, alinhado com os ODS 8, 11 e 17.

Keywords: *design participativo, design de serviços, inovação social, turismo sustentável, desenvolvimento territorial*

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folhas caídas da árvore: uma perspetiva do design sobre a coleção de cartazes da cooperativa de atividades artísticas. progresso de uma investigação iii

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Abstract. A Árvore Cooperativa de Atividades Artísticas foi fundada em 1963, no Porto, por artistas, arquitetos, escritores e outros intelectuais, como uma alternativa descentralizada de promoção cultural e artística, funcionando como um polo de resistência assumidamente de 'esquerda'.
Fruto da agenda plural e da diligência dos colaboradores, formou-se uma coleção de cartazes, da qual se desconhecia a extensão e o espectro. Identificou-se o risco de degradação do arquivo, além da memória impressa e latente, por carência de tratamento documental e científico.
O projeto dedica-se ao reconhecimento, à preservação física e digital dos 3.583 artefactos, à sua catalogação, caracterização, mapeamento visual e interpretação, com vista à divulgação pública.
Procura-se um entendimento holístico sobre o acervo, enquadrando-o na história do design gráfico português da segunda metade do século XX até 2018. Objetiva-se um estudo que, com design como mediador, contribua para a compreensão da produção cartazista nacional, com particular incidência na Árvore e nas temáticas culturais.
Aplicam-se métodos que, através do manuseamento do acervo, da construção da base de dados, de casos de estudo sobre arquivos nacionais semelhantes, da revisão bibliográfica e de entrevistas, compõem uma abordagem preponderantemente qualitativa ao objeto de estudo.
Recentemente, trabalha-se para enquadrar as decisões autorais, face a um dado programa e através das tecnologias disponíveis, no sentido de incrementar e divulgar registos da memória viva do design gráfico português. Em 10 vídeos editados, as entrevistas a artistas/designers focam a produção cartazista, enquanto outras abarcam o contexto da Cooperativa e a memória ligada à produção gráfica.
A investigação acrescenta um contributo para a compreensão da coleção inédita de cartazes da Árvore, enfatizando a importância da preservação do património visual a partir do estudo de arquivos de design em Portugal.
Esta apresentação faz um ponto de situação do percurso, mostrando métodos, resultados intermédios e perspetivas futuras, como um site e uma exposição com catálogo.

Keywords: *DESIGN, PORTUGAL, ARQUIVO, COLEÇÃO, CARTAZ, COOPERATIVA ÁRVORE*

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Design of modular furniture system for collaborative work experience

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Abstract. The increasingly nomadic lifestyles enabled by the evolution of mobile technology have contributed to the emergence of new ways of working and have transformed work routines into more agile and collaborative models (Gillen, 2019). Furniture design plays a fundamental role in this context by ensuring flexible, dynamic, and multifunctional workplaces that support the stability and functionality of workflows (Tuncel ; Kayan, 2018).
At the Research Summit 2025, the focus is on a furniture design project for collaborative workplaces. This research includes an analysis of three pairs of parameters function/comfort, materials/sustainability, and flexibility/form based on a study of several visits to various collaborative work environments (coworking spaces, companies, and business incubators) and trade fairs dedicated to workplace furniture (Cruz ; Pombo, 2024 Cruz et al., 2021). The analysis highlights the significance of flexibility and modularity in furniture design for the future of work, and its findings support the development of the proposed project.
The doctoral research presents the design of a modular furniture system for collaborative workplaces called Agilab. It enables the easy creation of diverse configurations that meet different functional needs and transform work scenarios into environments that foster creativity, collaboration, and wellbeing. The Agilab system consists of a series of plywood boxes designed for seating and the construction of various modules. The collection also includes trolleys for storing and transporting the boxes, as well as mobile tables and screens that, when combined, encourage dynamic and collaborative interactions. The proposal aligns with circular economy principles and sustainable production standards, with special attention given to material selection to ensure adequate acoustics and comfort. To complete the project, furniture prototypes will be produced in partnership with GUIALMI (Empresa de Móveis Metálicos S.A.).

Keywords: *collaborative workplaces, furniture design, hybrid work, creative experience, materials*

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Artificial lighting in urban ecosystems: sustainable strategies for environmental balance and human-centered design

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Abstract. Artificial lighting plays a vital role in our experience after dark, enhancing perception of safety, supporting social life and creating vibrant spaces. However, the use of LED technology, alongside urban expansion, has exacerbated the impacts of artificial light on human health, biodiversity and hindered the observation of the night sky (Chepesiuk, 2009; Kyba et al., 2017). Portugal ranks amongst Europes most light polluted countries, performing poorly in terms of average night sky brightness, light flux emission per capita, and flux emission per GDP, emitting four times more flux per capita than Germany (Falchi et al., 2019). Observing the urban environment as a hotspot for artificial lighting, this work proposes the development of a collaborative methodology for the lighting redesign within urban nighttime environments.

By asking "how can design contribute to light pollution mitigation in Portuguese urban environments addressing both the ecological impact and the everyday lighting experience?", this research aims to investigate how a methodology developed through informed design strategies and different stakeholder engagement can contribute to the prevention of light pollution and respond to its challenges.

The research is split in four methodological phases. The first involves the practical development of a road lighting project that serves as a comparative case study within a territory with a Starlight Tourism Destination. The second phase focuses on a theoretical approach regarding artificial lighting in urban environments, with an exploration of the historical advancements in technology, its policies, regulations and existing urban lighting methodologies. The third and fourth phases are dedicated to the development of the methodological model as well as its practical implementation and validation after the selection of an urban location for the case study. This research aims to offer practical strategies to municipalities, urban planners and designers, informing future guidelines for creating urban nighttime spaces for and with people.

Keywords: *Lighting Design; Light Pollution; Human Experience; Urban Ecosystem; Collaborative Methodology*

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Heurística da letra: modularidade tipográfica como prática pedagógica

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Abstract. O crescente interesse na modularidade aplicada ao Design de Comunicação e como ferramenta pedagógica especificamente no ensino da Tipografia proporciona a necessidade de mais estudos aprofundados neste domínio. A par desse cenário, a digitalização, que promove uma interação predominantemente imaterial com a informação, tem vindo a afastar os novos designers da prática analógica e tátil. A convergência desses fatores expressa um potencial para investigar a mediação tecnológica e promover a poíesis e a praxis do Design de Comunicação, em particular do Design de Tipos.
O projeto, baseado no desenho como ferramenta metodológica e na análise de sistemas modulares tipográficos ou não , procura perspetivas holísticas sobre linguagens em constante evolução. O conhecimento será enriquecido através de diálogos com designers, docentes e autores de referência. Nesse sentido, esta investigação propõe-se a explorar a tipografia modular como prática heurística e pedagógica, partilhando visões aprofundadas sobre a sua aplicação no cruzamento entre a ação criativa, a ação prática, o pensamento pedagógico e a construção morfológica.
Após a análise destes conteúdos, pretende-se desenvolver um sistema modular tipográfico open-ended. Como forma de validação do sistema, propõe-se a realização de um conjunto de workshops a oferecer em escolas vinculadas ao ID+. Este sistema será materializado num conjunto de objetos de uso dinâmico e exploratório permitindo, assim, que a sua utilização seja de forma individual ou sequencial. Por fim, tem-se como intenção partilhar os resultados e o conhecimento gerado através de exposições e publicações (digitais e impressas) como forma de disseminação.

Keywords: *Tipografia; Sistemas modulares; Pedagogia; Open-ended; Protótipo.*

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Examining the role of perceptual quality in underwater image classification

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Abstract. Underwater image classification faces significant challenges due to poor visibility conditions, color distortion, and light scattering that degrade image quality. Building upon existing work in underwater computer vision and image enhancement, we investigate the impact of perceptual quality on binary fish classification performance using the EUVP dataset [1], which provides paired underwater images with good and poor perceptual quality. We evaluate five CNN architectures (ResNet50, MobileNetV2, DenseNet121, EfficientNetB0, and EfficientNetV2B3) under three training configurations: using poor-quality images, good-quality images, and a combined dataset. Our experimental results confirm and extend previous findings, showing that models trained on good-quality images generally achieve better performance when tested within the same quality domain compared to models trained and tested on poor-quality images. Training on combined datasets enhanced the models' ability to generalize across both test qualities simultaneously, as expected. When testing on poor-quality images, models trained on the combined dataset consistently demonstrated superior performance (with only one exception across all five CNN architectures). When testing on good-quality images, two of the five CNN architectures actually performed best when trained on the combined dataset, while the remaining three mostly showed only marginally better results when trained exclusively on good-quality data. The dataset and code are available at: https://github.com/davsalmeida/perceptual-quality-classification.

Keywords: *Underwater Image Classification, Image Enhancement, Deep Learning, Convolutional Neural Networks, Data Augmentation, Domain Generalization, EUVP Dataset*

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Machine learning techniques for predicting the properties of ceramic products

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Abstract. Ceramic products are essential in various industries such as electronics, aerospace and construction due to their diverse physical properties.
However, obtaining a final product with specific physical properties such as mechanical resistance or water absorption is a challenging task due to the complex interactions between raw materials, often leading to extensive and costly laboratory testing.
In this project, we aim to reduce the trial-and-error nature of ceramic formulation by using machine learning (ML) to predict the final properties of the product based on the properties of the raw materials used on their composition.
To achieve this, we used a dataset comprising 230 past ceramic formulations, each containing 7 raw materials. Each raw material is described by 11, features for a total of 77 features. Instead of having 11 targets, we chose to have only 4, since the remaining ones can be extrapolated. This was done to reduce the complexity of the problem [1,2].
We used 2 supervised ML models: linear regression (LR) and neural networks (NN).
Despite the poor predictions obtained with LR (Rš = -3.15, MAE = 0.55), NN achieved significantly better results (Rš = 0.98, MAE = 0.69), demonstrating that it can be used to reduce the costs of laboratory testing and streamline the production of ceramic products [1,2].

Keywords: *ceramic materials, machine learning, property prediction, neural networks, supervised learning*

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Exploring action representations for learning control in anthropomorphic robotic hands

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Abstract. Anthropomorphic robotic hands hold the promise of achieving human-like dexterity, yet their control remains a central challenge in robotics. This difficulty arises from the high dimensionality and redundancy of their action space, which makes the direct learning of control policies inefficient [1]. The current objective is to investigate how principles from reinforcement learning and representation learning can be leveraged to make this control problem more tractable [2], with a particular focus on grasping and object interaction tasks.
Rather than prescribing fixed dimensionality reductions, such as those obtained through linear techniques like principal component analysis (PCA) [3], this work explores how low-dimensional action representations can be learned in a task-driven and adaptive manner. The goal is to identify latent action spaces that are not only compact but also aligned with the dynamic structure of the manipulation tasks. This approach offers the potential to improve learning efficiency, generalization across tasks, and robustness to environmental variation. The methodology combines theoretical insights from machine learning with experimental evaluation in robotic manipulation scenarios, particularly involving object grasping and interaction.
This work contributes to a broader effort to understand how structured representations can support decision-making in complex, high-dimensional systems.Ultimately, it seeks to bridge the gap between the expressiveness of human-inspired hardware and the efficiency of learned control strategies in grasp-centric robotic applications.

Keywords: *Reinforcement Learning, Representation Learning, Anthropomorphic Hands, Robotic Grasping*

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A method to accurately analyse and classify viral sequences

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Abstract. The need for precise analysis and classification of viral genomes has grown significantly with the increasing availability of diverse sequenced samples. This demand is particularly high as the characteristics and viral composition of most available sequenced samples are unknown.
To address this need we developed GenomeClass, a novel method that can extract various characteristics from genome sequences and provide fast reference-free classification. Specifically, GenomeClass is able to classify taxonomically viral sequences in the FASTA format using various machine learning models through a supervised approach.
Using GenomeClass, we have examined a set of sequences retrieved from the NCBI Virus database. Several characteristics of these sequences were analyzed, namely, their normalized size, GC content, normalized distance between subsequences, and compressibility. The information retrieved from these datasets was then used to train machine learning models, which were used to classify several viral genome sequences.
The ability of GenomeClass to quickly analyse sequences from different sources holds great potential to enhance our understanding of the viral genomes and their similarities. Moreover, as GenomeClass can generate its own training datasets from sequences in the FASTA format, it is flexible to the addition and classification of sequences from different sources in the future. GenomeClass, developed using C and Python, is fully reproducible and publicly available at https://github.com/mirakaya/GenomeClass.

Keywords: *Computational Biology, Genomics, Bioinformatics, Virology, Computational Virology*

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Blemish detection algorithms for image sensor improvement and qualification during camera production

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Abstract. Ensuring the quality of image sensors is essential for high-performance imaging systems, particularly in sectors such as general and video surveillance (Borgeaud, 2023; Laricchia, 2024). Traditional blemish detection approachessuch as rule-based image processing algorithms and proprietary hardware systemsare time-consuming and struggle to scale with increasing sensor resolutions (Liu, 2009; Ning, 2014; Wang et al., 2017). At Bosch, current inspection methods using the Blemish Box require several minutes per sensor, leading to inefficiencies in high-throughput manufacturing.

To address this limitation, we propose a machine learning-based anomaly detection approach using the Isolation Forest (iForest) algorithm (Malpetti ; Azzimonti, 2024). The method was trained and tested on a real-world dataset of RAW images from Bosch, including 413 non-anomalous and 11 anomalous samples. Images were preprocessed to extract the top 10% highest-intensity pixels, from which ten statistical features were computedsuch as mean, skewness, and kurtosisproviding a lightweight yet effective input for the anomaly detection model.

Due to the severe class imbalance and limited data, classical deep learning techniques were not suitable. Instead, the iForest algorithm demonstrated strong generalization and speed, requiring less than one second for inference per image. After extensive hyperparameter tuning and feature correlation analysis, the final model achieved excellent results: F1 score of 91.3% and a perfect recall of 100% on the test set.

This work illustrates that ML-based anomaly detection, when paired with lightweight statistical features, offers a scalable and efficient alternative to traditional blemish detection methods. The iForest model significantly reduces inspection time while maintaining high accuracy.

Keywords: *nan*

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Anomaly detection in multivariate time series via compression-based methodologies

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Abstract. Multivariate Time Series (MTS) are sequences of observations collected over time across multiple variables, each capturing a different aspect of the same underlying system. These data are often generated continuously and typically exhibit non-stationary behavior, making it crucial to detect changes, novelties, anomalies or to perform recurrent concept analysis. A major challenge in analyzing MTS lies in identifying meaningful patterns, which require simultaneously capturing both temporal dependencies and inter-variable (spatial) relationships.

MTS Anomaly Detection (MTSAD) has attracted much interest among the research community, with the number of proposed methodologies increasing significantly over the last six years. While Deep Learning (DL) architectures dominate this landscape due to their modeling power, they often come with high computational and memory demands that pose practical limitations.

This PhD project aims to address the computational challenges associated with MTSAD by advancing data science methodologies based on data compression using weighted strategies and the concept of Kolmogorov complexity. This approach offers computational efficiency, ensuring manageable computational costsan essential consideration when dealing with MTS. Additionally, these methods will not only support diverse MTS tasks but also have applications across numerous areas, from industrial to clinical fields, given their versatility.

Beyond the computational challenges, literature lacks a clear organizational structure of the existing methodologies aiming at MTSAD, limiting the comparison and selection of suitable approaches for each application. Given the rapid growth and increasing diversity of MTSAD methodologies, a systematic review of publications from 2019 to 2024 is currently in progress. This large-scale review involves the screening of 881 documents and aims to develop a taxonomy of MTSAD approaches to bring structure to the research field. While the screening process is still ongoing, some patterns have already been identified, namely, how spatial and temporal dependencies of the data are handled with the DL-based models.

Keywords: *Multivariate Time Series, Anomaly Detection, Novelty Detection, Outlier Detection, Recurrent Concept Analyses, Kolmogorov complexity*

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Efficient estimation of statistical models for time series of counts

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Abstract. Time series of counts are common in fields such as environmental monitoring and healthcare (Martins et al., 2021), yet their modeling poses unique challenges. Traditional autoregressive models like ARMA offer interpretability but lack flexibility and computational efficiency when adapted for integer-valued data. This complexity intensifies for integer-valued ARMA (INARMA) models, which rely on thinning operators and discrete distributions, making parameter estimation more difficult (Quoreshi et al., 2020; Scotto et al., 2015). Standard methods like Conditional Maximum Likelihood (CML) are often limited to low-order models and computationally expensive.

To overcome these challenges, this work proposes a neural network (NN)-based estimation framework. While traditional NNs can be faster and capture non-linear relationships, they often lack interpretability (Triebe et al., 2019). To address this limitation, this framework reformulates these models as differentiable computational graphs. This approach embeds model structure directly into the architecture, retaining interpretability while enabling parameter optimization via gradient-based methods such as Adam and RMSProp. The result is a scalable framework that reduces computation time without sacrificing estimation accuracy. Comparative studies with traditional estimation approaches will assess improvements in convergence speed, estimation quality (bias and precision), and scalability across model order and architecture. Applications include simulated datasets and real-world data arising from industrial collaborations.

Initial experiments on simple models (low-order AR and INAR) demonstrate that the NN-based estimation not only converges faster than classical methods but also reduces computational overhead, making it a more scalable and practical approach for modeling count time series, particularly when dealing with large datasets or real-time applications. These initial efforts have focused on lower order models, aiming to progressively extend the methodology to statistical models of higher order and more complex architectures, such as spatio-temporal structures (Martins et al., 2023), thereby enabling their application across a wider range of scenarios.

Keywords: *nan*

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Metadata-driven generation of synthetic patient case discussions

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Abstract. Physician-physician discussions of patient cases represent a rich source of clinical knowledge and reasoning that could feed AI agents to enrich and even participate in subsequent interactions. However, privacy regulations and ethical considerations severely restrict access to such data. While synthetic data generation using Large Language Models (LLMs) offers a promising alternative, existing approaches primarily focus on patient-physician interactions or structured medical records, leaving a significant gap in physician-to-physician communication synthesis. (Peng et al., 2023)
We present a framework that combines structured prompting techniques with privacy-preserving de-identified case metadata to generate clinically accurate physician-to-physician dialogues.
We use prompting techniques, including role-playingwhere we ask the model to adopt a persona and act accordinglyto establish the context, along with zero-shot chain-of-thought to guide the LLM in approaching the task step-by-step, followed by defining the expected output in the system prompt. Moreover, we adopted emotion prompting using capital letters to emphasize the important aspects of the user prompt. (Savage et al., 2024) (Wei et al., 2022)
Five physicians from various specialties and geographical locations, including intensive medicine (2), general surgery, oncology, and ophthalmology, evaluated synthetic case discussions from nine oncology and hepatology scenarios. The results showed exceptional communication effectiveness (mean 4.4/5) and strong medical content quality (mean 4.1/5), with substantial inter-rater reliability (= 0.70, 95% CI: 0.67-0.73). The framework achieved 91% clinical relevance ratings while maintaining the privacy of doctors and patients. These results show a positive path for improvements in medical AI research in a way that is ethical and responsible by creating synthetic conversations between doctors that preserve privacy and can be used in both medical education and clinical decision support areas.

Keywords: *Artificial Intelligence, Natural language generation, Physician communication, Medical ethics, Synthetic data, Privacy, Large language models*

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Skill learning using a single demonstration for hierarchical robotic navigation

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Abstract. Training robots for complex navigation tasks typically demands extensive expert demonstrations, which are costly and time-consuming to acquire. This work introduces a novel approach to robotic skill learning that aims to mitigate this dependency on large datasets.
The primary challenge addressed is the high data requirement of traditional imitation learning methods for robotic navigation. These methods often struggle with sparse rewards, credit assignment in long-horizon tasks, and generalization to new scenarios without numerous demonstrations.
The paper proposes a hierarchical reinforcement learning framework designed to extract and learn meaningful skills from a single expert trajectory. The core idea is to break down complex tasks into smaller, manageable sub-tasks (skills) that can be learned independently and then chained together.
The methodology combines reverse curriculum learning with goal-conditioned reinforcement learning. This allows the system to segment complex tasks and learn the resulting sub-tasks using sparse rewards. A key component is a learned skill selection mechanism that dynamically sequences the learned skills based on their estimated values during execution. The approach also involves a skill-value-based
uncertainty estimation algorithm and a skill-based segmentation technique.
The proposed method was evaluated in a high-dimensional autonomous driving scenario. The results demonstrated successful skill acquisition and task completion rates that outperformed a state-of-the-art baseline method utilising a single demonstration. This indicates that the approach of flexible skill extraction and chaining from minimal data can effectively address challenges related to sparse rewards and planning in robotic navigation.

Keywords: *nan*

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From graphs to questions: a framework for complex biomedical kgqa dataset generation

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Abstract. This work introduces BioGraphletQA, a novel large-scale dataset for complex biomedical Knowledge Graph Question Answering (KGQA) and describes the underlying generation framework. Central to our approach is the use of graphletssmall subgraphs extracted from a KGas anchors for generating diverse and complex QA pairs using large language models (LLMs). Our pipeline comprises three stages: (1) KG preprocessing and reduction to produce a manageable subset; (2) an extensive prompt ablation study to identify the optimal prompt for QA generation; and (3) a filtering phase using an LLM to refine the dataset by removing low-quality pairs. The final dataset comprises 119,856 complex QA pairs, each linked to a graphlet containing up to five nodes. To assess quality, a domain expert annotated 53 QA pairs across five criteria, confirming the scientific validity, complexity, and completeness of the data. All code is available at: https://anonymous.4open.science/r/Synthetic-KGQA-CE2F.

Keywords: *nan*

[Inet-MD ID+] Music and artistic creation

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Waterising: criacao artistica com comunidades e paisagens em desvanecimento

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Abstract. A presente investigação propõe uma análise da relação entre memória e alterações climáticas, a partir da noção de Waterising. Este termo refere-se a uma prática artística centrada em paisagens e comunidades em processo de desaparecimento como consequência da subida do nível do mar. O processo de criação teve como ponto de partida as salinas de Aveiro, em Portugal território historicamente moldado pela produção de sal e atualmente ameaçado por transformações ambientais de caráter progressivo. A pesquisa estende-se, posteriormente, à costa portuguesa, a Marrocos, Tuvalu e culmina simbolicamente na superfície lunar. Através da articulação entre experiências pessoais de perda e as memórias coletivas dos salineiros da região de Aveiro, este trabalho desenvolve a criação de uma abordagem neo-narrativa, concretizada em performance, composição sonora, instalação e práticas de envolvimento comunitário. Ao posicionar Waterising como metodologia autónoma, a investigação propõe novas formas de documentação e reinterpretação das alterações ambientais contemporâneas.
Este projeto assenta em referenciais teóricos que incluem o hidro-feminismo de Astrida Neimanis (2016), as reflexões de Edward S. Casey (1993) sobre lugar e memória, e a noção de lugares de memória de Pierre Nora (1989). Complementarmente, integra perspetivas provenientes da teoria da performance (Sarah Cameron), dos estudos do afeto (Sara Ahmed) e da estética climática (T.J. Demos), com o intuito de examinar de que modo o público se envolve com estas paisagens em desaparecimento e as internaliza. Através de uma prática artística de cariz interdisciplinar, esta investigação propõe uma abordagem poética, performativa e participativa às alterações climáticas, à memória e à narração, desafiando as fronteiras entre passado, presente e futuros especulativos, bem como as formas tradicionais de receção e participação do público.

Keywords: *Palavras-chave: Memória; Histórias; Corporeização; Paisagem em desaparecimento; Neonarrativa*

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Along blurred lines: a practice-led research journey through border activations

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Abstract. This research proposes a multidisciplinary approach to the PortugalSpain border, exploring the relationship between space, memory, and artistic practice to critically reconfigure the Raia. Drawing from Henri Lefebvres Production of Space(1991) triadperceived, conceived, and livedand Michel de Certeaus concept of practiced space(1998), the project challenges hegemonic border representations as fixed and perennial geographic lines(Nail, 2016). Instead, it proposes the creation of a sensory counter-archive that materializes collective memories through visual strategies.

The methodology articulates artistic-research with ethnographic fieldwork, mobilizing tools from the social-sciences such as semi-structured interviews, walk-alongs, participant observation, and archival research combined with artistic practices centered on the exploration of light, transparency and shadow. Techniques such as video projection, Polaroid transparencies, and the construction of field journals as artist books are used to create devices that operate simultaneously as archives and sensory reflections. This theoretical-practical approach unfolds across specific border contexts Valença-Tui, Senderiz, and Olivença through immersive residencies and an autoethnographic practice that serves as a guiding thread in the creative process. The lived-experience of the artist-researcher, situated between sensitive engagement and attentive listening to local communities, proves essential to capture the borderscape complexity, whose contemporary intangibility conceals deep layers of memory, friction, and social activation.

In situ symbolic elements such as the 'caramelos' of Valença-Tui or the border-mark in Senderiz are interpreted as sensitive manifestations of the conceptual problem of the border, condensing identities, affects, and narratives of belonging. By reinscribing these materialities into the artistic practice, the project develops new forms of Border-Art focused on the subjective experiences of place and the recovery of the memory of the nameless(Benjamin,2020).

The results contribute to expanding the Border-Studies field, highlighting the role of Art in constructing affective cartographies in territories where the apparent intangibility of the post-Schengen coexists with a still-vivid historical and emotional density.

Keywords: *Practice-led Research, Visual Arts, Territory, Border, Post-memory, Archive*

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O silêncio como fenómeno de cláusura: uma exploração artística no sistema prisional português

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Abstract. A presente investigação doutoral explora o silêncio em contextos de clausura, com foco no sistema prisional português, através de uma abordagem inovadora que combina prática artística e reflexão académica. O estudo investiga o impacto emocional, social e espiritual do silêncio em indivíduos privados de liberdade, evidenciando-o como um espaço de resistência, autoconhecimento e transformação. A intervenção artística centra-se na realização de concertos performativos em prisões, onde o silêncio, integrado na criação musical e na experiência sensorial, promove uma reflexão profunda e uma revitalização emocional dos reclusos.

Além dos concertos, o projeto desenvolve uma composição final de Pedro Emanuel Pereira, inspirada nos textos e experiências coletadas, que inclui elementos gravados nas prisões e sons do ambiente de reclusão, criando uma obra imersiva. O uso de tecnologias de ponta, como o som Dolby Atmos, e instalações multissensoriais, potencializam a experiência artística e a sua acessibilidade ao público. Através de fotografia, audiovisual e exposições, a investigação visa comunicar o potencial do silêncio e da arte como instrumentos de mudança social.

Colaborando com artistas e académicos de relevo, o projeto demonstra como a cultura pode ser um potente veículo de transformação social e reabilitação. Ao dar voz aos silenciados, a investigação reafirma o poder da criação artística como ferramenta de resistência, autoconhecimento e humanização do sistema prisional, incentivando uma visão mais empática, inclusiva e transformadora do espaço de reclusão.

Keywords: *Silêncio; Clausura; Estabelecimento Prisional.*

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Entre o saber e o não saber: criação colaborativa e a relação artistanão artista

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Abstract. Este estudo emerge de uma investigação baseada na prática artística desenvolvida com um grupo de teatro amador, centrada na ideia do Eu criador enquanto dispositivo metodológico e performativo. O processo criativo é aqui entendido não apenas como um meio para gerar um objeto performativo, mas como método de produção de conhecimento situado. Pretende-se também questionar o conceito de Artista, colocando-o numa relação horizontal com o(s) não-artista(s).
A investigação decorreu num período de 15 meses, dividido em três momentos distintos: (1) Explorações da linguagem dramática e performativa; (2) Construção do objeto performativo; (3) Apresentações públicas do objeto performativo. O processo pretendeu desencadear uma relação individual no processo de criação colaborativa, onde cada elemento foi encorajado a explorar e assumir a sua própria agência criativa, fora de categorias disciplinares ou técnicas mas, simultaneamente, na descoberta de novas formas de expressão e nas ressonâncias do processo criativo.
Ao integrar a experiência subjetiva dos participantes no processo, o estudo observa como a autoria se distribui, se fragmenta e se reinscreve continuamente no coletivo, desafiando o paradigma tradicional de criação hierárquica. Através de atividades de exploração artística e da construção coletiva do espetáculo, o estudo sugere que o teatro amador é um espaço inclusivo que desafia hierarquias tradicionais da arte. O trabalho de investigação revelou como o Eu criador pode ser um lugar de escuta, de transformação e de resistência, especialmente no contexto do teatro amador. A criação performativa torna-se aqui simultaneamente processo de pesquisa e de enunciação estética, onde o conhecimento se constrói na ação e através da ação. O projeto propõe, por fim, que este tipo de prática contribui para alargar os modos de investigação em artes cénicas e para repensar o papel do não-artista enquanto produtor de saber artístico.

Keywords: *Teatro amador, Eu criativo, Cocriação, Consciência artística, artista vs. não-artista.*

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Cantar o efêmero: coros pop-up e a integração na era das tribos contemporâneas

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Abstract. Este projeto visa investigar o potencial dos coros pop-up como ferramenta de promoção da integração social e do bem-estar de pessoas migrantes em contextos urbanos contemporâneos. Através de uma abordagem qualitativa, de caráter exploratório e aplicado, complementada por instrumentos quantitativos, o estudo articula revisão teórica, mapeamento de práticas internacionais e implementação de ações corais em parceria com o Centro Local de Apoio à Integração de Migrantes (CLAIM), em Aveiro. Serão analisados os impactos emocionais, sociais e motivacionais da participação em atividades corais efémeras, integrando referenciais da Teoria da Vinculação e da psicologia do bem-estar. A investigação culminará na proposta de um modelo metodológico replicável de coro pop-up, com potencial para reforçar o sentimento de pertença e os laços comunitários entre populações migrantes. Esta proposta responde à necessidade de práticas artísticas acessíveis e inclusivas, alinhadas com os desafios da vida pós-moderna e com as políticas públicas de acolhimento e integração.

Keywords: *Coros pop-up, migrantes, integração, canto coletivo, tribos contemporâneas, motivação*

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Estufa social: um estudo sobre as potencialidades do plástico como metáfora da opressão sistêmica

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Abstract. Este projeto de investigação em criação artística, intitulado Estufa Social: Um Estudo Sobre as Potencialidades do Plástico Como Metáfora da Opressão Sistêmica propõe uma abordagem sensível e crítica das estruturas de dominação opressoras por meio da performance.

Partindo de uma inconformidade e crítica em relação às estruturas e diante das violências do patriarcado, do racismo e da LGBT+fobia, esta pesquisa não busca representar a opressão, mas acontecer com ela, tensionando padrões normativos de visibilidade e existências.

A performance, neste contexto, é compreendida como experiência corporeizada, vivida e instável, que escapa à lógica da representação. O corpo e o plástico atravessam a opressão e a desestabiliza através da ação artística transdisciplinar, experienciando o instante performático. O plástico, aqui, opera simbolicamente diante dos modos invisíveis, persistentes e sufocantes com que a opressão atua no cotidiano. Ao explorar sua plasticidade e sua relação direta com o corpo, a performance transforma-se em um campo de insurgência estética e política, onde a figura normativa se desfaz para dar lugar ao acontecimento performático. Trata-se de uma pesquisa prática que investiga, a partir da subjetividade, os modos possíveis de existir e resistir diante da opressão sistêmica.

Na segunda performance exploratória da minha investigação em criação artística, desenvolvo um gesto performático que denomino O NOME DO CORPO PLASTIFICADO. Nesta ação, exploro a experiência de desaparecer para existir, onde o corpo deixa de ser figura reconhecível para tornar-se forma instável, de fiscalização, de busca e precária. Coberto por plástico, sufocado em meus gestos, o meu corpo não se apaga: ele insiste, mesmo invisível. É nesse espaço entre o desaparecimento e a existência que se produz uma estética da resistência, uma performance exploratória que nasce da dor, da urgência, do incômodo, mas que refuta a representação.

Keywords: *performance, plástico, subjetividade, opressão sistêmica, corpo, desumanização, criação artística, corpo/plástico.*

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De dentro para fora: co-criação, intervenções e diálogos na esfera pública

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Abstract. De dentro para fora: co-criação, intervenções e diálogos na esfera pública é uma proposta de investigação que surge de uma vontade de explorar o potencial da co-criação artística para promover conexões relacionais entre humanos e um sentido de pertencimento em espaços públicos. Através de uma abordagem artística colaborativa e multidisciplinar, procuro envolver a comunidade, artistas e instituições culturais em um processo de criação
compartilhada e horizontal. As práticas artísticas aqui propostas têm como objetivo explorar possibilidades que provoquem uma maior interação e re-aproximação entre os humanos em espaços públicos.
Utilizando como contexto a bolsa de doutoramento enquadrada no programa Ciência no Património, pretendo desenvolver esta investigação artística
enquadrada no espaço do Museu José Malhoa, situado no Parque D. Carlos, no centro da cidade das Caldas da Rainha, usando os espaços públicos que o rodeiam como laboratórios de experimentação para as práticas artísticas aqui propostas. Ao longo do projeto, serão realizados workshops, laboratórios de experimentação, residências artísticas e projetos site-specific, visando desenvolver uma prática artística singular que promova a interação coletiva. O diálogo entre diferentes agentes e a aproximação entre instituições culturais permitirá alargar o campo da co-criação.
Como resultado desse processo, será apresentado um conjunto de objetos (i.e., aqui reconhecidos como dispositivos que despoletam uma ação) que posteriormente poderão ser integrados num ciclo de intervenções artísticas no espaço público. Estas intervenções, que utilizarão diversas linguagens como vídeo, fotografia, instalação e performance, serão concebidas para promover a conexão entre as pessoas que habitam os espaços públicos, incentivando a interação, a expressão coletiva e a valorização da diversidade cultural.

Keywords: *arte pública ; reaproximação ; espaço público ; co-criação ; ex-tituições*

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O corpo de trabalho deste corpo trabalhador: documentário performativo em tempo-real.

O corpo de trabalho deste corpo trabalhador[†,1]

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Abstract. Resumo:
O meu projeto de doutoramento trata sobre documentário performativo em tempo-real. Esta ideia surge pela dificuldade de me posicionar enquanto artista nas fronteiras entre as artes visuais e as artes performativas. Proponho desenvolver estratégias artísticas de auto-representação e auto-ficção que rompam as fronteiras do tempo e do espaço, que questionem a percepção, que combinem a temporalidade da performance com a permanência da instalação. No final, espero criar um corpo de trabalho que reconfigure os limites das definições que mantêm as artes performativas e as artes visuais separadas.
Partindo da ideia de mim e do meu corpo como medida das coisas, explorando o potencial criador e transformador desta abordagem. Importa referir que neste trabalho, eu - o meu corpo, é mais Pigmalião que Narciso. Enquanto o mito de Narciso fala da duplicação do corpo, a mais antiga prótese da história do corpo segundo Baudrillard (1991), o mito de Pigmalião pressupõe a sua (re)construção. A reconstrução do meu próprio corpo como exercício de deslocação e diluição da presença - colocar o corpo em fluxo, explorando novos espaços/tempos/presenças.
Interessa-me o experimental enquanto processo, interessa-me o experimental enquanto prática artística. A experimentação é a principal ferramenta deste CORPO TRABALHADOR neste CORPO DE TRABALHO que pretendo desenvolver. Um corpo de trabalho que explora uma prática artística audiovisual mais livre, que assume o experimental como processo, que explora o poético, o abstrato, o pessoal.

Keywords: *corpo; imagem; movimento; documentário performativo; performance audiovisual; vídeo em tempo-real; auto-representação e auto-ficção.*

Acknowledgements. documentário performativo; performance audiovisual; auto-representação e auto-ficção.

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Entre ser e não ser cigano: o cinema de documental e o experimentalismo cinematográfico

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Abstract. Este projeto de doutoramento propõe uma investigação artística centrada nos processos de construção identitária de indivíduos ciganos que vivem na intersecção entre a cultura cigana e a cultura maioritária. A pesquisa incide sobre as dinâmicas de pertença e os possíveis conflitos inerentes à vivência de sujeitos que, através da sua experiência quotidiana, desenvolvem formas híbridas de identidade cultural. Partindo da experiência pessoal do investigador, enquanto membro da comunidade cigana, e ancorando-se numa abordagem prática (practice-based research), o projeto conjuga reflexão teórica, recolha empírica e criação cinematográfica. Em oposição às abordagens etnográficas convencionais, adota-se aqui uma perspetiva interna e autor-reflexiva, que assume o cinema como dispositivo crítico, poético e epistemológico.

A investigação estrutura-se em quatro fases: (1) levantamento teórico e artístico, com foco em autores como Chris Marker, Jonas Mekas, Tony Gatlif e Gianfranco Rosi, cujas obras se situam entre o documentário, o filme-ensaio e o cinema experimental; (2) recolha de material empírico e elaboração de uma memorabília audiovisual que integra testemunhos, fragmentos do quotidiano e elementos sonoros identitários; (3) experimentação criativa através de ensaios audiovisuais que exploram formas narrativas fragmentadas e sensoriais; e (4) produção de um conjunto de curtas-metragens e redação de uma tese multimodal que articula análise crítica e reflexão sobre o processo artístico.

Este percurso visa afirmar o cinema não apenas como meio de criação artística, mas também como espaço de escuta, mediação intercultural e transformação social. Através da produção e difusão de um portefólio audiovisual em contextos académicos e artísticos, a investigação pretende contribuir para o debate contemporâneo sobre a representação das minorias étnicas e culturais, os processos de construção identitária em contextos de hibridez e a agência do artista-investigador como sujeito implicado na produção de conhecimento.

Keywords: *nan*

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Dual site-specific art: bridging rural localities through ethnographic and landscape-based artistic practices

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Abstract. This research proposes the concept of dual site-specific artartworks created in two distinct rural locations that engage in creative dialogue. Rooted in an evolution of traditional site-specific art, this approach recognizes the enduring significance of place in a technologically driven, fast-paced world. Places carry rich sensory qualities and deep emotional attachments.
Building on discussions about cultural and creative work in rural and remote areas (Duxbury, 2020) and anthropological multi-sited ethnography (Marcus, 1995; Falzon, 2015), this research is developed in rural areas of Portugal, Spain, and Italy, by establishing relationships between places that transcend geographical boundaries. It also embraces the concept of "in-betweenness"and its latencya nuanced space of creative tension and dialogue that invites reflection on boundaries without erasing them.
The theoretical framework also incorporates the concept of boundary objects (Star and Griesemer (1989), which highlights how certain objects can bridge different social worlds by maintaining enough shared meaning to facilitate collaboration while allowing for interpretative flexibility. This aligns with the practice of integrating diverse disciplinary insights into sound and media arts.
Methodologically, the research evolves from previous artworks such as "Sweet water, salted water"(Gomes da Costa ; Rodríguez, 2023) and "The third river: an imaginary journey between distant waters"(Gomes da Costa, 2024), and draws inspiration from video works by Peter Hutton (Two Rivers, 2001/2002) and Shirin Neshat (Soliloquy, 1999), which similarly navigate dual cultural and geographical contexts.
The proposed methodology includes a) Empirical-phenomenological fieldwork in different rural sites, b) collection and assemblage of diverse materialssounds, images, objects, texts, mapsrelated to both sites, expanding the archive of sensory and cultural data.c) Creation of lateral, improbable narratives that explore the "in-betweenness"of sites. d) Synthesis of these elements through "expanded audiovisual essays, an artistic format that foregrounds the dialogic and layered nature of the research findings.

Keywords: *site-specific art, rural-based art, "sound & media arts", place-shaping, ethnography, geography, oral histories", "boundary objects"*

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Crescer para dentro: multimodalidade e performance na música pop

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Abstract. Palavra Chave: Investigação Artística; Multimodalidade; Performance; Música Pop; Cantautoria; Criação Colaborativa

Esta proposta de investigação, inserida no Programa Doutoral em Criação Artística da Universidade de Aveiro, tem como objetivo explorar a multimodalidade na performance da música pop a partir de uma abordagem intimista e autoral. Partindo de uma crítica à tecnofilia e à espetacularização generalizada das atuações ao vivo, muitas vezes dominadas por excessos tecnológicos e estímulos visuais que distraem do conteúdo musical, este projeto propõe um caminho inverso: a criação de performances multimodais que privilegiem a proximidade e intimidade.

Através da análise e desconstrução de canções originais, e da exploração do movimento, da luz, o traço e da poesia, pretende-se construir performances que revelem camadas invisíveis da canção e permitam ao público embarcar numa experiência de escuta ativa. O projeto desenvolve-se em três fases principais: (1) análise musical e poética das canções; (2) laboratórios criativos colaborativos com base no método de bodystorming; e (3) reconstrução performativa com integração de elementos visuais e gestuais.

Assente na metodologia de investigação baseada na prática (Practice-Based Research), esta investigação procura articular diferentes linguagens artísticas para dar corpo a uma proposta performativa coerente com a identidade estética da autora enquanto cantautora. O resultado esperado inclui não apenas a produção de um álbum, performances ao vivo e materiais audiovisuais, mas também uma reflexão crítica sobre os modos como a música pop pode ser estar em palco de forma mais sustentável, inclusiva e significativa.

Com esta abordagem, pretende-se abrir espaço para uma nova conceção de performance na música pop, que valorize a interdisciplinaridade, a escuta e a presença, e que restabeleça uma ligação sensível entre artista e audiência.

Keywords: *nan*

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Cantar (n)o lugar uma abordagem à música contemporânea em contexto rural

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Abstract. Este projeto de criação artística propõe uma abordagem inovadora à música contemporânea, centrada na performance vocal em espaços rurais, através de um processo colaborativo e site-specific. Partindo de experiências anteriores desenvolvidas com o ensemble Síntese Grupo de Música Contemporânea, em que se realizaram performances em aldeias portuguesas envolvendo diretamente as comunidades locais, este trabalho visa aprofundar a articulação entre o canto lírico, o canto tradicional, a declamação e a improvisação, valorizando as características identitárias dos lugares e das pessoas.

Com base num método tripartido que envolve intérprete, compositor e comunidade, o projeto propõe-se a criar novo reportório vocal a partir de vivências e elementos sonoros recolhidos in loco, promovendo a co-criação e o envolvimento direto das populações nos processos artísticos. A metodologia integra três fases principais: a seleção dos locais e dos compositores, a recolha de material e desenvolvimento colaborativo das obras, e a apresentação pública em contexto rural, em forma de residências artísticas e performances abertas.

Este trabalho assume o processo criativo como elemento central, não apenas o resultado final, valorizando o reconhecimento dos espaços não-urbanos como território fértil para a criação artística contemporânea. Defende-se que a música contemporânea, enquanto experiência estética emancipada, deve poder ser partilhada com todos os públicos, contribuindo para desconstruir estereótipos sobre o meio rural e ampliar a perceção da prática vocal na contemporaneidade.

Ao integrar dimensões emocionais, culturais e antropológicas dos lugares, esta abordagem procura gerar empatia, partilha e participação ativa, promovendo novas possibilidades expressivas para a voz e desafiando modelos tradicionais de criação e fruição artística. Este projeto inscreve-se, assim, numa perspetiva humanista e transformadora da prática musical atual, uma inquietação que a autora assume ao logo do seu percurso artístico. O projecto encontra-se na segunda fase, tendo sido realizadas experiências prévias em diferentes localidades.

Keywords: *nan*

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Orfeomessianismo

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Abstract. Inquestionavelmente, um dos arquétipos musicais mais proeminentes da nossa contemporaneidade cultural é a figura do cantor-compositor ou, empregando outra terminologia, cantautor. Num certo sentido, um pouco como o pianista-compositor dominou o século XIX e o início do século XX eruditos, esta é a figura modelar do atual cenário musical popular, revelando-se uma configuração específica de disposições e de competências a partir da qual as manifestações coletivamente consideradas, nos dias correntes, as mais consentâneas e potentes surgem. De facto, na era do estrelato, não basta que se componha e se publique a codificação legível de um objeto imaterial: o público, sedento por uma estética mimética e por adentrar o simulacro, exige a proximidade aparente de uma voz demiúrgica, cujas idiossincrasias mais ou menos dissonantes, numa circunstância ideológica dominada pelas correntes do individualismo, são frequentemente mais valorizadas do que a possível adequação a determinados preceitos canónicos. Mas a figura do cantor-compositor, segundo um exame dos fundamentos ao contrário do que diria a doxa , não é um fenómeno recente. Num certo sentido, uma das principais figuras tutelares da tradição erudita, Claudio Monteverdi, foi um exemplo desse arquétipo musical, uma vez que, como a terminologia indica, cantava e compunha. Antes da atividade do italiano, contudo, os trovadores, os bardos e os menestréis, no contexto de outras tradições, já conjugavam a laringe com as invenções verbal e melódica. Mas a anciania, na verdade, é muito maior; é tão grande, aliás, que atinge o ponto da singularidade e atravessa o limiar da mitologia: o primeiro cantor-compositor foi Orfeu.
Esta comunicação, baseando-se num dos capítulos de uma tese de doutoramento em elaboração, procura perceber, propondo um novo conceito teórico orfeomessianismo , de que modo essa figura entretanto esquecida poderia orientar uma prática musical, situada na temporalidade de uma atomização extrema, a arrogar uma potência transformadora.

Keywords: *música; composição; música popular; teoria; estética*

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Ai as a tool for externalizing visualperception in the multimodal musicalperformance of qigang chen and olivier messiaens works

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Abstract. This project aims to integrate multisensory perception and imagination with the purpose of creating a multimodal performance that offers a more immersive artistic experience and meanings. Based on the musical works of Qigang Chen and Olivier Messiaen, the performer/researcher stimulates the auditory, visual, and tactile senses through synaesthesia. Meanwhile, by combining music analysis, specific images are defined through the musical score, in which musical structure, harmonic colour, melody and rhythm are intrinsically linked to visual elements, thus offering a holistic interpretation.
In the creative production process (from the mind to a visual object), the performer/creator attempts to use AI to collaborate in generating visual materials. Consequently, questions arise as to whether AI can play a role in the visual creation of this specific case, and to what extent does AI, as one of the tools, collaborate in this creative production.
Methodologically, the process involved iterative content generation, guided by both algorithmic outputs and the creators sensibilities. This means that the performer/creator defined the visual creative ideas, and AI collaborated by generating. Then, the performer/creator refined the visual materials based on the provided prompts and by the hybrid workflow, trained to seek the final result.
The video works are presented in a live multimodal performance, and the role of AI in this project is evaluated to verify its support for achieving the multisensory perceptual output on the multimodal performance stage.

Keywords: *Multimodal performer, Synaesthesia, Audiovisual Interaction, Artificial Intelligence, Qigang Chen, Olivier Messiaen, Performative research*

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Teias: estratégias de participação artística transdisciplinar

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Abstract. Título: TEIAS: Estratégias de Participação Artística
Num momento em que as artes procuram reposicionar-se como agentes de intervenção social, o projeto TEIAS: Estratégias de Participação Artística Transdisciplinar propõe a investigação de metodologias colaborativas na prática artística contemporânea, promovendo processos de cocriação com grupos em situação de vulnerabilidade. Reforçando a articulação entre arte, território e comunidade, adota uma abordagem crítica e experimental, integrando escultura, performance e vídeo-performance em práticas transdisciplinares e sustentáveis.
Apesar do crescimento da arte socialmente implicada, observa-se uma lacuna na integração da escultura em práticas colaborativas, sobretudo em contextos de vulnerabilidade social. Paralelamente, a incorporação de princípios ecológicos e sustentáveis em projetos de arte pública e comunitária permanece limitada, assim como se observa uma escassez de metodologias transdisciplinares que favoreçam uma participação artística efetiva, horizontal e com potencial transformador no âmbito da investigação artística.
Em resposta a estas lacunas, o projeto propõe um modelo de criação partilhada que valoriza as experiências individuais como matéria artística e promove metodologias horizontais, diluindo hierarquias entre artista e participantes, procurando ainda reforçar o papel da arte como agente de transformação social, identidade e pertença.
A metodologia adota uma estratégia multifásica, com quatro etapas interligadas: (1) laboratório de intervenção comunitária e territorial; (2) residências artísticas de cocriação; (3) apresentação pública das obras com ativação performativa e vídeo-performance; e (4) registo e documentação contínuos. Materiais naturais e técnicas sustentáveis serão privilegiados na criação.
Como resultado, serão produzidas três instalações escultóricas com ativação performativa, além de uma vídeo-performance, todas cocriadas com os participantes e apresentadas em espaço público. Serão também elaborados um documentário e um livro bilíngue. Prevê-se que a investigação contribua para o fortalecimento da arte participativa como campo legítimo de produção de conhecimento, enriquecendo o debate contemporâneo sobre práticas artísticas colaborativas e integrando arte, natureza e sociedade de forma crítica, inclusiva e transformadora.

Keywords: *nan*

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Palavras-chave:
arte participativa; transdisciplinaridade; escultura; performance; vídeo-performance; práticas colaborativas; sustentabilidade; cocriação

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Exploring devising as a multimodal strategy in contemporary music performance

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Abstract. This research explores the role of devising as a methodology for stimulating multimodal aesthetic experiences in contemporary Western art music performance. Motivated by a personal need to deepen communicative possibilities as a performer, the project investigates how collaborative, cross-disciplinary processes can challenge conventional modes of musical production and reception.

While multidisciplinary projects often promise innovation, they frequently maintain linear, discipline-bound structures. Artists from different fields may coexist within a work, yet rarely co-create in a genuinely integrative way. This project addresses the need for artistic frameworks that allow musicians and collaborators from other disciplines to participate equally in the creation of new works, shaping not only the content but the form and meaning of the performance itself.

By adapting techniques from other art forms, particularly the devising process, which emphasizes co-creation without a fixed script or begins with existing works transformed through collaboration, the research proposes a model for collaborative artistic experimentation. Two case studies form the basis of this investigation: one involving professional artists, the other involving young music learners or emerging practitioners ("future artists"). In both cases, devising was used to generate original performance material, enabling a fluid negotiation of roles and contributions across disciplines.

The results demonstrate that devising supports a reconfiguration of contemporary music practice, yielding performances that are not only artistically rich but also more accessible and engaging for diverse audiences. This approach opens new avenues for performance-making, where musicians are empowered as co-creators in a multimodal artistic dialogue.

Keywords: *collaboration, devising, co-creation, artistic research, multimodality*

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Retratos da mulher pop - maquilhagem digital como reação artística à repressão de género

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Abstract. Esta investigação artística tem como ponto de partida a inquietação face à objetificação do corpo feminino e a forma como interfere com a liberdade individual. Proponho reagir à experiência da exposição corporal, transformando-a em produção visual através da prática do autorretrato. Partindo da cultura Pop, frequentemente associada à reprodução de estereótipos de beleza, utilizo os seus próprios elementos visuais na criação de personagens híbridas. Aproprio-me desses códigos, reconfigurando-os em narrativas visuais críticas que encarnam tensões ligadas à exposição do corpo. A prática tem-se centrado na criação de alter egos e na encenação fotográfica, a partir de episódios vividos, onde o corpo aparece como espaço simbólico de conflito e resistência.

No segundo ano de doutoramento, a prática expandiu-se à videoperformance e à experimentação com inteligência artificial como ferramenta de hibridização da imagem, dando origem a composições que traduzem dualidades como defesa e ataque, esconder e enfrentar, resguardar-se e expor-se. Embora a maquilhagem digital inicialmente prevista tenha sido pouco aprofundada, as personagens que emergem deste processo mantêm o objetivo de questionar os mecanismos visuais e culturais que sustentam a desigualdade de género.

Esta investigação procura evidenciar tabus estruturais opressores das mulheres e reforçar o debate crítico sobre as relações entre género, imagem e poder.

Keywords: *Autorretrato* | *Alter ego* | *Encenação* | *Performance* | *Hibridização* | *Cultura Pop* | *Objetificação do corpo* | *Género e imagem* | *Resistência simbólica*

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Identity mapping: early experiments in postcard identity mapping (pim)

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Abstract. This PhD research explores the intricate relationship between identity and artistic expression, emerging from my personal need to reconcile the different parts of my identity. In today's globalized context, identity is often viewed as a personal journey, yet its collective dimension is underexplored in community-based and transmedia art practices, as existing approaches frequently prioritize individual perspectives over the shared cultural narratives and emotional geographies that shape identities.
While many artists have addressed identity through autobiographical or symbolic means, few methodologies explicitly connect individual experience with collective cultural memory and place-based resonance. These limitations have inspired me to propose a new artistic strategy that can reveal and reflect a more communal dimension of identity.
To address this, I propose Postcard Identity Mapping (PIM), a transmedia methodology that maps the artistic geography of the places where I have lived. PIM employs photography, video, textual narratives, and live piano performance to visually and sonically represent cultural geographies and emotional landscapes.
This presentation will share some first results from the experimental phase of "My Terra Reconstructing Common Identities through Art,"continuing with the notion of Emotional Geography and inspired by shared and personal memories from culturally significant Mediterranean locations.
Each postcard created in this process encapsulates the triad of Place (opos/Land/Home) Sound Human, functioning as an emotional and cultural connector that bridges personal memories with shared Mediterranean heritage. The project will produce a diverse array of outputs: visual identity maps, musical compositions, video essays, and multimedia performances that combine live music, projections, and photography.
This project seeks to provide an alternative viewpoint and contribute new insights and perspectives to the discourse on identity and artistic creation by fostering dialogue about belonging and cultural diversity while highlighting the interconnectedness of individual and collective experiences.

Keywords: *nan*

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Deep learning-based fault detection in cellular networks using rnn and mlp architectures

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Abstract. The increasing complexity of modern cellular networks, especially in 5G environments, has introduced challenges in maintaining network reliability and service continuity. Traditional monitoring approaches are often inadequate in handling dynamic user behaviors and high-volume KPI data. This study explores the application of deep learning modelsspecifically Multi-Layer Perceptron (MLP) and Recurrent Neural Network (RNN) architecturesfor real-time fault detection in cellular networks. The dataset includes features such as WebRTC, SIPP, web server traffic, jitter, and CQI across three user equipment endpoints, with a binary fault label as the prediction target. Both models were trained and validated using KPI time-series data across multiple epochs. Results show that both RNN and MLP architectures achieved high fault detection accuracy, with validation accuracy exceeding 99%. The RNN model demonstrated faster convergence and slightly better generalization. Performance evaluation through accuracy and loss trends confirmed model stability and robustness. These findings demonstrate that deep learning models can effectively classify faults and enable proactive fault management in next-generation cellular infrastructures.

Keywords: *Fault detection, Cellular networks, Deep learning, Recurrent Neural Network, Multi-Layer Perceptron*

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Carrier synchronization for analog visible light communication receivers

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Abstract. This study focuses on the development and analysis of a carrier synchronization technique designed for a hybrid multiband carrierless amplitude and phase (m-CAP)/QAM VLC architecture, targeting IoT applications (Rodrigues et al.,2023a). As IoT applications continue to expand, there is a growing need for communication systems that are both reliable and efficient. Traditional IoT networks primarily rely on radio frequency (RF) technologies, which often suffer from issues such as spectrum congestion and packet collisions due to massive node connections. Because of RF impairments, VLC is gaining traction as an indoor communication alternative. Analog demodulation systems are simpler and lower power consuming circuits than those required by typical digital modulation systems such as Orthogonal-Frequency Division-Multiplex (OFDM), which need a considerable silicon area in integrated circuit designs. While the Costas-Loop (Best,2017) is a well-established phase-locked loop (PLL) architecture for carrier recovery in QAM systems, its use for hybrid analog VLC receivers hasn't been thoroughly investigated in existing literature. In this study, we designed a Costas-Loop specifically for analog VLC receivers that utilize m-CAP/QAM modulation, considering factors like low-power operation, using readily available analog components, and compatibility with previously developed analog front-end circuits. The designed Costas-Loop was simulated using MatLab Simulink (Rodrigues et al.,2023b) which validates the proposed solution. Based on simulation results, an electronic circuit was proposed using off-the-shelf components such as operational amplifiers, analog multipliers, filters, and voltage-controlled oscillators. The proposed design was then simulated in TINA-TI with available SPICE models, which demonstrated the circuit functionality when integrated in the remaining circuits (signal amplification, signal demodulation, and filtering). While experimental validation is still a work in progress, the PCB design has been finalized, and assembly of the components is currently underway, all with the goal of achieving full validation within the previously implemented indoor VLC testbed (Rodrigues et al.,2022).

Keywords: *Visible light communications, Internet of Things, Costas-Loop, PLL*

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Timely and reliable localization based on optical camera communication

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Abstract. When considering indoor positioning, technologies such as GPS do not provide enough accuracy in these scenarios, and existing alternatives have either low accuracy or high installation and maintenance costs (Brena et al.,2017). As a promising candidate, Visible Light Positioning (VLP) has been increasingly explored, where modulated visible light sources are employed as positioning beacons (Dawood et al.,2021). Using a camera as the receiver provides high accuracy at a low cost (Hussain et al.,2022). To estimate the position, we need to identify each fixture, which can be done with rolling shutter based optical camera communication (OCC), allowing us to capture a modulated light signal across the rows of an image (Cossu et al.,2020). This can be used to transmit simple packets of data, such as identifiers, as well as implementing optical wireless links with applications in 6G wireless networks and Internet of Things scenarios (Chowdhury et al.,2019).
This work aims to improve the state-of-the-art on camera-based VLP, by proposing techniques to increase accuracy and robustness. We will propose algorithms that allow the decoding of multilevel modulated transmitters and synchronize multiple captured images to increase the number of decoded symbols, and localization algorithms for improved accuracy and timely position estimation, extending them to larger scenarios. This will be achieved through sensor fusion, image correlation and machine learning, using inertial measurements and statistical prediction, while reducing the processing time, guaranteeing the system timely behavior.
So far, we have obtained an average positioning error of 7.4 cm for a setup with a height of 2.7 m, and proposed an algorithm to increase the maximum communication distance by 2.5 fold. We also proposed an algorithm to increase the accuracy when using circular transmitters and studied the impact of measurement uncertainties on the positioning error. Finally, we experimentally demonstrated 8-PAM OCC with a low cost camera.

Keywords: *indoor positioning, optical communications, camera, rolling shutter, robotics*

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Fiber optic rehabilitation glove based on fiber bragg grating pressure sensors

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Abstract. Hand disabilities often resulting from car accidents, ageing, strokes. As a result, people with hand disabilities experience social problems, dependence on daily life, and economic challenges. Existing technologies capable of evaluating the degree of disability of the hands, through the measurement of the grip force exerted at the finger contact points, rely on electronic sensors [1] [2], which are susceptible to electromagnetic interference (EMI), are bulky, have low flexibility, and pose safety problems. As a result of lack of tools, the therapist cant recognize the weak points and the degree of weakness. This results in longer treatment processes, sometimes inconclusive diagnoses, and leads to a waste of time and money. Consequently, there is an urgent need to develop a wearable sensor solution, allowing for the quantification of hand function and determining the degree of disability, thereby making rehabilitation more efficient and accurate.
The high flexibility, small size, and immunity to EMI of optical fiber sensors [3] make them an interesting technology platform. Fiber Bragg Gratings (FBGs) [4] which are a well-established technology, allowing the incorporation of multiple sensors along the same fiber strand. They have been used in our work to measure the grip force at the finger contact points, to evaluate the function of the hand. To measure pressure, a dedicated arrangement that includes a steel washer, a nickel strip spot-welded onto it, and a metal cylinder placed on top, working together to induce longitudinal strain in the fiber when transversal pressure is applied, causes a change in wavelength that can be used to quantify the pressure. This structure was later integrated into a glove to measure the pressure applied by each of the finger contact points. As a result, therapists would be able to identify areas of weakness in hand and plan a more focused and effective treatment.

Keywords: *Hand disabilities, Wearable sensor, Diagnosis and treatment, optical fiber sensor, FBG, Force sensor.*

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10g/400g reliable bidirectional fso transmission over turbulent channels with reciprocity-driven power adaptation

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Abstract. Free-space optical (FSO) communications have emerged as a high-capacity wireless technology for 6G networks and last-mile connectivity. However, their performance is significantly affected by weather conditions and atmospheric turbulence, limiting both capacity and reliability. Optical amplification offers a promising approach to overcome the resultant power fluctuations. In particular, erbium-doped fiber amplifiers (EDFAs) operating in automatic power control (APC) mode can effectively compensate for signal fading by stabilizing the received power level prior to detection, thereby enhancing link reliability under dynamic channel conditions. In this paper, we experimentally demonstrate the adaptive optical power pre-compensation of atmospheric turbulence using two counter-propagating signals. A 400 Gbps upstream signal, affected by turbulence, is wavelength-multiplexed with the carrier of a 10 Gbps downstream on-off keying (OOK) signal, and subsequently both signals are launched into an EDFA in APC mode. Leveraging the coherence time of atmospheric turbulence, we achieved upstream pre-compensation and downstream post-compensation of turbulence. The Rytov variance of both signals is analyzed under various turbulent conditions resorting to an atmospheric chamber, considering the different power ratios between both signals. The results reveal a reduction in the upstream Rytov variation of two orders of magnitude, effectively achieving turbulence suppression. Furthermore, real-time upstream signal analysis indicates reliability gains up to 90%.

Keywords: *Free-space Optics, Wireless Communications, Atmospheric Turbulence*

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Towards an always-on network of multimobile service robots using multiple shuttle robots agents

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Abstract. The deployment of mobile service robots (SRs) is rapidly expanding across applications such as cleaning and surveillance, driven by advances in telecommunications, battery technology, and networked operation. Wireless SRs are getting ng attention, as they are not limited by physical connection. These robots, whether operating independently or in a cooperative network, rely on battery power, making energy management crucial to ensuring continuous service. However, one major challenge is their limited energy capacity and need for recharging. This constraint disrupts task operation, especially during long-duration missions, reducing overall network eciency. Existing strategies such as task interruption and battery swapping have been proposed, but most still require robots to stop or deviate from their paths (Ding et al., 2019; Mathew et al., 2013). To the best of the authors knowledge, no existing work allows SRs to recharge without interrupting task performance.
This research aims to develop an algorithm that, in a multi robot network, SRs perform their task without interruption for desired duration, eectively create an always-on system.
To achieve this, I proposed shuttle robots (ShRs) as intermediary agents that deliver energy to SRs along their mission paths. Previously, I validated the concept where a single ShR recharges multiple SRs (Ghanbari et al., 2024). However, this setup lacks scalability for larger networks, as one ShR cannot support all SRs continuously.
I address this limitation by developing an algorithm where multiple ShRs are considered. The key challenge lies in how ShRs decide which SR to charge and how they resolve conflicts when selecting the same SR. I propose a decentralized decision-making protocol that enables each ShR to independently select an SR and calculate reasonable meeting point. Additionally, the algorithm includes a conflict-resolution protocol, using criteria such as travel time, mobile robots ID, etc., to ensure eective coordination between ShRs without external control.

Keywords: *Multi-Mobile Robots, Decentralized Mobile Network, Power Management*

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Enhancing serverless function resilience against vulnerabilities with mofaas

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Abstract. As cloud computing evolves, a new paradigm is gaining increased relevance: serverless computing. Serverless computing enables scalable, cost-efficient cloud development by abstracting infrastructure management. At its core lies Function-as-a-Service (FaaS), where applications are decomposed into many short-lived, event-driven functions. This granularity and dynamism accelerate deployment but also create a volatile, fragmented attack surface that traditional security tools struggle to protect, especially against zero-day vulnerabilities.

We present Moving Functions-as-a-Service (MoFaaS), a novel security architecture that enhances serverless resilience by integrating Moving Target Defense (MTD), N-Version Programming (NVP), and Large Language Model (LLM)-guided variant synthesis. Unlike conventional MTD, which usually only reshuffles infrastructure components, MoFaaS introduces runtime execution diversity at the application level, randomly rotating through functionally equivalent but syntactically distinct function variants. This disrupts attacker reliability by making exploitation paths inconsistent. MoFaaS also extends classic NVP with a cloud-native control plane, enabling simultaneous execution and output comparison of function variants. Critically, it monitors outputs and external interactions, catching divergences in API calls or database queriesan enhancement essential in modern cloud-native applications.

To reduce the high engineering cost of NVP, where developers must create multiple versions for the same function, MoFaaS includes an LLM-driven feedback loop that generates, tests, and refines new function variants with minimal developer effort. We implemented this system on the widely used open-source Knative platform, validating it through proofs of concept (PoCs) and evaluations on vulnerable but realistic serverless applications.

This initial evaluation shows that MoFaaS significantly reduces attack success rates, even reaching zero effective exploitation under certain concurrency levels, with only modest performance overhead. Our architecture also introduces customizable consistency policies, allowing developers to fine-tune resilience versus flexibility.

Overall, MoFaaS represents a paradigm shift in serverless security. It presents a new direction for resilient, cloud-native defense, blending self-healing infrastructure through NVP with secure-by-design principles using MTD.

Keywords: *Serverless, Function-as-a-Service (FaaS), Moving Target Defense (MTD), N-Version Programming (NVP), Cloud Computing, Cloud Security*

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Open digital architecture for 5g service orchestration: achieving standards compliance and vertical integration

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Abstract. 5G and Beyond 5G have enabled transformative capabilities for various vertical sectors, such as the automotive and industry ones. However, interoperability and legacy system components hinder Mobile Network Operators (MNOs) and Communication Service Providers (CSPs) from capitalizing on these opportunities. This work aims to tackle these issues, by exploring how open APIs can be employed to achieve high interoperability levels. We propose a framework fully aligned with TMFs Open Digital Architecture (ODA) principles and open APIs to support the design, orchestration, and lifecycle management of 5G resources, such as network slices, and next-generation applications. We rely on mapping GSMA Network Slice Templates to TMF services to abstract 3GPP complexity and enable multi-vendor interoperability. Additionally, the proposed framework also supports continuous monitoring and testing capabilities and offers simplified CAMARA APIs to manage the lifecycle of various resources. This approach is accessible to organizations without deep telecom expertise, providing intuitive interfaces and reusable blueprints to simplify the management of complex 5G resources. The framework was validated through a smart manufacturing use case, considering automated 5G resources provisioning, applications deployment, and KPI validation via TMF-aligned testing. Therefore, through this scenario, we showcase how our framework can streamline the deployment of applications and ensure that operational goals and service quality targets are consistently met. By abstracting technical complexity and relying on open specifications, our solution allows MNOs and CSPs to modernize their systems, accelerate service delivery, and unlock new revenue streams across diverse sectors. Ultimately, our work demonstrates a practical path for embracing digital transformation, fostering interoperation and collaboration, and creating value in a connected world.

Keywords: *5G, Interoperability, TMF ODA, Standards, Interfaces, Orchestration*

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Integrating digital twin and blockchain technologies for sustainable development

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Abstract. The convergence of digital twin and blockchain technologies is revolutionizing the pursuit of sustainability and operational optimization across multiple industries. Digital twins-virtual replicas of physical assets, systems, or processes-enable real-time monitoring, simulation, and predictive analytics, driving efficiency and resource conservation in sectors such as energy, construction, and urban infrastructure [2][3]. When integrated with blockchain, these digital ecosystems benefit from enhanced data integrity, transparency, and security, fostering stakeholder trust and enabling decentralized, tamper-proof management of complex systems [1][4][5].

This synergy is particularly relevant for addressing the challenges of climate change, resource depletion, and the need for sustainable urban development. Blockchain-optimized digital twins support secure, transparent, and decentralized data management, which is critical for fostering stakeholder trust and enabling automated, tamper-resistant transactions [1][4]. Recent studies have demonstrated the effectiveness of this combined approach: predictive analytics and optimization algorithms within blockchain-enabled digital twins have achieved significant reductions in resource usage, improved energy distribution, and enhanced transportation efficiency [1][3]. For example, integrating blockchain for secure transactions and advanced predictive algorithms in digital twin-driven energy management has resulted in a 24% increase in renewable energy use and a 52% reduction in peak demand [1][3].

This PH.D. thesis proposes a framework that integrates digital twin technology with blockchain to create a secure, scalable, and transparent platform for sustainable asset and process management. The solution involves the deployment of IoT-enabled digital twins to continuously monitor and simulate physical systems, while blockchain serves as the backbone for immutable data storage, secure transactions, and decentralized governance. Smart contracts automate sustainability-related actions-such as dynamic energy allocation, emissions tracking, and compliance verification-based on real-time digital twin data. This approach not only enhances operational efficiency and resource optimization but also ensures trust and accountability among all stakeholders, paving the way for smarter, greener, and more resilient cities and industries.

Keywords: *Digital Twin, Blockchain, sustainability*

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[LAQV-REQUIMTE] Clinical Biochemistry

Research Summit 2025
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Unraveling the lipidome in mental health: identifying biomarkers of depression and anxiety during endocrine-sensitive life stages

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Abstract. Mental health disorders rank among the ten most prevalent diseases worldwide, with depression and anxiety being the most common and severe (Vos et al., 2020). Their onset is particularly likely to occur during endocrine-sensitive life stages, such as puberty and pregnancy, characterized by intense hormonal fluctuations. Such changes may increase vulnerability to mental illness through biological mechanisms that remain incompletely understood (Luo et al., 2024; Workman et al., 2012). Given the crucial roles of lipids in diverse neurobiological processes, lipidomics has emerged as a promising tool to explore lipids as potential biomarkers for mental disorders (Yoon et al., 2022).

As part of the Re-MEND Building REsilience against MEntal illness during ENDocrine-Sensitive Life Stages project, our work aims to identify differences in plasma lipid profiles between individuals with depression and anxiety during endocrine-sensitive life stages and healthy controls. To achieve this, untargeted lipidomic approaches using high-resolution LC-MS, complemented by targeted analysis of oxidized (epi)lipid species, will be employed in plasma samples from three clinical cohorts, focused on perinatal depression, depression during puberty, and anxiety during puberty.

For the BASIC cohort, raw MS and MS/MS data have been acquired. This cohort includes plasma samples from healthy controls, pregnant women diagnosed with depression at gestational week 17, week 38, or postpartum week 8, and pregnant women not depressed at sampling but with a depressive trajectory during pregnancy, postpartum or both. Multivariate analysis revealed differences in plasma lipid profile across pregnancy stages. Notably, samples from gestational week 38 showed discrimination between healthy, depressed and trajectory groups. Additionally, hierarchical clustering Heatmap also showed group-specific differences in lipid species from the phosphatidylcholine (PC) and triacylglycerol (TG) classes.

Here, we present the study design, workflow, and preliminary findings from the BASIC cohort, supporting the potential of lipidomics to identify biomarkers associated with mental health during endocrine-sensitive periods.

Keywords: *Mental disorders; puberty; pregnancy; lipids; lipidomics; mass-spectrometry*

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Phosphatidylethanolamine with different fatty compositions modulates raw 264.7 macrophage function and lps-induced inflammatory response

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Abstract. Macrophages are effector cells of the innate immune system with essential roles throughout all phases of the inflammatory response. Recent evidence suggests that phospholipids (PL) act as immunoregulators, shaping the functional outcome of macrophage-mediated immune responses [1]. However, the role of specific PL classes and their fatty acid composition on this immunomodulatory action remains poorly understood. Therefore, our study investigated the immunoregulatory effects of two different phosphatidylethanolamine (PE) species, n-3 PE 18:0/22:6 and n-6 PE 18:0/20:4, on RAW 264.7 macrophages alone and in an in vitro model of lipopolysaccharide (LPS)-induced inflammation. A multi-omics approach based on mass spectrometry (C18-LC-MS/MS) was employed to simultaneously analyze the lipidome and the proteome of PE-supplemented macrophages. Pre-treatment with both PE, significantly modulated macrophage lipidome and proteome, not only under basal conditions but also during LPS-induced inflammatory response. Under basal conditions, PE supplementation increased the levels of specific lipid classes (PE, SM, CL, PG, and PS), with effects being more pronounced in macrophages treated with PE 18:0/22:6. At protein level, the most pronounced effects were observed for antioxidant defense proteins such as Catalase and Hmox1. Interestingly, in a pro-inflammatory context, PE 18:0/22:6 and PE 18:0/20:4 supplementation partially attenuated LPS-induced lipidomic changes, reducing pro-inflammatory associated lipid classes (PC, PC O-, PC P-, and Cer). Simultaneously, PE supplementation selectively attenuated inflammatory signaling by downregulating Nfkb1, Nfkb2, and Ptgs2, while enhancing the expression of proteins involved in oxidative stress response and immune regulation (Prdx1, CD36, and Abcc1). Notably, Ptgs2 downregulation was specific to PE 18:0/20:4, highlighting the differential effects of the two PE species. Altogether, our study demonstrated that PE 18:0/22:6 and PE 18:0/20:4 effectively modulated lipid and protein profiles in both resting and LPS-activated macrophages, promoting phenotypes that enhance inflammation resolution.

Keywords: *nan*

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[LAQV-REQUIMTE] Food Biochemistry

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Valorization of grapevine leaves (vitis vinifera l.): looking for pattern of harvest period markers

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Abstract. According to Inova Market Insights Top 10 Trends for 20251 consumers are increasingly seeking plant-based, sustainable foods solutions that prioritize natural ingredients, improved taste, texture and health benefits. Grapevine leaves (Vitis vinifera L.), a by-product of one of the most important perennial crops in the world, offer untapped potential in this context. In Portugal, viticulture plays a fundamental role, covering 177,954 hectares and with a total wine production of 7,542,060 hL in 2023, generating about 20 million tons of by-products from vinified grapes2. Despite their role in grapevine vegetative cycle, including during senescence, their potential applications still remain unexplored. However, leaves are a promising source of compounds with nutritional properties and biological potential, including phenolic compounds, terpenoids, volatile thiols and amino acids derivatives3 among others. A practical and sustainable way to access these bioactive compounds is though infusion. The aim of this work is to define a set of objective parameters in order to establish the best period for harvesting vine leaves after the grapes harvest, as well as to evaluate the effect of variables with potential impact on the variability of this natural product, namely meteorological conditions, year and vineyard location. Leaves from three red varieties (Alicante Bouschet, Sousão, Tinta da Barca), characterized by their reddish colour during senescence, and one white variety (Alvarinho) were collected over three years (2022 to 2024) during different harvest periods, at different vineyards. The leaves infusions were performed and then were characterized by several physicochemical parameters to determine the appropriate collection: řBrix, pH, titratable acidity, chromatic parameters, total phenolic content and antioxidant activity. Statistical analysis (ANOVA-Simultaneous Component Analysis combined with Linear-Mixed-Model), showed harvest year, followed by cultivar, harvest day and vineyard, had the highest impact (33.4% of total variance) on the leaves infusion parameters.

Keywords: *Grapevine leaves, Vitis vinifera, Sustainability, Bioactive compounds, Infusion characterization*

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Constructing the identity of portuguese sparkling wine

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Abstract. The development of a distinctive identity is essential for the valorization of Portuguese sparkling wines in a competitive global market. This study investigates the spatial and temporal variability of Portuguese grape varieties with potential for sparkling wine production, aiming to contribute to the construction of a distinct and data-driven identity for this wine style. The analysis of volatile profiles is particularly relevant, as these compounds directly influence the aroma expression of the final sparkling wine. To fulfil this objective, a comprehensive set of samples was defined, aiming at being representative of the diversity of varieties used in Portugal in the production of sparkling wines. Thus, a set of grapes collected during two consecutive harvests (2023 and 2024), from the two main Portuguese demarcated regions to produce sparkling wine were characterized: Távora-Varosa and Bairrada. The study includes 23 grape varieties (17 white and 6 red), in a total of 58 different samples.
The analytical strategy includes the determination of technological maturity parameters (pH, total acidity and total soluble solids), antioxidant activity, phenolic content and the profiling of free volatile organic compounds (VOCs). VOCs were analyzed using headspace solid-phase microextraction (HS-SPME) combined with comprehensive two-dimensional gas chromatography and time-of-flight mass spectrometry (GCŒGC-ToFMS). A total of 89 VOCs were identified, with 77 shared across all samples under study.
ASCA (ANOVASimultaneous Component Analysis) was applied to combine different domains of information acquired during this study plus the meteorological data collected from sampling sites, during 2023 and 2024. This approach allowed ranking the factors that may explain the spatial and temporal variability within these data set. It represents the first step to build a pattern of markers to explain the identity of Portuguese sparkling wine, which should include the compounds/parameters least affected by fixed or random factors.

Keywords: *Sparkling, grapes, technological maturity, volatile profile, biodiversity, statistical tool*

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Comprehensive volatile characterization of grape fermented beverages: addressing ethanol matrix effects through spme/gcŒgc-tofms optimization

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Abstract. Recent trends in the international beverage market reveal a growing demand for products with low ethanol content (<5% vol.). However, current market offerings fall short, especially in terms of the quality of grape-based beverages due to the potential loss or alteration of volatile composition, responsible for the sensory profile of the product. Thus, characterization of volatile organic compounds (VOCs) is critical for the development of new no/low ethanol beverages. Complex volatile fraction of beverages, that includes several chemical families like alcohols, esters, organic acids, and carbonyl compounds, with different physicochemical properties (e.g., log P values from -0.36 to 4.21), low concentration of minor compounds and susceptible to ethanol matrix effect (Villamor ; Ross, 2013), difficult the analysis of these type of samples.

The optimization of sample preparation parameters and selection of the most suitable gas chromatographic method are two fundamental steps in the construction of an analysis workflow (Carriço et al., 2020) for characterization of volatile composition of grape-based beverages with different ethanol content. Thus, the aim of this research was to develop a simple, accurate and rapid method based on headspace solid-phase microextraction (HS-SPME) combined with comprehensive two-dimensional gas chromatography (GCŒGC) that minimize ethanol-matrix effect and allow the estimation of aroma potential. With this objective, a set of three grape-based beverages with different ethanol content were used to evaluate separation efficiency of different chromatographic conditions (normal vs reverse column configuration; secondary oven program offset), and sample preparation (fiber coatings; extraction time). Better compounds separation and higher peak capacity were observed for reverse column configuration and 5 řC secondary oven offset, while using 2 mL of sample in a 12 mL vial, with 0.66g of NaCl and agitation. Vials were thermostatized at 40 řC, during 5 min (pre-equilibrium) followed by 10 min extraction.

Keywords: *Grape beverages, Ethanol, Volatile components, SPME/GCŒGC-TOFMS, Aroma*

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Valorisation of shrimp shell waste for the sustainable recovery of rare earth elements

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Abstract. The transition to renewable energy technologies, driven by climate goals such as the Paris Agreement and the European Green Deal, has intensified demand for critical raw materials (CRMs), particularly rare earth elements (REEs) like Nd, Pr, Dy, and Gd used in NdFeB magnets [1]. These materials are essential for wind turbines and electric vehicles but face supply risks. Approximately 1530 % of the raw materials are wasted as scraps during the shaping and finishing stages of NdFeB manufacturing, resulting in significant waste [2]. Moreover, after a life span, the NdFeB magnets lose their magnetic property, becoming an End-of-life (EoL) waste [3]. Their recovery is thus crucial for advancing circular economy strategies. Among separation methods, sorption using biosorbents has gained attention as a sustainable and cost-effective approach.
This study investigates the use of untreated shrimp shellsa waste-rich biosorbentas a low-cost alternative for the selective recovery of REEs from multi-element solutions simulating a wind turbine magnet dissolution.
The evaluated mixture simulated the composition of the nacelle component (B, Ni, Co, Nd, Dy, Pr, Y, Gd) in a concentration of 100 ţM. Untreated shrimp shells and pyrolyzed shrimp shell (400, 500, and 600 řC) were evaluated to remove REEs from the multi-element solution. Untreated shrimp shells showed better performance in selectively removing REEs with low Co and Ni removal (99 % of REEs removal, 28 % of Co removal, and 27 % of Ni removal). Response surface methodology identified concentration and sorbent dosage as the most significant factors, while salinity and pH were non-significant. Kinetic studies revealed rapid REEs removal within 6 h of contact, with a maximum adsorption capacity of 80.4 mg/g.
Overall, the results support the use of shrimp shells as a low-cost sorbent to efficiently recover REEs from complex mixtures.

Keywords: *Wind turbine waste, Critical raw materials, Removal, Secondary resource, Shrimp shell*

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Green remediation of acid mine drainage via seaweed sorption

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Abstract. The growing importance of critical raw materials (CRMs) in driving the green and digital transitions has led to a projected surge in global demand. Simultaneously, geopolitical instability and intensified resource competition have heightened concerns over secure and sustainable CRMs supply chains¹. Recovering CRMs from alternative sources offers a promising solution, contributing both to resource security and waste management. Acid mine drainage (AMD) is a widespread and persistent environmental problem characterised by low pH and high metal(loid) concentrations, which degrade soil and water quality². However, AMD also represents a potential secondary source of valuable CRMs, including rare earth elements (REEs), cobalt (Co), and nickel (Ni)³. Two factors support its valorisation: the long-term persistence of AMD, creating a quasi-renewable metal reservoir, and the need to comply with costly environmental regulations. Integrating metal recovery into AMD treatment could reduce remediation expenses and support ecosystem restoration⁴.
This study assessed the potential of living seaweed (Ulva sp.) to remove and recover CRMs from real AMD waters, supporting circular economy goals and Sustainable Development Goals nž 6, 12, and 14.
Under original AMD conditions (pH 2.5), seaweed mortality was observed, necessitating pH adjustment. At pH 5, where REEs remain soluble, REE removal reached 2649% with no Co or Ni uptake. Increasing the pH to 8 significantly enhanced Co and Ni biosorption, with biomass accumulating up to 409-fold more Co and 41-fold more Ni than baseline levels.
A two-stage process is proposed: REE extraction at pH 5 and Co/Ni recovery at pH 8. This approach enables cost-effective CRMs recovery while simultaneously remediating AMD-contaminated waters.

Keywords: *Acidic waters, rare earth elements, cobalt, nickel, Removal, Secondary resource, seaweed-based approach*

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Byproducts from agar industry: strategies to obtain oligosaccharides with potential application in functional foods

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Abstract. Agar is an important polysaccharide widely used in the food industry. Its industrial extraction process generates three byproducts with potential for valorization: wastewater from alkaline treatment washing, wastewater from freeze-thaw cycles, and insoluble biomass. The wastewaters contain low-molecular-weight carbohydrates, whereas the biomass contains residual, non-extracted polysaccharides, mainly rich in galactose and 3,6-anhydrogalactose[1]. Carbohydrates obtained from red algae, such as galacto-oligosaccharides, floridoside and their derivatives, have demonstrated prebiotic activity by modulating gut microbiota composition and promoting the growth of beneficial bacteria[2,3]. Additionally, these molecules exhibit promising anti-inflammatory properties, which can be enhanced by the presence of phenolic compounds and pigments[4].
This study hypothesizes that agar extraction byproducts could be valuable sources of oligosaccharides and floridoside, given their potential prebiotic and anti-inflammatory activities. The knowledge of the structure of the oligosaccharides and its derivatives recovered from the agar extraction byproducts, allows to establish structure-functionality relationships. The proposed methodology involves the isolation and fractionation of oligosaccharides from wastewaters using ultrafiltration. The insoluble biomass will be partially hydrolyzed to obtain the oligosaccharides that will be also fractionated. The different fractions will be structurally characterized through determination of sugars composition, glycosidic linkages, and sulphate content. The prebiotic potential of these fractions will be assessed via in vitro gastrointestinal digestion models and fermentation assays with probiotic bacteria. Their anti-inflammatory activity will be evaluated through in vitro assays measuring nitric oxide (NO) production and the expression of pro-inflammatory cytokines.
The main outcome of this project is to develop sustainable strategies to valorize agar industry byproducts, transforming them into high-value compounds with potential health-promoting properties as ingredients for producing functional foods.

Keywords: *Floridoside; galacto-oligosaccharides; anti-inflammatory; prebiotic; red algae*

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Healthypassion: from bioprospection of purple passion fruit to the evaluation of health-promoting food ingredients for asthmatic patients

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Abstract. Asthma is a disease with a high socioeconomic impact characterized by the chronic inflammation of the respiratory airways induced by cellular mechanisms that produce increased levels of reactive oxygen species (ROS). The accumulation of these compounds leads to oxidative stress in the airways, which in turn promotes asthma exacerbation. The intake of exogenous antioxidant compounds through diet has been reported as one of the potential strategies to mitigate the effects of oxidative stress in asthma and existing epidemiological studies have confirmed the correlation between ingestion of polyphenols and lower disease incidence.

This work aims to take advantage of the nutritional and bioactive properties of purple passion fruit and evaluate the potential of PPF-derived food ingredients for the well-being and health promotion of asthmatic patients.

With this intent, the nutritional value of different parts (peel, pulp, seeds) of PPF was determined and their bioactivities evaluated. PPF peel was found to have a particularly high Vitamin C (458mg/100g DW) content as well as the highest total phenolic content and antioxidant activity among the testes fruit components. Additionally, an in-depth analysis of the volatile profile of the fruit and fruit juice was performed and it was evaluated how different pasteurization technologies impact the aroma and physicochemical characteristics of juice and consequently influence consumers quality perception. Selected as the most promising fruit part, PPF peel was tested in an in vivo trial where the mice diet was supplemented with PPF peel powder. It was found that a 3% (w/w) diet supplementation significantly improved several antioxidant and anti-inflammatory markers compared to the positive control without demonstrating toxicity. Overall, this work has demonstrated the potential of valorization of the purple passion fruit peel (a juice production by-product) through minimum processing into a food ingredient that can contribute to asthma management.

Keywords: *Purple Passion Fruit; Asthma; By-products; Peel; Bioactivities; in vivo assay*

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Unlocking the potential of gelidium corneum residue after agar extraction

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Abstract. Polysaccharides are essential hydrocolloids used as texturizing agents in food. Sulfated polysaccharides from red algae, due to their negative charges, play an important role in gelatinization and viscosity [1]. Agar, a sulphated polysaccharide valued for its gelling and thickening properties, is mainly obtained from Gelidium species. However, the extraction process is incomplete, leaving significant amounts of residual agar in the solid waste. The agar industry generates tons of this carbohydrate-rich residue, but its composition and potential applications remain largely unexplored [2].
This study aims to characterize the insoluble biomass residue from Gelidium corneum (provided by Iberagar, S.A.) for its valorizing. The waste biomass consists of 31% carbohydrates (16% glucans and 14% agar), 33% ash, 14% protein, and 9% moisture. Hot water extractions were performed time intervals from 1 to 4 h to evaluate the effect of extraction duration. The results show that a two-hour extraction is sufficient to achieve the maximum yield of 12%. A sequential extraction (1h + 1h) did not improve sugar recovery and resulted in higher solvent consumption. The extracted fraction contains 70% of total sugars, mostly galactose and 3,6-anhydrogalactose, the main components of agarose (the gelling fraction of agar). Additionally, the extract contains 5.9% of sulfates, indicating the presence of agaropectin, a more soluble and less gelling component.
These findings highlight the potential of Gelidium corneum residues as a sustainable source of agar, a gelling agent for the food industry, contributing to resource efficiency and circular economy practices.

Keywords: *sulfated polysaccharides; gelling;*

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Design, synthesis and biological evaluation of novel potential inhibitors of p52

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Abstract. Cancer constitutes a substantial impact on the global healthcare system and stands as the second leading cause of mortality, according to the World Health Organization.[1] Considering the profound impact of this disease, both in terms of the cost in human lives and the pressure it imposes on healthcare resources, the urgent need for increased research efforts to mitigate the consequences of cancer care is highlighted.[2] The activation of nuclear factor-kappa B (NF-B) signaling has emerged as a crucial molecular linker between inflammation and cancer.[3] The non-canonical NF-B pathway is based on the processing of p100 that leads to p52 generation.[4] The overexpression of non-canonical NF-B subunit p52 has been observed in cancers of epithelial origin.[5] Therefore, modulation of p52 emerges as a novel therapeutic target in cancer treatment. The main objective of the present work was the rational design and synthesis of potential inhibitors of p52 (inhibition of p52:p52, p52:RelA and p52:RelB dimers formation) through structure-based drug design. In silico screening of 48 billion compounds of Enamines REAL Space, using motif matchers from several families of interest (e.g., acridine, acridone, chromone, quinolone, triazole, xanthone, indazole, pyrazole, quinoline, pyridine and steroid derivatives), yielded 799209 candidates for evaluation against chain B of p52:p52 dimer (PDB: 1A3Q) through AutoDock Vina. Chain B of p52:p52 dimer corresponds to a monomer that aligns with monomeric subunits of both the p52:RelB dimer (PDB: 3DO7) and the p52:RelA dimer (predicted by AlphaFold), including residues within the dimerization domain, supporting its suitability as a docking model. Based on docking score analysis, compound families such as indazole, pyrazole, pyridine, quinoline, quinolone, triazole and chromone were excluded. Synthetic routes are currently being planned for synthesizing the library of promising scaffolds, including xanthones, acridones, acridines and steroid derivatives. Herein, some of these synthetic routes for the xanthone family will be presented.

Keywords: *NF-B, p52, Anticancer, Virtual Screening, Nitrogen and Oxygen-heterocyclic compounds*

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Kröhnke-zincke cascade reaction as an innovative strategy for synthesizing 3-aminopyridines

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Abstract. The intrinsic electronic properties of pyridines pose significant challenges in the synthesis of meta-substituted derivatives, particularly meta-amino pyridines, as opposed to the relatively more accessible ortho- and para-substituted variants.[1] Conventional methodologies generally entail the reduction of nitro groups following nitration processes, which necessitate severe conditions and exhibit limited chemo- and regioselectivity for targeting the meta-position. Nonetheless, recent advancements in temporary dearomatization have enabled meta-fluorination, hydroxylation, and nitration. However, achieving meta-selective amination of pyridines continues to present a significant challenge.[2]
In this study, we introduce an innovative approach for synthesizing 3-aminopyridines via a KröhnkeZincke cascade reaction through a key pyridinium intermediate (Scheme 1). We have successfully synthesized over 50 novel 3-aminopyridines, categorized into five distinct libraries, encompassing both aromatic and aliphatic substituents, as well as heteroatom groups located at the ortho-position. The method we employed has demonstrated compatibility with flow strategies, indicating significant potential for application in large-scale manufacturing. The 3-aminopyridines produced have proven to be of substantial value in the synthesis of other meta-functionalized pyridines.

Keywords: *Pyridine; Kröhnke; Zincke*

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Optimizing artemisinin extraction from artemsia annua l. with biobased solvents and accelerated solvent extraction

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Abstract. Artemisinin is an effective antimalarial compound against chloroquine-resistant and piperaquine-resistant malaria. Artemisia annua L. is the primary commercial source of artemisinin since it presents one of the highest artemisinin contents compared with other species of the genus Artemisia (Numonov et al., 2019). Although synthetic routes are being developed, plant extraction is the primary and economically viable source of obtaining this drug (Lapkin, 2014). Traditional extraction processes use solid-liquid extraction with volatile organic solvents. These can be expensive, increasing treatment costs and limiting access to the population (Cao et al., 2017).

This study aims to develop a more efficient, safe, and environmentally friendly process using hydrated mixtures of alternative biobased solvents via accelerated solvent extraction (ASE), which applies high pressures and temperatures to enhance solubility and diffusion. Solvents evaluated included ethyl acetate, gamma-valerolactone (GVL), Cyrene, and polyols. The selection was supported by COSMO-RS, a quantum chemistry-based thermodynamic model, through activity coefficient analysis. Extraction time, solvent concentration, and temperature were optimized using response surface methodology (RSM) based on a central composite rotatable design (CCRD).

Under optimized conditions, the hydrated biobased solvent mixture yielded up to 14.6 mg of artemisinin per gram of plant in a single extraction step, outperforming conventional organic solvents. GVL extraction showed significant stability, preserving approximately 60% of artemisinin content after three months at 4řC and 30řC. These results demonstrate the possibility of using biobased solvents and ASE for high-yield, single-step extraction.

In summary, using innovative solvents and advanced extraction techniques significantly increases artemisinin yield and efficiency from Artemisia annua L. while improving sustainability, potentially lowering costs, and preserving extract bioactivity under room temperature storage.

Keywords: *Malaria, Artemisinin, Alternative Solvents, Response Surface Methodology*

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Development of new amyloid probes with donor-acceptor-donor architectures

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Abstract. Early diagnosis is essential for the successful treatment and management of Alzheimers Disease (AD).[1] Over time, numerous near-infrared fluorescent (NIRF) probes have been developed to target both tau and A species, including compounds like curcumin derivatives, carbazoles, DANIRs, BODIPYs, and cyanines.[2] These probes typically display donor-acceptor (D-A) or donor-acceptor-donor (D-A-D) molecular frameworks that emit in the NIR-I range (700-900 nm).[2,3] Chromone-based compounds, in particular, have demonstrated strong affinity for A species and have been utilized to design and develop aggregation-induced emission (AIE) active probes with D-A architectures for precise A and mapping.[4]
In this study, we present the design, synthesis, and structural analysis of a new series of chromone-based probes featuring D-A-D architectures, aimed at serving as NIRF probes for amyloid species. Beginning with a 2-methylchromone core structure, we developed three sets of compounds by modifying key features: (i) extending the east-side -bridge by adding conjugated double bonds (ranging from 0 to 2), (ii) varying the west-side donor group by introducing aliphatic and aromatic amines, and (iii) expanding the west-side -bridge by incorporating electron-donating styrenes. To identify the most promising candidate for binding studies, we first assessed the compounds native fluorescence in solvents with different polarities. For the top-performing compounds, those with longer emission wavelengths, we conducted an initial evaluation of their fluorescence response upon interaction with A peptide. In this report, we will detail the fluorescence characteristics of the synthesized compounds, examining how these properties relate to their structural features and amyloid binding capacity.

Keywords: *Alzheimer's Disease; Chromone-based compounds; Near-Infrared Fluorescent probes; A species;*

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Multifunctional theranostics for alzheimers disease

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Abstract. Alzheimers disease (AD) is a multifaceted and progressive neurodegenerative disorder, primarly marked by the accumulation of -amyloid (A) plaques, which contribute to neuronal damage, cognitive impairment, and behavioral disturbances [1]. Despite significant research efforts and financial investiment, there remains a scarcity of therapies that effectively prevent or reverse A aggregation. Since 2003, only a limited number of drugs, including the monoclonal antibodies Aducanemab, Lecanemab and Donanemab, have been approved. Although these treatments represent important brakthroughs in AD drug development, their high costs pose serious challenges for acessebility, particularly in low-resource healthcare settings [2,3]. Moreover, the reliable detections of A deposits tipically depends on post-mortem analysis, making early diagnosis and real-time monitoring particularly difficult [4]. To address these gaps, we recently disclosed a novel molecular scaffold capable of both binding and disrupting A fibrillation. Building on this discovery, we have further modified the compounds by incorporating different types of electron-donating groups, to enhance their push-pull character and inherent fluorescent properties. This modification supports the development of multifunctional theranostic agents, offering a promising dual strategy for the early detection and treatment of AD. Based on this, herein we present the in vitro and in cellulo evaluation of these compounds, including design, synthesis, photo-physical properties, molecular docking and molecular dynamics simulations.

Keywords: *Alzheimer's Disease, multifunctional compounds, theranostics, cholinesterases, -amyloid, tau protein*

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From menace to resource: biomass valorization of invasive species tradescantia fluminensis and pontederia crassipes

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Abstract. The proliferation of invasive exotic species presents significant risks to biodiversity, ecosystem services, socioeconomic stability, and ultimately human well-being (1). In Portugal, Tradescantia fluminensis and Pontederia crassipes, two species introduced as ornamental plants, have become particularly problematic due to their rapid growth and high productivity, proving resistant to conventional control strategies. Nonetheless, they offer an abundant source of biomass that can be sustainably harvested and extracted for industrial and medicinal applications.

Recent studies have highlighted promising properties in both species. The potential of P. crassipes in phytoremediation, as a source of bioenergy, and biofertilizer has already started to be explored (2), with several properties such as anti-inflammatory, antioxidant, antimicrobial, anticancer, and larvicidal (2), associated to extracts of different parts of this plant. For T. fluminensis, ethnomedicinal information and studies on chemical properties show its potential as an anti-inflammatory, anti-cancer, and antioxidant agent (3). Moreover, invasive species have been linked to the production of novel secondary metabolites as an adaptive response to new habitats, which may be interesting from a chemical point of view (4).

In this context, this PhD project aims to explore the valorization of the biomass of T. fluminensis and P. crassipes through phytochemical profiling, identification of bioactive compounds, and development of bio-based materials, repurposing plant waste into valuable resources. This integrative approach combines ecological management with the exploration of pharmacological and industrial applications, in which invasive species are not merely eradicated but repurposed. This strategy can aid in reducing invasive populations in natural habitats, generate economic value from otherwise problematic plants, and promote more resilient and sustainable ecosystems. Preliminary results from the phytochemical analysis of P. crassipes extracts will be presented and discussed, highlighting the species potential for pharmacological and industrial applications.

Keywords: *Invasive species; GC-MS profile; HPLC-DAD-MS analysis; Biobased plastics*

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[PhD thesis project defense] Accounting

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A formação profissional contínua e a sua relevância para as empresas portuguesas não cotadas em matérias contabilísticas complexas

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Abstract. Este estudo tem como objetivo investigar a integração das matérias contabilísticas complexas através da formação, nas empresas portuguesas não cotadas. O objetivo será a identificação dessas matérias, compreender os fatores que contribuem para a sua complexidade e analisar a sua presença na formação profissional atualmente administrada pelas ordens e associações profissionais em Portugal. Será utilizada uma abordagem mista, com aplicação de método Delphi complementando com questionários e entrevistas a contabilistas certificados e formadores. Espera-se que os resultados contribuam para aperfeiçoamento dos planos de formação profissional contínua, tornando-a mais alinhada com as exigências da prática e também contribua para a ciência tendo implicações relevantes para entidades reguladoras, instituições formadoras e a classe de profissionais de contabilidade, promovendo a competência e a confiança na formação e no trabalho daí resultante.

Keywords: *Formação profissional contínua, matérias contabilísticas complexas, método Delphi*

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Contabilidade, poder e legitimação: esg e a (re)configuração da indústria europeia da defesa em tempos de rearmamento

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Abstract. The resurgence of the European defence and aeronautics industry, driven by the geopolitical context following the invasion of Ukraine, has introduced new challenges and ethical dilemmas to public and corporate governance. This thesis project seeks to examine how the interplay between political and business interests shapes the financing and social legitimation of the defence sector, and how accounting practices and ESG (Environmental, Social and Governance) standards can contribute to greater transparency and accountability. Adopting a mixed-methods approach, the research aims to propose an ESG reporting framework tailored to the defence industry, capable of balancing national security requirements with ethical transparency, while also contributing to the ongoing debate on the role of accounting in controversial sectors. Expected outcomes include recommendations for regulators, academics, and industry practitioners, with the goal of enhancing accountability, regulatory harmonization, and the social legitimacy of the European defence industry.

Keywords: *ESG, Contabilidade, Rearmamento, Reporte, Legitimação, Política, Defesa.*

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Assessing the impact of financial and tax incentives on the acquisition of newpassenger vehicles

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Abstract. In order to stay aligned with the Paris Agreement targets to limit global warming and reduce greenhouse gas emissions, the European Union, or EU, has implemented a series of financial and tax policies to decarbonize the transport sector. The European automotive sector employs around 13 million people, representing 6,1% of total EU employment (European Commission, 2025).

Our study aims to assess how economic and regulatory instruments shape the consumers behavior, the industries adaptation and the labor dynamics during the green transition. This project seeks to answer the following research question: To what extent do environmental and fiscal policies influence the purchase of new passenger vehicles and affect employment within the European automotive industry?

The project will be conducted in three interconnected studies. The first study is a systematic literature review that will identify how EU member states have implemented transport-related measures under the Paris Agreement. It evaluates compliance levels and policy effectiveness, identifying critical gaps. The second study investigates the impact of both monetary (tax incentives, operational costs) and non-monetary factors (infrastructure, risk perception) on consumer decisions when it comes to vehicle acquisition. Using econometric models applied to data from the EU, the study will quantify which incentives are most effective in shifting the consumers to more carbon neutral options (Santarromana et al., 2020). The third study will add a new variable to the research, labor. In this part of our research, we aim to measure how these environmental policies have affected the labor market in the automotive sector. Existing literature highlights the need for fair transition policies to avoid widening socio-economic inequalities(Reimers, 2021).

Together, these studies wish to provide a holistic understanding of the behavioral, institutional, and socio-economic effects of EU decarbonization strategies, contributing evidence to shape more effective and equitable climate policies.

Keywords: *Passager vehicles, tax incentives, environmental policy.*

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Machine learning and earnings management: a critical analysis of discretionary accruals

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Abstract. Machine learning (ML) has expanded accounting research through multiple applications. In earnings management research, ML has been used for estimating discretionary accruals (e.g., Li ; Sun, 2023). Despite performing better than linear models in various statistical metrics, ML approaches raise methodological concerns. ML models do not directly detect earnings management; instead, discretionary accruals are typically derived as residuals and can only be meaningfully evaluated on actual cases of earnings management. Thus, the aim of this paper is to critically analyse the application of ML in discretionary accruals research.

The analysis uses a sample of 1,173 publicly listed European firms from 2012 to 2022. Financial data were collected in the Orbis BvD database and merged with the Audit Analytics European Restatements dataset. Discretionary accruals were estimated linearly following the models of Dechow et al. (1995) and Kothari et al. (2005). ML-based discretionary accruals were derived as residuals from the Kothari et al. (2005) model, using multiple algorithms (e.g., LightGBM, Random Forests).

Discretionary accruals from linear and ML methods were compared on actual restatement cases, including those enforced by regulators, as a proxy for earnings management. The analysis was conducted through group mean comparisons, decile analyses, and logistic regressions. Neither traditional nor ML-based discretionary accruals significantly predicted restatements in logistic regressions, nor showed consistent differences between restatement and non-restatement groups. Restatement rates did not follow any consistent pattern across discretionary accrual deciles, reinforcing the weak association between discretionary accruals and real restatement cases.

This study contributes to the critique regarding the application of discretionary accruals as a universal proxy for earnings management (Jackson, 2018), emphasizing that the success of discretionary accruals is contingent on specific economic contexts and research designs. The paper cautions against asserting ML advantages in contexts where the outcome of interest is unobservable and is based on prediction errors.

Keywords: *discretionary accruals, machine learning, earnings management*

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Taxar o digital:análise crítica das respostasinternacionais à tributação da economia digital

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Abstract. A crescente digitalização da economia, impulsionada pelos avanços nas tecnologias de informação e comunicação, alterou profundamente as dinâmicas económicas e sociais a nível global. Esta transformação desafia os modelos fiscais tradicionais, concebidos para realidades económicas físicas e territorialmente localizadas. O tema central desta investigação é, assim, a tributação da economia digital, sendo o problema de investigação a inadequação dos sistemas fiscais atuais face aos novos modelos de negócios digitais.

O principal objetivo do projeto é analisar criticamente os desafios da tributação na economia digital e propor recomendações de política fiscal internacional, fundamentadas em evidência teórica e empírica, que promovam uma tributação mais justa, eficaz e coordenada. Para tal, propõem-se os seguintes objetivos específicos: (i) examinar o enquadramento conceptual e jurídico da tributação digital; (ii) avaliar o conteúdo, os impactos e as limitações das principais iniciativas internacionais em curso e (iii) identificar oportunidades de harmonização fiscal global.

A relevância do estudo reside na sua atualidade e importância política e económica, num contexto em que a fiscalidade internacional enfrenta pressões crescentes para se adaptar a uma economia cada vez mais desmaterializada, deslocalizada e centrada na criação de valor intangível.

Metodologicamente, o projeto adotará uma abordagem qualitativa, com recurso à análise documental e revisão sistemática da literatura, complementada por estudos de caso e análise comparativa de políticas fiscais em diferentes jurisdições. Será também considerado o contributo de relatórios institucionais e de literatura empírica recente.

Espera-se, como resultado, uma sistematização crítica da evolução do debate sobre a tributação digital, a identificação de lacunas nos modelos atuais e a formulação de propostas políticas fundamentadas. As contribuições potenciais da investigação incluem o enriquecimento da literatura académica na área da fiscalidade internacional e a disponibilização de recomendações úteis para os decisores políticos no processo de adaptação dos sistemas fiscais à nova realidade económica digital

Keywords: *Economia digital, Desafios de tributação, Erosão da Base Tributável, Cooperação Fiscal Internacional*

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Deslocalização de lucros: o papel da inteligência artificial

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Abstract. A maior parte da análise económica fiscal parte do pressuposto de que a obrigação fiscal pode ser determinada e cobrada sem custos, o que Slemrod ; Yitzhaki (2002) consideram ser falso. Nos Estados Unidos da América (EUA), o Internal Revenue Service (IRS) estima que cerca de 17% do imposto sobre o rendimento não é pago. Apesar do crescente interesse académico pela aplicação da inteligência artificial (IA) na fiscalidade, a maioria dos estudos concentra-se na utilização da IA pelas autoridades tributárias. A investigação do uso da IA pelas empresas, enquanto instrumento de planeamento fiscal, continua a ser um campo emergente e pouco explorado.

O objetivo deste projeto de tese é analisar o impacto da IA nas estratégias de deslocalização de lucro utilizadas pelas empresas, comparando os contextos anterior e posterior à adoção desta tecnologia. Neste sentido, no final deste trabalho pretende-se responder à seguinte questão de investigação: De que forma a IA alterou as estratégias de elisão e evasão fiscal utilizadas pelas empresas?

O projeto de tese pressupõe a realização de 3 ensaios. O primeiro ensaio consiste numa revisão sistemática da literatura, conduzida com base na metodologia ProKnow-C, que visa analisar e classificar o conhecimento científico sobre as estratégias fiscais empresariais utilizadas antes do aparecimento da IA. O segundo ensaio recorre à mesma metodologia, mas aplica-a ao contexto posterior ao surgimento da IA. O terceiro ensaio tem como objetivo comparar as estratégias de elisão e evasão fiscal adotadas pelas empresas no período pré e pós-IA, identificando continuidades, transformações e novas tendências.

Este projeto de tese posiciona-se assim na interseção entre a IA e fiscalidade, propondo uma reflexão crítica sobre os impactos da IA na tributação das empresas. Em termos práticos, oferece um contributo relevante para empresas e académicos na compreensão dos riscos e oportunidades associados ao uso da IA na área fiscal.

Keywords: *Inteligência artificial, evasão fiscal, elisão fiscal, deslocalização de lucros*

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Tax policy and business development: the impact of tax benefits in corporate income tax

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Abstract. This research examines the strategic role of corporate tax incentives under the Portuguese Corporate Income Tax (IRC) system as instruments of public policy and organisational transformation. The central problem explores how these incentives, while designed to foster innovation and development, may also reinforce structural asymmetries and inequities in access (Carbonnier et al., 2022). The study aims to evaluate the effectiveness, fairness, and policy impact of these mechanisms within the Portuguese context.

Structured around three scientific articles, the thesis combines theoretical, empirical, and policy-oriented perspectives. The first article presents a systematic literature review repositioning tax incentives as historically embedded mechanisms of organisational adaptation and strategic alignment, with evidence of varied effectiveness across contexts and firm profiles (Hall ; Van Reenen, 2000). The second article provides an exploratory analysis of tax benefits in Portugal (20132023), focusing on SIFIDE and RFAI, and showing how they function as behavioural levers aligned with innovation and sustainability goals (OECD, 2023). The third article offers a multidimensional quantitative assessment of SIFIDE using national aggregate data (20062023), identifying key structural determinants such as firm size, sectoral alignment, company age, and the level of competition for the incentive, revealing persistent asymmetries in access and allocation (Baghana ; Mohnen, 2009).

Methodologically, it combines qualitative and quantitative approaches, including literature review, longitudinal data analysis, and robust statistical techniques. This mixed-method design enables a comprehensive view of fiscal policy effects.

Expected results include greater clarity on the relationship between tax incentives and organisational behaviour, and evidence to inform the design of more inclusive and sustainability-oriented fiscal policies. The dissertation proposes an integrative conceptual model linking fiscal strategy, corporate transformation, and alignment with the UN Sustainable Development Goals. Findings will contribute to debates on fiscal justice, policy simplification, and the states role in fostering innovation (Walter et al., 2023).

Keywords: *SIFIDE; fiscal incentives; IRC; innovation; fiscal policy; equity; sustainable development.*

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The financial implications of post-electoral protests on mozambican companies: risks, strategies and resilience (2024-2025)

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Abstract. Resumo
Esta investigação propõe-se a analisar os impactos financeiros causados pelas manifestações pós-eleitorais de 20242025 nas Pequenas e Médias Empresas (PMEs) moçambicanas. Considerando a recorrente instabilidade política no país, o estudo procura identificar os prejuízos diretos e indiretos sofridos pelas empresas, as estratégias de resiliência organizacional adotadas e o papel das políticas públicas no apoio à continuidade dos negócios. Para tal, será empregue uma abordagem metodológica mista, que combina inquéritos aplicados a empresas afetadas com entrevistas a gestores e decisores institucionais. Espera-se que os resultados contribuam para o fortalecimento da literatura sobre gestão de risco em contextos de instabilidade política, bem como para a formulação de recomendações práticas para o setor privado e para os decisores políticos. A análise será sustentada teoricamente por autores como Fiorina (1991), Gartner e Wellershoff (1995), e Amore e Corina (2021), cujos estudos destacam as relações entre ciclos políticos, instabilidade e desempenho económico empresarial.

Keywords: *Political instability, Post-electoral demonstrations, Financial impact, Business resilience, Risk management.*

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Barriers to women's career progression: studies on female accounting professionals

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Abstract. Themes related to gender diversity, equity, inclusion, career progression, salary, and work-life balance have received increasing attention in accounting research (Mehnaz ; Yang, 2025). Despite growing initiatives to promote gender equity, the profession remains male-dominated, and structural and cultural barriers persist (Galizzi et al., 2024; Storm ; Muhr, 2023).
Societal expectations often burden women with work-life balance responsibilities, reinforcing gender inequalities. In accounting, this highlights the need for stronger policies to promote equity (Ghio et al., 2024), reduce gender bias, support work-life balance, and increase female leadership (Muhammad et al., 2025).
Indeed, valuing gender diversity should be regarded as highlighting the importance of Sustainable Development Goal 5 of the United Nations 2030 Agenda: Achieve gender equality and empower all women and girls.
In this context, this thesis aims to investigate the challenges faced by women accountants in developing their careers and to propose strategies that promote gender equity in the profession. The study addresses two key research questions: 1. What are the barriers to career progression faced by women accountants in Portugal? 2. What measures can be proposed to eliminate or mitigate those barriers?
The research includes three essays: a systematic literature review on gender-related career barriers in accounting, an empirical study with Portuguese women accountants, and focus groups to develop practical recommendations related to human resources policies, leadership, and work-life balance
Expected results include a clear identification of existing barriers, insights into the Portuguese context, and practical recommendations.
The study contributes by critically analysing gender inequalities in accounting career progression and proposing concrete solutions for their mitigation. It aims to transform professional practices and foster a more equitable, diverse, and sustainable organizational culture, serving as a foundation for broader dialogue on social justice, inclusion and value within the accounting profession.

Keywords: *accountant, career progression, gender diversity, profession, women*

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Auditing and esg reporting: a three-essay investigation on information qualityand credibility

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Abstract. ESG reporting (Environmental, Social and Governance) has become a strategic dimension of corporate governance, driven by regulatory pressures and increasing stakeholder scrutiny. However, concerns persist regarding the quality and credibility of non-financial information, especially when not subject to independent assurance (Bisogno et al., 2024). This issue is particularly critical in the European context, with the implementation of the CSRD Directive.

This project proposes an in-depth investigation into the influence of independent auditing on the quality and credibility of ESG reporting. The theoretical framework adopts an integrated approach, grounded in agency, legitimacy, stakeholder, and institutional theories, which collectively explain the auditing function as a mechanism of control, legitimisation, and strategic response (Suchman, 1995).

The research follows a deductive, quantitative methodology, structured in three interrelated essays: (i) a systematic literature review, conducted according to the PRISMA protocol and complemented by the ProKnow-C and Methodi Ordinatio methods; (ii) a perceptual study exploring the views of auditors, preparers, and users regarding the added value of auditing in ESG reporting; and (iii) an empirical analysis using econometric models applied to panel data from publicly listed companies in European markets.

The expected results include a positive association between independent auditing and higher levels of ESG disclosure. This study aims to provide robust scientific evidence with practical relevance for regulators, policymakers, and companies, supporting the effective implementation of the CSRD Directive and contributing to greater institutional trust in European financial markets.

Keywords: *ESG Reporting, Audit Quality, Information Credibility, Legitimacy Theory*

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O impacto da contabilidade de gestão na integração de práticas de melhoria contínua (kaizen) em empresas industriais.

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Abstract. Este projeto de doutoramento analisa o impacto da contabilidade de gestão na integração de práticas de melhoria contínua (Kaizen) em empresas industriais. Apesar do reconhecimento do Kaizen como uma abordagem eficaz para promover a eficiência e a inovação operacional, subsistem lacunas na literatura relativamente à forma como a contabilidade de gestão pode apoiar, influenciar ou limitar a sua implementação (Otley, 2016; Fontenelle ; Sagawa, 2021). O objetivo central da investigação é compreender de que modo os sistemas de contabilidade de gestão contribuem para a adoção e eficácia das práticas Kaizen e quais os efeitos dessa integração no desempenho organizacional.

A relevância do estudo reside na necessidade crescente de alinhar os sistemas contabilísticos com práticas modernas de gestão industrial, promovendo ganhos sustentáveis de produtividade e competitividade (Barney, 1991). Para tal, a investigação será conduzida através de uma abordagem metodológica mista, organizada em três fases: (i) uma revisão sistemática da literatura entre 2000 e 2025; (ii) estudos de caso múltiplos em empresas industriais moçambicanas com experiência consolidada em Kaizen; e (iii) um inquérito quantitativo aplicado a uma amostra de 100 empresas industriais.

Espera-se, como resultado, o desenvolvimento de um modelo integrador entre contabilidade de gestão e Kaizen, a produção de evidência empírica sobre os impactos desta integração no desempenho organizacional e a formulação de orientações práticas para gestores. As contribuições previstas abrangem o avanço teórico no domínio da contabilidade estratégica e o apoio à implementação eficaz de iniciativas de melhoria contínua em contextos industriais.

Keywords: *Contabilidade de gestão; Kaizen; melhoria contínua; desempenho organizacional; indústria*

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Fat tax: imposto sobre os alimentos e bebidas adoçados

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Abstract. Dietary concerns in order to minimize diseases have been analyzed with the aim of creating measures to reduce the harmful effects of such consumption.To this end, many countries have developed fiscal measures, through the application of taxes, to force a change in consumer behavior and lead to a reduction in the intake of harmful products. Over the years, various studies have used data from one country with the intention of looking at various factors, such as whether the tax is actually reducing consumption or changing consumer choices, the impact of the measure on non-communicable diseases, price elasticity of demand, regressivity of the tax, distributional impacts, the debate between the tax and positive incentives, the political viability of the fat tax and others. We propose to carry out a differentiated study to elucidate more precisely how this tax policy can be as effective as possible. Our objectives are to:-Analysis of which countries that have implemented the measure have actually succeeded in reducing consumption through taxation and whether other factors have had an influence;-We will propose an innovative system for reducing the consumption of unhealthy foods and drinks. In order to meet the proposed objectives, a quantitative methodology will be used, using data on the consumption of unhealthy foods. We will also use a qualitative methodology through interviews to propose an innovative system to help reduce consumption. We hope that the tests will firstly help to understand what has been studied over the years in the various countries, and then make it possible to distinguish which countries have had effective measures and understand the commonalities, so that it will then be possible in test 3 to present a proposal, with the help of professionals in the field.
Keywords: change behaviors, fat tax, unhealthy products

Keywords: *nan*

[PhD thesis project defense] Chemical Engineering

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Innovative encapsulation methods for stabilizing phycobiliproteins

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Abstract. As climate change accelerates, the need for sustainable alternatives in processes/product development is more urgent. One essential need is the shift from synthetic pigments, often derived from petrochemicals to natural pigments extracted from biological materials, plants, fruits, and algae. Algae are especially promising, known to produce a diverse array of pigments. These are renewable, easy to cultivate, and suitable for large-scale use across various industries [1].
Algae's pigments such as chlorophylls, carotenoids, and phycobiliproteins, offer a broad color palette. Phycobiliproteins, like phycoerythrin and phycocyanin, found in red-algae and cyanobacteria, are particularly valued for their intense color and beneficial biological properties, including antioxidants, anti-inflammatory, and anticancer effects. These make them highly attractive for use in food, pharmaceuticals, cosmetics, and feed [2].
Phycobiliproteins are highly sensitive to environmental factors such as light, oxygen, temperature, and humidity [3]. To address this, this study explores encapsulation as a stabilization strategy. Encapsulation involves surrounding the pigment with protective agents, commonly polysaccharides and biopolymers such as gum arabic, chitosan, maltodextrin, or gelatin. While these materials have not yet achieved optimal stabilization on their own, their combination with other agents, like ESs or hydrotropes, offers new potential [4]. Hydrotropes, known for enhancing solubility of poorly soluble compounds due to their amphiphilic nature, may form dynamic aggregates that protect pigments from degradation [5]. This study investigates hydrotropes primarily in liquid systems, with spray drying employed for solid-state applications. Spray drying not only enhances stability but also facilitates incorporation into commercial formulations [6].
A preliminary study focused on stabilizing phycoerythrin through polysaccharide-based encapsulation for application in food products, particularly in the development of plant-based salmon or tuna analogues. The pigment, extracted from the red microalga Porphyridium cruentum, was encapsulated using natural polysaccharides. The objective was to enhance the pigments thermal and photostability. The results show an improvent in photostability.

Keywords: *Phycobiliproteins; Color stability, Encapsulation; Polysaccharides, Eutectic solvents; Hydrotropes*

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Mechanistic studies and data-driven prospection of molecular modulators of pgc-1

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Abstract. Peroxisome proliferator-activated receptor gamma coactivator 1 (PGC-1) is a transcriptional coactivator primarily involved in the regulation of cellular energy metabolism by modulating the expression of genes related to mitochondrial biogenesis, oxidative phosphorylation, thermogenesis, and gluconeogenesis (Lin et al., 2005). Abnormal expression of PGC-1 has been implicated in a wide range of human pathologies, including cancer, metabolic disorders, cardiovascular diseases and neurological disorders (Qian et al., 2024). Recognizing the potential of PGC-1 as a therapeutic target, this project aims to identify novel small molecules capable of modulating PGC-1 activity using a structure-based virtual screening pipeline (Giordano et al., 2022). Within this framework, molecular dynamics (MD) simulations will be employed to generate conformational ensembles of PGC-1 for the identification of transient binding pockets (Saurabh et al., 2023). Chemical features of the identified binding sites will be used to construct a structure-based pharmacophore model that will guide the screening of large databases of drug-like small molecules (Irwin ; Shoichet, 2005). High-scoring candidates will be further evaluated through molecular docking to estimate binding affinities for the target. Selected ligands will undergo MD simulations to assess binding stability and refine affinity predictions. Top candidates will be commercially acquired for in vitro testing using a human cardiomyocyte cell line. If needed, lead compounds will be structurally optimized to improve target affinity and reduce potential toxicity. This approach offers a more cost-effective and rational alternative to traditional drug discovery, while also enabling the investigation of PGC-1 structure-function relationship.

Keywords: *drug design; drug discovery; molecular dynamics; PGC-1; virtual screening*

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Detection of prostate cancer biomarkers assisted by supported ionic liquids and microfluidic devices

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Abstract. Prostate cancer (PCa) is one of the most prevalent cancers among men, with early detection being critical to improve patient outcomes (Chacko ; Ankri, 2024). In particular, the detection of cancer biomarkers in human serum, such as prostate-specific antigen (PSA), has emerged as a promising non-invasive approach for the early detection and management of cancer (Garg et al., 2023). However, the high abundance of human serum albumin (HSA) and immunoglobulin G (IgG) in serum makes the detection of biomarkers such as PSA difficult. As a result, biomarker analysis requires sample pretreatment and detection methods that rely on expensive and time-consuming resources and protocols (E. Rosa et al., 2023). This PhD thesis aims to address this challenge by developing efficient microfluidic point-of-care (POC) devices for prostate cancer detection by integrating sample pretreatment to remove IgG and HSA prior to biomarker detection. To achieve this goal, supported ionic liquids (SILs) are employed as efficient materials for sample pretreatment, owing to their tunable properties that enable enhanced selectivity. Given the lack of reports on the integration of SIL-based materials into microfluidic devices, this PhD thesis is expected to address unmet analytical needs at the POC level, thereby facilitating faster and more accessible prostate cancer detection for a broader population.

Keywords: *Prostate cancer; PSA biomarker; Human serum; Supported ionic liquids; Microfluidic devices.*

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N0 and nox sequestration from nitric acid industry tail gas using gas-liquid membrane contactor with encapsulated non-volatile solvents

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Abstract. Nitrogen oxides (NOx), such as NO, NO2</sub> and N2</sub>O have several negative effects on the environment, human health, and biological ecosystems, including acid rain and ozone layer depletion.1 According to the European Environment Agency, in 2022 it was emitted 5 380 Gg of NOx, being transportations the main source (48.6%), followed by combustion processes in energy supply (14.2%), and industry (13.1%).2 Regarding the emissions from combustion processes the most used NOx removal technologies are reduction processes (selective catalytic reduction (SCR), selective non-catalytic reduction (SNCR), non-selective catalytic reduction (NSCR) and eletrocatalytic reduction), adsorption and absorption processes.3 Despite existing technologies, nitrous gas emissions in nitric acid plants during transient operation periods, such as start-up and shutdown, remain a technological challenge. This challenge underscores the need for more efficient and environmentally friendly mitigation approaches during these periods. Non-volatile solvents, particularly Ionic Liquids (ILs) and Eutetic Solvents (ES) have emerged as promising alternatives to conventional solvents, due to their attractive properties, including negligible vapor pressure, high thermal stability, and tuneable properties.4 However, the direct implementation of non-volatile solvents in conventional separation units faces obstacles, including the need for large separation units and high energy demands for solvent recovery.5 To address these challenges, we proposed the development of a Gas-Liquid Membrane Contactor (GLMC) with hollow-fiber membranes with a thin layer of Pebaxő functionalized with non-volatile solvents. This novel approach aims to optimise the balance between the sorption capacity and selectivity of the solvent with the modularity, compactness, and scalability inherent in membrane technology. Thermodynamic models, based on complex EoS (with associative term) and Fick and Stefan-Maxwell equations, will be developed aiming their implementation in a process simulator for realistic scale-up and technical-economic evaluations. This study underscores the importance of mitigating emissions through innovative separation technologies supporting environmental sustainability and industrial viability.

Keywords: *Ionic Liquids, Mixed-Matrix Membranes, Gas Separation, NOx emission reduction and Nitric Acid.*

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Development and optimization of an innovative membrane reactor for green-methanol synthesis by direct co hydrogenation

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Abstract. Over the last years, carbon dioxide (CO2</sub>) emissions and global energy demand have been steadily growing, with fossil fuels still playing a dominant role in energy production, representing around 80 % of the total energy supply [1]. In this context, the European Commission has highlighted the strategic importance of maximizing renewable deployment to achieve the goal of climate neutrality by 2050 an economy with net-zero greenhouse gas emissions [2].
Renewable methanol, produced from captured CO2</sub> and renewable hydrogen, has gained significant attention since it is a promising energy carrier and a key building block for the chemical industry, holding immense potential as a driver for global decarbonization and energy transition [3]. However, the direct CO2</sub> hydrogenation to methanol route is thermodynamically and kinetically limited, resulting in low CO2</sub> conversion (below 25 %) [3]. To overcome these challenges, this research proposal aims to develop a novel method using a membrane reactor to achieve high CO2</sub> conversion and methanol yield. The work involves the modeling and simulation of the membrane reactor, the development and optimization of a lab-scale prototype, and the assessment of techno-economic metrics in comparison with other competing processes.
The envisioned impact of this work extends to the construction of a renewable methanol plant of 80 kton/year in Portugal by Capwatt, introducing a more sustainable and effective route for methanol synthesis. This pioneering approach aims for zero greenhouse gas emissions and holds the potential to significantly benefit the Portuguese economy and industrial decarbonization efforts.

Keywords: *CO2 hydrogenation, decarbonization, membrane reactor, methanol, polymeric membrane, renewable energy.*

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Development, scale-up and evaluation of processes for the sustainable recovery of bioactive compounds from eucalyptus biomass

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Abstract. The pulp and paper industry plays an important role in the Portuguese economy and mainly relies on Eucalyptus globulus wood as its primary raw material. However, eucalyptus harvesting generates substantial amounts of residues such as foliage, branches, and bark that are currently only used for power generation, despite being rich in bioactive compounds with valuable applications in the cosmetic, food, nutraceutical, and pharmaceutical industries (Domingues et al. 2010; Santos et al. 2011). Unlocking the full potential of these undervalued resources requires the integration of innovative and sustainable processes within a biorefinery framework.

A recently patented process describes the sequential recovery of extracts enriched in specific families of high-value bioactive compounds from eucalyptus leaves, including essential oil, triterpenic acids, and phenolic compounds (Pinto et al. 2023). The central focus of the present PhD project is to further develop, optimise, and scale up this process, improving its viability, efficiency, and sustainability. The project's work plan was strategically designed to address key research and technology challenges, advance the process's technological maturity, and assess its techno-economic and sustainability performance, to support its deployment for commercial applications. The successful implementation of this valorisation strategy in existing pulp mills, optimised for efficiency and resource utilisation, would boost the national bio-based and circular economy while creating new and sustainable market opportunities for the industry.

Keywords: *Bioactive compounds; Eucalyptus globulus; Scale-up; Sustainability assessment; Tecno-economic analysis*

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Model integrative of organizations competitive knowledge - miock

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Abstract. The MiOCK Model Model Integrative of Organizations Competitive Knowledge emerges from the author's professional practice, which identified a persistent issue: despite the existence of numerous international standards, their application within organizations often remains isolated, monodisciplinary, and strategically limited, leading to operational silos and structural inefficiencies. The literature confirms the lack of integrated solutions that connect innovation, sustainability, knowledge management, and information security.

MiOCK proposes an integrated operating system where knowledge is treated as a strategic, collaborative, and ethical asset. Inspired by ISO56008, it is structured around ten interdependent axes: knowledge, sustainability, information security, innovation, ethics, human capital, resilience, culture, digitalization, and ESG. These axes serve as normative translation vectors into comparable indicators, enabling evidence-based decision-making and near real-time monitoring.

The model is based on the structure of Annex SL a common annex to ISO management system standards facilitating integration across normative domains. Its theoretical foundation is rooted in the Knowledge-Based View of the Firm (KBV), treating knowledge as the main integrative element between risk, innovation, and sustainability.

The research adopts a mixed-methods approach in two phases: (1) analysis of 27 ISO standards and development of a pilot study; (2) empirical validation through case studies, surveys, statistical analysis, and qualitative triangulation.

The thesis is organized into three scientific papers, each structured around an analytical metaphor and a core pillar: Forests and Oceans explores Normative Integration and knowledge as a strategic resource; Jungle and Habitability addresses Near Real-Time Measurement in the face of systemic complexity; Mirror of Who We Are develops Cultural Transformation, aligning identity with practice.

The MiOCK model reflects a commitment to scientific, organizational, and societal impact, offering an integrated approach to knowledge and sustainable innovation designed for fearless organizations: conscious, resilient, and future-oriented.

Keywords: *Integrated Management Systems; Annex SL; ISO 56008; ISO 42001; KBV; Knowledge Management; Sustainable Innovation; ESG; Information Security; Cybersecurity; Culture; Artificial Intelligence; Ethics; Continuous Learning; Organizational Resilience*

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Business intelligence for strategic decision-making: a digital analytics approach for innovation in smes

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Abstract. Digital transformation has expanded the availability of data in small and medium-sized enterprises (SMEs), creating opportunities for strategic decision-making based on evidence rather than intuition. However, many SMEs still struggle to convert digital analyticssuch as SEO data, user behavior, or internal metricsinto meaningful strategic insights. This thesis addresses this gap by proposing and validating a business intelligence (BI) system tailored to the practical and strategic needs of SMEs undergoing digital transition. What distinguishes this project is the integration of a triadic strategic framework centered on three pillars: keywords, brand, and technology. First, the system helps SMEs align their keyword usage across channels with actual customer perception, search behavior, and internal brand language, creating consistency between how a company is found and how it wants to be perceived. Second, it promotes alignment between SEO insights and the brand manual, ensuring that digital signals reinforce strategic positioning. Third, it enables structured decision-making around core technologiesranging from CRM and ERP systems to communication tools and e-commerce platformsas fundamental components of business identity and capability. The system will incorporate attribution models to connect user touchpoints with business outcomes and visualize insights through an executive dashboard. Grounded in design science methodology, the research will adopt a mixed-methods approach: identifying requirements through literature and stakeholder input, followed by iterative development and field deployment in real SME contexts. Its impact will be evaluated through performance metrics and longitudinal feedback. This thesis delivers both a validated BI system and a conceptual framework that empowers SMEs to clarify and operationalize their strategy through the lens of language, identity, and infrastructure. By bridging gaps between perception and practice, the project enhances data-driven agility and strategic coherence in digitally evolving businesses.

Keywords: *Business Intelligence, Strategic Decision-Making, Digital Analytics, Small and Medium-Sized Enterprises (SMEs), Design Science Research, Data-Driven Management*

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Statistics for managerial decision- making and intermodality in the sector: a case study of the ministry of transport of angola

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Abstract. Statistics for Managerial Decision-Making and Intermodality in the Sector: A Case Study of the Ministry of Transport of Angola

Effective decision-making in the transport sector increasingly depends on timely, accurate, and integrated statistical data. In Angola, intermodality (combining various modes of transport such as maritime, rail, air, and land) presents both opportunities and challenges for national development.

Currently, statistical data in Angola's transport sector is fragmented and inconsistently managed across subsectors. This hampers strategic planning, sustainable resource allocation, and real-time operational decisions. There is a critical need for a centralised and dynamic system that supports managerial decisions through integrated intermodal data analysis.

This research proposes the development of innovative approaches to the information that consolidates data from all transport subsectors. Leveraging Machine Learning and dynamic modelling techniques, the platform aims to enable periodic (daily to annual) reporting, trend analysis, and predictive modelling, tailored for intermodal transport management.

A case study approach is adopted, focusing on the Ministry of Transport of Angola. The study involves qualitative and quantitative data collection from several transport agencies. Statistical tools and machine learning algorithms will be employed for data analysis and system modelling. Comparative frameworks inspired by global initiatives will be explored for contextual adaptation.

The results of the research are expected to improve decision-making efficiency, increase inter-sectoral coordination, and support policy development. It aims to provide a unified statistical overview of transport flows, including freight and passenger data, contributing to Angolas economic planning and integration into broader international logistics networks.

Keywords: *Intermodality, Statistical Data Systems, Managerial Decision-Making, Transport Sectorm, Data-Driven Management, Logistics Innovation, Multimodal Transport*

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A integração de práticas pedagógicas inovadoras no ead em moçambique: uma analise dos desafios e dos resultados educacionais.

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Abstract. This thesis project aims to investigate the integration of innovative pedagogical practices in Distance Education (EaD) in Mozambique, with a particular focus on the case of Universidade Aberta ISCED (UnISCED). In the context of the expansion of online higher education as a response to geographical, technological, and socioeconomic limitations, it becomes imperative to adopt methodologies that promote quality, interactivity, and equity in the learning process (Silva, 2022). The study seeks to understand the main challenges faced by teachers and students in the adoption of such methodologies, identify effective implementation strategies, and analyze the pedagogical, social, and institutional impacts of this integration. The research will follow a qualitative approach, using content analysis and data triangulation from semi-structured interviews, focus groups, and document analysis. The expected outcomes aim to contribute to the strengthening of educational policies and the improvement of teaching practices in Distance Education, fostering greater student engagement, autonomy, and digital inclusion in the Mozambican context. The relevance of the topic is supported by studies that highlight the importance of pedagogical innovation in teacher training and the quality of distance education (Silva, 2022).

Keywords: *Distance Education, Innovative Pedagogical Practices, Higher Education, Mozambique, UnISCED.*

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Management and control of operations in port concessions: the case of container terminals at the port of luanda

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Abstract. The innovation in management and control of operations in port concessions is critical for ensuring efficient and transparent service delivery, especially in container terminals, which are fundamental to global trade. This study focuses on the Port of Luanda in Angola, where concession agreements impose contractual obligations that require concessionaires to submit mandatory monthly, quarterly, and annual reports based on established performance standards.
The problem addressed the challenges in enforcing contractual obligations over the extended duration of port concessions. In the absence of stringent and transparent monitoring, there is a significant risk that concessionaires may fail to meet their commitments fully, which could lead to operational inefficiencies and financial losses for the granting authority
The study proposes integrating advanced digital and communication technologies into the management and control frameworks of port concessions. These technologies include Big Data analytics, Artificial Intelligence (AI), Terminal Operating Systems (TOS), Business Intelligence (BI) tools such as Tableau, Machine Learning combined with System Dynamics, automated report extraction, the Internet of Things (IoT), real-time monitoring, and predictive analytics. Such tools can significantly enhance monitoring capabilities, improve compliance, and reduce risks associated with non-compliance.
The methodology involves a qualitative case study of the Port Authority of Luanda, using data collected from operational reports, interviews with key stakeholders, and analysis of existing monitoring processes. This approach enables a comprehensive assessment of current management and control practices and the identification of areas for technological integration.
Preliminary results suggest that adopting advanced technologies can increase transparency, boost operational performance, and ensure better compliance with contractual obligations. This research aims to support the decision-making process in management of port concessions and offer practical recommendations for port authorities looking to optimize their oversight of concessions.

Keywords: *Port Concessions, Concessionaire Performance, Container Terminals, Contractual Compliance, Operational Control, Performance Monitoring, Port Management, RealTime Monitoring, Predictive Analytics*

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Digital twin architectures for innovation in complex socio-technical systems

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Abstract. This research develops and evaluates a federated reference architecture for socio-technical digital twins (STDTs) designed to support innovation and resilience in complex, multi-stakeholder systems. Such systemsfrom airspace management to urban infrastructureare shaped by the dynamic interplay of institutional, technical, and human factors. While digital twins (DTs) are increasingly used to model these environments, existing architectures are typically narrow in scope, lacking robust support for the evolving social and organizational contexts that define them. Concurrently, the emergence of agentic artificial intelligence (AI)systems capable of autonomous reasoning, planning, and actionpresents a transformative opportunity to enhance foresight and collaborative decision-making. However, the role of agentic AI within federated DT ecosystems remains conceptually underdeveloped and its ethical implications under-examined. This research addresses this critical gap by architecting agentic AI not as a peripheral analytical tool, but as a participatory component capable of mediating institutional learning, simulating complex disruption scenarios, and facilitating socio-technical adaptation.

Grounded in socio-technical systems theory and employing a Design Science Research (DSR) methodology, the proposed reference architecture is developed and validated through a real-world demonstrator focused on airspace resilience, designed to support coordinated planning among diverse actors such as airport authorities, airlines, and regulators. The architecture's generalizability is further examined through comparative modeling in urban resilience and smart city planning. The evaluation framework is multi-layered, assessing not only architectural performance and agentic efficacy but also the quality of human-agent collaboration, perceived user workload, system usability, and trust. The primary outcomes are a transferable reference model for STDTs, a simulation environment for multi-stakeholder planning, and a framework for responsible innovation with agentic AI. These contributions offer actionable pathways for public institutions and SMEs to engage with next-generation intelligent systems, advancing strategic priorities for digital sovereignty and innovation democratization.

Keywords: *Digital Twin Architecture, Agentic AI, Socio-Technical Systems, Innovation Ecosystems, Smart Infrastructure, Design Science Research*

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Ai-enabled r&d teams for sustained innovation in mature high-tech firms

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Abstract. Mid-sized high-tech firms in sectors such as biotechnology, quantum technology, and photonics experience innovation stagnation as they transition from rapid growth to organizational maturity despite continued investment in R;D. In dynamic, technology-driven markets, sustained innovation is essential for maintaining competitiveness making the resolution of this stagnation a strategic priority. Although technical expertise remains essential, the role of R;D team composition in overcoming this plateau remains underexplored. Existing research largely focuses on startups or assumes static structures, offering limited guidance for firms navigating complex innovation challenges in later stages. As OConnor (2024) demonstrates, many innovation-intensive firms struggle to institutionalize breakthrough capabilities due to misaligned organizational models during later stages of development.

This study addresses this gap by investigating how artificial intelligence can support dynamic, context-sensitive R;D team formation in mature high-tech environments. Using a Design Science Research (DSR) approach, the project unfolds in three phases: (1) a systematic literature review and expert interviews to identify innovation barriers and design requirements; (2) the development of an AI-enabled decision-support framework based on expert heuristics and adaptable machine learning techniques, which operationalizes contextual expertise and cognitive diversity and allows for the comparison of different AI approaches regarding their effectiveness in guiding team design decisions; and (3) empirical validation using firm-level data and feedback from R;D leaders.

Inspired by the Medici Effect, the study derives empirically grounded design principles and examines whether interdisciplinary collaboration and diverse perspectives can be systematically orchestrated to unlock innovation. It contributes (1) a conceptual reframing of how R;D teams should evolve in the maturity phase, and (2) a practical, AI-based tool that supports the formation of cognitively diverse, high-performing teams demonstrating how AI-supported team design can extend innovation effectiveness into the maturity phase of firm development.

Keywords: *Artificial Intelligence; R&D Team Composition; Innovation Management; Medici Effect; Design Science Research*

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Building innovation capabilities in manufacturing firms

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Abstract. This presentation contributes to the Research Summit by outlining a PhD project that investigates the development of Innovation Capabilities (ICap) in manufacturing firms, with a focus on the Indian export furniture industry, particularly in Jodhpur and Jaipur, Rajasthan. These cities host India's largest woodworking cluster, which faces significant challenges due to global market fluctuations such as economic downturns in Germany and current import policies in the USA while simultaneously being presented with growth opportunities in the domestic market.
Given the need for firms to adapt and innovate to maintain competitiveness, this research emphasizes the importance of building and assessing ICap. Although ICap is widely recognized as a critical factor for sustainable competitiveness (Lianto 2023), the concept remains theoretically fragmented, lacking consistent definitions and operationalizations across studies (Blommerde, 2023; Pufal ; Zawislak 2022). This results in conceptual and practical challenges when defining and measuring ICap, highlighting the need for more robust frameworks and clearer distinctions from related concepts, such as innovation and innovation capacity. This project addresses these challenges by providing a structured investigation into the assessment and development of ICap within the context of manufacturing firms.
The presentation has three objectives: (1) to present the research context, goals, and methodology of the PhD project which follows a mixed-methods approach, integrating qualitative and quantitative data collection and analysis; (2) to elaborate on a key paper that analyzes the current state of ICap in manufacturing firms, including key metrics for its assessment; and (3) to engage the academic community in refining the research framework and identifying potential improvements.
The presentation concludes with a call for academic dialogue around the theoretical framework and the research design of the PhD project, aiming to enhance the studys relevance in understanding ICap and its potential contributions to science and practice.

Keywords: *nan*

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From foundations to capabilities: a multilevel maturity model for organizational change readiness

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Abstract. Digital transformation confronts organizations with increasingly complex and accelerated change dynamics, demanding not only strategic foresight but also a robust foundational readiness. While the Dynamic Capabilities framework provides a valuable lens (Eisenhardt ; Martin, 2000; Teece, 2007) to understand how firms adapt through sensing, seizing, and reconfiguring, the foundational conditions that enable these ordinary capabilities remain insufficiently explored (Heubeck, 2024).
The thesis addresses this gap by investigating how foundational capabilities contribute to organizational change readiness in digital transformation contexts. A systematic literature review identifies six foundational domains (people, culture, strategy, processes, technology, and financial resources) and maps their relationships across the micro-, meso-, and macro-levels of Dynamic Capabilities. This synthesis results in a conceptual model that integrates these domains into a structured, multilevel framework for transformation readiness.
To extend this theoretical contribution, the thesis aims to develop a maturity model through a Delphi study involving experts from academia and industry. The model will subsequently be tested using multiple case studies as a diagnostic instrument to assess change readiness and uncover capability gaps.
The expected outcome is a validated, actionable maturity model that enables organizations to evaluate and strengthen their foundational conditions for change. By aligning ordinary capabilities with strategic transformation goals, this research offers both empirical insight and practical guidance for innovation leaders, advancing the application of Dynamic Capabilities theory in complex digital environments.

Keywords: *Dynamic Capabilities; Change Readiness; Digital Transformation; Foundations for Digital Maturity; Foundations for Change; Ordinary Capabilities; Maturity Model; Systematic Literature Review; Delphi Study; Case Study Research*

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Qualidade 4.0 numa empresa automóvel integração de visão computacional e machine learning

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Abstract. A Inteligência Artificial (IA) tem adquirido um papel cada vez mais importante em diversos setores, transformando completamente o panorama industrial [1]. A utilização de IA na indústria automóvel já é uma realidade, e o seu impacto tem sido orientado para as vertentes de: procurement de materiais alternativos; simulação de sistemas de produção; implementação de Machine Learning e integração de visão Computacional [2][3]. A integração de Machine Learning com Visão Computacional encontra-se na deteção, classificação e tratamento de informação de imagens, gráficos, documentos e vídeos [3]. Esta tecnologia é frequentemente mencionada como um tópico-chave da Qualidade 4.0 [4]. Nesta perspetiva, o foco da qualidade passou de uma visão centralizada na exclusão de produtos não conformes e na monitorização de processos, para uma perspetiva mais holística através de uma monitorização dos elementos que contribuem para a cadeia de valor [4].
Neste sentido, o projeto de trabalho proposto passa pela implementação de Visão Computacional integrada com Machine Learning para deteção e análise de dados numa empresa do ramo automóvel e visa resolver problemas de Qualidade no processo de abastecimento logístico, através do reconhecimento de diferentes peças que compõem dollies de abastecimento à linha de produção. O sistema a implementar deverá ter a capacidade de detetar peças incorretas, categorizar essa informação e gerar relatórios em tempo real, com análises de tendências feitas através de Machine Learning. Pretende-se que seja uma ferramenta de melhoria operacional, mas também de apoio à decisão por parte dos gestores, promovendo a integração de eventuais aplicações desenvolvidas. Do ponto de vista científico, a aplicação destas ferramentas permitirá explorar as suas potencialidades no contexto industrial, através de um sistema que se diferencie de alguns exemplos encontrados na literatura, capaz de suprir as necessidades num contexto da indústria automóvel, com a possibilidade de replicação para outros setores.

Keywords: *Machine Learning, Data analysis, Visão Computacional, Qualidade 4.0*

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Generative artificial intelligence in traditional industries: mapping applications across the wine supply chain

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Abstract. The integration of Generative Artificial Intelligence (GenAI) into traditional sectors represents a significant opportunity for digital transformation, particularly in heritage-based industries such as wine production. Despite its growing potential, GenAI adoption in these domains remains limited, primarily due to the absence of structured methodologies that guide its effective and context-sensitive implementation. This research addresses that gap by proposing a strategic approach to map the wine supply chain and identify high-impact areas where GenAIincluding AI agents and content-generation toolscan generate tangible value through process automation, decision support, and enhanced customer engagement.

Grounded in the AI Ladder framework (Thomas ; Zikopoulos, 2020), which structures AI adoption in four sequential phasesunderstanding the problem, collecting and organizing data, analyzing it through AI models, and infusing intelligence into business operationsthe methodology unfolds through three interdependent stages that directly respond to previously identified challenges: (i) mapping and diagnosing the core processes of the wine supply chain to reveal structural inefficiencies and data bottlenecks; (ii) identifying business functionssuch as production, commercialization, and marketingwhere GenAI can amplify capabilities and address operational pain points; and (iii) designing implementation proxies that simulate realistic GenAI adoption scenarios using real or representative datasets.

A case study will be conducted in partnership with the Dão Regional Wine Commission, which plays a pivotal role in the certification and promotion of wines in the region. In addition to assessing technological feasibility, the study addresses cross-cutting concerns such as algorithmic bias, data governance, and the preservation of authenticity in traditional value chains (Feng et al., 2024; Jackson et al., 2024). The expected outcomes include not only applied models that demonstrate how GenAI can modernize operations, but also decision-support tools that may inform sectoral strategies, policy design, and innovation roadmaps. These contributions aim to reinforce competitiveness and digital maturity across traditional economic sectors (Hartmann et al., 2024).

Keywords: *Generative Artificial Intelligence; Wine Supply Chain; Digital Transformation; AI Agents; Business Innovation; Process Mapping*

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Intelligent decision support system for assembly line balancing considering the minimization of work-related musculoskeletal disorders

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Abstract. In the industrial world, workers are constantly exposed to different physical workloads. High market demand, combined with repetitive execution of manual tasks, inadequate postures and excessive application of force, can overload the human musculoskeletal system. This tension presents significant risks, namely Work-Related Musculoskeletal Disorders (WMSDs) [1]. These conditions, which stem from the increasing demands of industrial work, prompt us to ask how we can prevent and manage them [2].

When facing the Assembly Line Balancing Problem (ALBP), ergonomic factors related to individual tasks are often overlooked or only partially addressed after the initial balancing process [3]. Studies are increasingly focusing on the integration of ergonomics evaluations into human operations analysis since it is a mutually beneficial approach due to the connection between productivity, workflow efficiency, and operational safety [46].

This doctoral research aims to investigate intelligent strategies for real-time optimization of assembly line balancing within the industrial sector. The main outcomes also involve reducing the product cycle time to increase production efficiency, as well as the workers well-being by reducing the risk of WMSDs. The study will be conducted in collaboration with Bosch Termotecnologia, located in Portugal. Current assem- bly line balancing practices at Bosch rely on predefined motion time standards using the Methods-Time Measurement (MTM) system, and the company already employs real-time bottleneck detection systems. However, existing methods do not consider ergonomic integration, which will be a perfect landscape to apply the planned study.

With the proposed Intelligent Decision Support System (IDSS), we aim to create a novel and intelligent approach to line balancing, incorporating real-time data and advanced ergonomic assessments.

Keywords: Ergonomics; Assembly line balancing; Work-Related Musculoskeletal Disorders (WMSDs); Industry 5.0; Intelligent Decision Support System (IDSS)

Keywords: *nan*

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Escalonamento cíclico de turnos: modelagem, complexidade e métodos de resolução aplicados ao apoio à decisão

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Abstract. A elaboração de escalas de trabalho em ambientes operacionais contínuos, como hospitais, indústrias e demais serviços que operam em regime 24x7, representa um desafio crítico para organizações que buscam conciliar eficiência, bem-estar e conformidade legal. O problema de escalonamento com rotação de folgas e turnos com horário fixo (em inglês, Rotating Days-Off and Shifts with Fixed Hours Scheduling Problem - RDSF</sub>P é uma classe específica que, apesar de amplamente estudada, ainda é considerada pela literatura como pertencente à categoria dos problemas NP-difíceis [1].
A alta complexidade combinatória, as exigências legais (como o limite de dias consecutivos trabalhados) e os impactos fisiológicos associados à rotação de turnos tornam o RDSF</sub>P um problema multidimensional. Diversos autores têm proposto heurísticas e modelos baseados em programação inteira para abordá-lo [2], mas tais métodos frequentemente dependem de tentativa e erro, ajuste de parâmetros e resultam em soluções subótimas difíceis de justificar legalmente.
Este trabalho propõe uma nova abordagem para o RDSF</sub>P com base na análise estrutural de blocos de dias trabalhados e folgas (DTxF). A partir da hipótese de que, sob determinadas condições restritivas, porém realistas, é possível reestruturar o problema de forma a permitir soluções polinomiais, investiga-se a existência de padrões cíclicos e propriedades modulares que simplifiquem a construção de escalas viáveis.
A pesquisa prevê: (1) a caracterização formal das condições que permitem tratar o RDSF</sub>P como problema polinomial; (2) o desenvolvimento de um método construtivo para a geração de escalas legais e balanceadas; e (3) a formulação de uma estrutura matricial que auxilie sua visualização e implementação prática. O estudo será complementado por estudos de caso em contextos reais de escalonamento, considerando especialmente a legislação trabalhista internacional [3].
Esta investigação busca revisar a complexidade do RDSF</sub>P e fornecer subsídios práticos para a gestão de recursos humanos em operações contínuas.

Keywords: *Escalonamento de Turnos, Rotação de Folgas, Complexidade Computacional, Modelagem de Escalas, Apoio à Decisão, Métodos de Resolução*

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Digital twins for port logistics: a framework focusing on smart gates

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Abstract. Advancements in automation and digitalisation have driven the development of smart solutions, combining emerging information and communication technologies with process optimisation and enhanced decision-making. As over 80% of global trade relies on maritime transport, seaports face mounting pressure to improve efficiency, security, and sustainability throughout their operations.

One critical problem lies in managing traffic congestion and allocating resources at container terminal gates, particularly during peak hours (Moszyk et al., 2021). These operational bottlenecks are key drivers of port digitalisation, which aims to support more coordinated, agile, and efficient logistics systems. In this context, the concepts of smart ports and smart gates have gained traction. A smart port integrates technologies such as the Internet of Things, Big Data, and Artificial Intelligence to optimise the logistical chain. Among its innovations, smart gates replace manual inspections with sensor- and camera-based technologies, reducing human intervention and enhancing operational control (Owusu-oware et al., 2023).

This research proposes the development of a Digital Twin (DT)based framework to enhance truck flow and operational efficiency in the context of smart gates. A DT is a virtual model that replicates physical systems in real time, enabling monitoring, simulation, and predictive analysis (Jiang et al., 2021). By facilitating dynamic visualisation and faster, data-informed responses to unexpected events, DTs can significantly improve decision-making and operational resilience. Although existing literature presents various DT architectures for ports (Yang et al., 2024), integration into gate operations for real-time decision support remains limited.

This project adopts the Design Science Research methodology, following an iterative process of design, prototyping, and validation. The research aims to establish best practices and provide a replicable framework, which will first be exemplified for the Port of Sines. The expected outcome is a validated DT artifact that will enhance gate performance, support port digitalisation, and promote sustainable, data-driven logistics planning.

Keywords: *Digital Twin, Simulation, Smart Gate, Port Logistics, Digital Transformation*

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Participação cidadã e resiliência climática: o papel dos laboratórios de inovação cidadã na governança urbana

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Abstract. Esta investigação analisa como modelos inovadores de participação cidadã contribuem para a construção da resiliência climática em contextos urbanos. Parte-se da emergência climática como expressão do principal desafio da humanidade no Antropoceno e da necessidade de modelos de governança adaptativos, policêntricos e colaborativos. Inserida nos debates sobre inovação democrática e transição socioecológica, a pesquisa propõe o desenvolvimento de um modelo de governança para a transição socioecológica, aplicado à avaliação crítica de laboratórios cívicos (LABICs). Através de estudos de caso em Matosinhos, Maia e Ílhavo, procura-se compreender se e de que modo os LABICs institucionalizam práticas participativas que ampliam a capacidade adaptativa local e fortalecem respostas públicas à crise climática. A metodologia combina análise qualitativa, com estudo de documentos estratégicos e entrevistas semiestruturadas com atores-chave. Pretende-se oferecer um contributo teórico original e ferramentas analíticas replicáveis, capazes de apoiar outras experiências de LABICs na catalisação da transição ecológica das cidades.

Keywords: *Resiliência Climática; Participação Cidadã; Governança Urbana; Inovação Democrática; Laboratórios Cívicos*

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Trajetórias de amamentação e políticaspúblicas: determinantes da amamentaçãoexclusiva até aos 6 meses

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Abstract. A amamentação exclusiva até aos seis meses é recomendada por entidades como a Organização Mundial da Saúde (OMS) e o Fundo das Nações Unidas para a Infância (UNICEF), pelos seus benefícios reconhecidos para a saúde infantil e materna (Meek ; Noble, 2022; UNICEF ; WHO, 2023). Para além da sua relevância em termos de saúde pública, a amamentação deve ser compreendida como uma prática situada socialmente, moldada por fatores sociais, económicos e institucionais. Neste contexto, as políticas públicas assumem um papel estruturante, não no sentido de prescrever comportamentos, mas de criar condições que respeitem e sustentem a autonomia das mulheres nas suas decisões (Tomori, 2023). Não obstante, a investigação nesta área tem privilegiado abordagens quantitativas e epidemiológicas, deixando menos explorada a dimensão subjetiva e contextual da decisão das mulheres mães.
Este projeto de doutoramento propõe-se analisar de que forma as políticas públicas dirigidas à parentalidade influenciam a decisão de iniciar e manter a amamentação em Portugal, identificando barreiras e fatores facilitadores com base nas perceções e experiências das próprias mulheres. A investigação adota uma abordagem qualitativa, organizada em duas etapas: 1. uma análise comparativa das políticas públicas de apoio à amamentação em Portugal e noutros países europeus; 2. entrevistas semiestruturadas realizadas em dois momentos: durante a gravidez e seis meses após o nascimento. A amostra incluirá 50 participantes, em linha com orientações metodológicas para estudos qualitativos com diversidade experiencial (Morse, 1994; Govindaraj, 2020).
Espera-se que o estudo contribua para o conhecimento sobre os determinantes sociais e políticos da decisão de amamentar e forneça evidência empírica útil para políticas públicas mais equitativas. Articula-se com os Objetivos de Desenvolvimento Sustentável da Agenda 2030 (ONU, 2015), sublinhando a importância de integrar os cuidados e a parentalidade nas políticas sociais.

Keywords: *nan*

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Governance and ombudsman in higher education

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Abstract. This research explores the relationship between higher education governance models and the implementation of the Student Ombudsman Institution. Grounded in institutional theory, it explores how governance structures influence the establishment, functioning, and variation of ombudsman roles across institutions. The study employs a qualitative, case-based methodology divided into three phases: a systematic literature review, document analysis of institutional statutes and ombudsman regulations and reports, interviews with student ombudsmen and focus groups with student representatives. By examining how the Portuguese governance model affects implementation choices and ombudsman roles, this research aims to fill a gap in the literature on the institutionalisation of ombudsmen in higher education. The findings may offer actionable insights for improving the design and implementation of ombudsman roles in higher education institutions. Additionally, insights gained may serve as a foundation for similar analyses in other national contexts, highlighting the relevance of governance in shaping the implementation of the Ombudsman.

Keywords: *Ombudsman, Governance, Models, Roles, Institutions.*

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A agricultura periurbana na promoção da segurança e sustentabilidade alimentar: o contexto português e brasileiro

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Abstract. A relação entre alimentação e cidades é crucial, dada a previsão de aumento da população urbana e a ameaça crescente das alterações climáticas à segurança alimentar e hídrica. As evidências empíricas mostram que os atuais sistemas alimentares são insustentáveis, impondo pressões ambientais em vários contextos, ao mesmo tempo em que indicam estes mesmos sistemas como fundamentais na transição para cidades mais resilientes.
Neste contexto, cresce o interesse sobre a agricultura periurbana (APU) enquanto uma das estratégias de transição para sistemas alimentares sustentáveis e integração territorial. A investigação sugere que a agricultura periurbana é particularmente vital para as zonas urbanas, proporcionando benefícios como o abastecimento alimentar, a conservação da biodiversidade, a atenuação de catástrofes e oportunidades de lazer. Entretanto, políticas direcionadas a essas áreas enfrentam obstáculos significativos, como definições conceituais e geográficas imprecisas, integração inadequada na gestão territorial e conflitos de uso do solo. Muitos estudos reconhecem a importância de políticas públicas para promoção da agricultura periurbana e ressaltam seus desafios. No entanto, poucos focam nos fatores que limitam a sua eficácia a nível local. Assim, este projeto de tese visa compreender os desafios para a eficácia de políticas públicas na promoção da agricultura periurbana como estratégia de segurança e sustentabilidade alimentar em dois contextos, o das cidades portuguesas e brasileiras.
Para atingir este objetivo será adotada uma abordagem qualitativa, recorrendo a estudos de casos. A recolha de dados será feita de forma indireta, por meio de informação documental e geográfica processadas com softwares como NVIVO e em sistemas de informação geográfica e de forma direta, através de entrevistas semiestruturadas com gestores públicos, agricultores e proprietários de terras. Espera-se, com isso, avançar no conhecimento sobre o tema, identificar as condições que favorecem a eficácia dessas políticas e contribuir para seu aprimoramento em contextos periurbanos específicos.

Keywords: *periurbanização; sistema alimentar; sustentabilidade ambiental; gestão territorial; políticas públicas*

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Urbis: unveiling the role of strategic environmental assessment in advancing climate-resilient bioeconomy strategies in urban areas

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Abstract. To address climate change challenges and advance sustainability, Bioeconomy has emerged as a promising strategy, particularly in urban areas, where resource consumption is concentrated. Bioeconomy strategies are increasingly integrated into urban policies. However, the effectiveness and sustainability of these strategies depend on rigorous impact assessments, particularly to evaluate their role in climate change mitigation and their potential effects on human health and the ecosystem. Strategic Environmental Assessment (SEA) offers a valuable tool to evaluate environmental and social impacts of policies at a strategic level, yet its application to bioeconomy strategies in urban planning remains understudied. This research addresses this gap by investigating the role of SEA in supporting the implementation of climate-resilient bioeconomy strategies in cities. It aims to understand how SEA can help overcome challenges such as biodiversity loss and environmental injustice, often associated with urban bioeconomy transitions. The research employs a multi-method approach structured in four work packages: (i) a Systematic Literature Review to map urban bioeconomy strategies, their challenges, and how SEA has been used to assess them; (ii) a multi-case study analyzing how bioeconomy policies are included and evaluated in Strategic Urban Plans of selected European cities; (iii) the development of a conceptual framework to guide the assessment of bioeconomy strategies via SEA; and (iv) validation of the framework through a Delphi study with international experts. Expected results include a critical synthesis of existing knowledge, empirical insights from urban plans, and a validated framework to strategically assess bioeconomy strategies using SEA. This output will support policymakers and planners in designing more sustainable and climate-resilient urban futures, contributing to several Sustainable Development Goals (SDGs), including SDG 11 (Sustainable Cities), SDG 13 (Climate Action), and SDG 15 (Life on Land). The study also aims to disseminate results through academic publications, conferences, policy briefs, and public engagement events.

Keywords: *nan*

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Centros académicos clínicos em portugal: integração entre ensino superior, investigação e cuidados de saúde

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Abstract. As reestruturações ao sistema de saúde português, introduzidas pelo Decreto-Lei nž102/2023, de 7 de novembro têm nos últimos anos redefinido profundamente a organização, gestão e prestação de cuidados de saúde, introduzindo novos mecanismos de articulação institucional. Esta evolução tem exigido uma articulação e integração cada vez maior entre os vários domínios partilhados da saúde. Neste contexto, surgem os Centros Académicos Clínicos (CAC) como estruturas colaborativas e de interligação, que integram em si saúde, investigação e Instituições de Ensino Superior (IES), e que procuram, através de uma abordagem holística e lógicas de cooperação, solucionar problemáticas associadas ao setor e promover sinergias entre si. A literatura indica a existência de desafios de governança associados a estas estruturas, nomeadamente a fragmentação das interações interorganizacionais e a ausência de liderança estratégica clara. No contexto português, embora existam antecedentes de ligações entre IES e prestadores de cuidados de saúde, essas ligações permanecem emergentes, em desenvolvimento e pouco estudadas, dificultadas pela inexistência de personalidade jurídica dos CAC e pela sua limitada autonomia operacional.
Assim, o presente estudo tem como principal objetivo analisar a conexão entre o Ensino Superior (ES) e a prestação de cuidados de saúde, analisando o CAC Egas Moniz Health Alliance (EMHA) como estudo de caso. O estudo adota uma abordagem metodológica mista para analisar o papel dos CAC na promoção da missão tripartida, visando identificar desafios estruturais e propor recomendações estratégicas para otimizar estas estruturas em Portugal, reforçando o seu papel como modelos integradores. Este estudo pretende oferecer contributos para a formulação de Políticas Públicas práticas, eficazes e relevantes.

Keywords: *nan*

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O papel da psp na implementação de políticas públicas para o envelhecimento da força de trabalho: desafios e estratégias

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Abstract. O envelhecimento da força de trabalho constitui um dos principais desafios estruturais da Polícia de Segurança Pública (PSP), num contexto profissional marcado por exigências físicas e psicológicas elevadas (Galanis et al., 2021), onde os polícias integram um grupo de risco acrescido em termos de morbilidade em saúde mental (Stanley et al., 2016). Embora o tema esteja em progressiva integração nas agendas de políticas públicas, permanece escassa a produção científica centrada no impacto deste fenómeno sobre o setor policial. Este projeto propõe-se analisar de que forma a PSP tem integrado políticas públicas orientadas para a valorização dos seus profissionais com mais idade e identificar os fatores que influenciam a decisão de prolongar a vida ativa entre polícias com idades entre os 50 e os 65 anos.
A investigação recorre a uma metodologia mista. A componente qualitativa será desenvolvida através da análise documental de enquadramentos legais, relatórios institucionais e literatura científica relevante. Em paralelo, a vertente quantitativa será operacionalizada com a aplicação de um inquérito por questionário aos polícias no ativo dentro da faixa etária definida, e com o tratamento estatístico dos dados sociodemográficos.
Espera-se que os resultados permitam compreender as dinâmicas internas da instituição perante o envelhecimento do seu efetivo, bem como os constrangimentos e oportunidades percebidas pelos próprios profissionais. As conclusões deverão fundamentar recomendações para o desenho de políticas públicas mais ajustadas à realidade da PSP, contribuindo simultaneamente para a sustentabilidade organizacional, a valorização da experiência acumulada e a manutenção da eficácia do serviço prestado à população.

Keywords: *Envelhecimento da força de trabalho, Gestão de recursos humanos, Políticas públicas; Sustentabilidade demográfica; Polícia de Segurança Pública.*

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Avaliação de políticas educativas cofinanciadas num período de mudança em portugal

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Abstract. This research falls within the field of public education policy and examines various stages of the policy cycle, with particular emphasis on monitoring and evaluation. Its overarching aim is to contribute to the advancement of Theory-Based Evaluation (TBE) methodologies, in dialogue with other relevant approaches. The focus is placed on the priorities of Portugal 2020 and the current measures under Portugal 2030 aimed at promoting educational success, domains that are central to the demonstrative and continuous assessment of education as a sector co-financed by European structural funds. It is in this context that the added value of the co-funded PIICIE Monitoring Project (POAT-01-6177-FEDER-000053) is mobilised. This project, which targeted a single place-based measure to tackle school failure, has sparked various reflections, particularly concerning methodological approaches with strong potential for integration into the TBE framework.

Keywords: *Evaluation of Public Policies; Education Policy; European Structural and Investment Funds (ESIF); Theory-Based Evaluation.*

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Research metrics integration in responsible research assessment

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Abstract. The increasing reliance on research metrics in assessment exercises (Hicks, 2012) has raised substantial concerns about their misuse, reductionism, and systemic consequences for research ecosystems (Ioannidis ; Boyack, 2020). This doctoral project investigates how research metrics can be responsibly integrated into research assessments to complement, rather than replace, peer review, while avoiding issues associated with metric-driven assessment methods. Grounded in the principles of responsible research metrics (RRM) and the broad approach to responsible research assessment (RRA), this project addresses both conceptual and practical challenges in aligning the use of metrics with transparency, openness, contextualization, diversity, inclusivity and robustness, while reinforcing their supportive role in complementing qualitative, peer-review-based assessments (Curry et al., 2022).

Structured as a compendium of four interrelated scientific articles, the research begins with a systematic literature analysis to examine the influence of foundational RRM reform documents, trace the evolution of thematic patterns, and identify major parallel reformist documents (Rushforth ; Hammarfelt, 2023). The second article presents a comprehensive content analysis of global policy texts to extract guiding principles and requirements for integrating metrics into RRA frameworks. Building on these findings, the third article proposes a conceptual model for responsible metric integration and presents a prototype of an open-source tool designed to support narrative CVs with contextualized metrics, using publicly accessible research information systems (Rushforth, 2025). The final article presents an empirical evaluation of the tool, involving experienced evaluators and evaluatees, to assess its usability, perceived value, impact, and alignment with RRA principles.

This project aims to inform and support the development of evidence-based public policies that promote open, fair, transparent, robust and context-sensitive research assessment systems, bridging the gap between policy-aligned principles and their practical application in promoting responsible research ecosystems and enhancing the public value of scientific research.

Keywords: *Research Metrics Issues; Responsible Metrics; Responsible Research Assessment*

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[PhD thesis project defense] Research project in mathematics

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Mixed dynamic equations and applications

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Abstract. Oscillations and non-oscillations in mixed differential equations with monotonic delays and advances have been studied in both continuous [Györi'1991; Pinelas 2009; Ferreira2010] and discrete-time domains [Kelley'2009; Agarwal 2013; Jekl 2020]. Results on an arbitrary time scales [Bohner'2001; Belarbi'2024; Belarbi'2025] are, however, scarce. In this thesis we propose to investigate Mixed Dynamic Equations (discrete-time difference equations, continuous-time differential equations and, more general, dynamic equations on time scales) with time and/or advanced delays and its possible applications. In concrete, in this PhD thesis we propose to:
* Generalize the work of [Agarwal2013] for the mixed-case investigated in [Ferreira2010]. In particular, we intend to find conditions for the existence of non-oscillatory solutions.
* Generalize the work of [Jekl2020] for the discrete-time equations studied in [Agarwal2013]. In particular, we intend to prove existence of positive solutions, which are crucial in applications [Belarbi'2025].
* Prove the coexistence of solutions investigated in discrete-time by [Ferreira 2010] in the mixed continuous time framework of [Pinelas2009].
* Unify and extend previous results to arbitrary time scales using the time-scale calculus [Bohner2001; Sousa'2023]. To the best of our knowledge, results on mixed dynamic equations on time scales are rare and much remains to be done.
* Investigate applications of the proposed models in mathematical modeling of diseases [Belarbi'2024; Das'2018].

Keywords: *discrete-time; continuous-time; difference equations; ordinary differential equations; dynamic equations on time scales; time-delays; mixed-type equations; mathematical modeling; oscillatory and non-oscillatory solutions; existence of positive solutions.*

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Analytical study of mixed-mode oscillations in multiple time scale systems

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Abstract. Dynamical systems with multiple time scales (fast-slow systems) are ubiquitous in several fields of study like biology, physics, epidemiology and more. These systems describe the evolution in time of variables where their derivatives have different orders of magnitude. This separation is introduced in the system with a time scale parameter that accounts for the ratio between the two time scales. Fast-slow systems are singular perturbation problems. Geometric singular perturbation theory provides a geometric approach to such systems [Kue15].
Current literature contains multiple works on FitzHugh-Nagumo (FHN) systems with several couplings. Mixed-mode oscillation (MMO) dynamics were found with coupling in the fast equations [KP23], and with weak coupling in the fast and slow equations [KAAa14]. Such dynamics is characterized by the existence of periodic solutions that exhibit oscillations with large and small amplitudes.
When coupling two FHN systems through linear diffusion in the slow equations, numerical evidence of MMO dynamics was found. Chaotic MMO dynamics appears when the coupling effect is only applied to one slow equation.
The analytical proof of existence of MMO and of chaotic MMO dynamics requires the use of complex tools. For the first coupled system, the difficulty arises in the analysis of small amplitude oscillations. These oscillations occur near a double fold singularity which is non-hyperbolic. To overcome this constraint, blow-up analysis is a natural way to follow. For the system with chaotic MMOs dynamics, the existence of chaotic attractors must be investigated. A general technique for proving the existence of chaotic attractors for three-dimensional models with two time scales is developed in [GWY06]. It is not clear whether this system verifies the conditions that guarantee the existence of chaotic attractors. The goal of this work is to develop the geometric approach to multiple time scale systems and obtain analytical results that explain the numerical evidence.

Keywords: *Mixed mode oscillations; Multiple time scale system; Chaos; Canard.*

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Unified framework for spatio-temporal ingarch models with zero-inflation, seasonality and covariates

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Abstract. Integer-Valued Generalized Autoregressive Conditional Heteroscedasticity (INGARCH) models are a common approach to model time series of counts by expressing its conditional expected value as a function of its past and past observations, possibly also including exogenous covariates (Ferland et al. 2006, Liboschik et al. 2017). These models have advanced significantly and are increasingly used in environmental health e.g. to assess the impact of time-varying environmental covariates on the daily number of hospital admissions within 20 km influence areas (Martins et al. 2021). These data often have non-stationary characteristics, exhibit seasonality and higher spatial resolution will result in counts that have an excess of zeros.
Although zero-inflated INGARCH models address excess zeros (Lee et al. 2021), they typically do not account for seasonality. This research aims to develop a unified INGARCH framework that integrates zero-inflation with seasonal components, using time-varying parameters and/or periodic functions. Furthermore, a spatio-temporal extension via a weight matrix that encodes information about the proximity of neighboring locations will be proposed. Simulation studies will be conducted to assess the performance of the estimation methods.
These novel models will be applied to model the daily number of hospital admissions at the Portuguese municipality level, using meteorological and air quality covariates, providing an estimate of their impact on the populations health. This integrated approach aims to provide both methodological and statistical advancements, along with a reproducible, data-driven method to objectively quantify environmental justice (EJ) across communities, ultimately helping to identify actionable insights into population health and social equity.

Keywords: *Time Series Analysis, INGARCH Models, Zero-Inflation, Seasonality, Spatio-Temporal, Environmental Justice*

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Assessing the feasibility of incorporating neural mobilization techniques into a physical exercise program for older adults with chronic musculoskeletal pain

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Abstract. Background and aims: Chronic musculoskeletal (MSK) pain has been associated with disability in older adults¹. An intervention that has been used to improve pain and disability is neural mobilization (NM)^{2,3}. However, few studies have investigated its effectiveness in older adults. Therefore, this 2-arm pilot study aimed to evaluate the feasibility and acceptability of using active NM integrated into an exercise program for community-dwelling older adults with chronic MSK pain (primary aim) and the impact of NM on pain and disability (secondary aim).
Methods: The control group (CG) received an 8-week exercise program (twice a week), while the experimental group (EG) received the exercise program plus NM. Adherence and dropout rates were registered. Acceptability was assessed through focus groups. Pain intensity and disability were measured using the Portuguese version of the Brief Pain Inventory.
Results: Thirty participants were included (EG=14; CG=16). Adherence rates were above 90% and dropout rates were below 15% in both groups. Adjustments to the NM protocol had to be made during the intervention program. Participants from both groups considered that the intervention was appropriate for their condition and that its components met their needs. There were no relevant differences in reports between participants in both groups, showing that participants did not know which group they belonged to. There was no interaction effect (time/group) for pain (p = 0.36) and disability (p = 0.78).
Conclusions: Adherence rates were high and dropout rates were low. NM was well accepted and can be used considering that adjustments were made to suit the participantt's abilities. The results suggest that active NM integrated in an exercise program will be viable in a future RCT.

Keywords: *pilot trial, older adults, chronic musculoskeletal pain, neural mobilization.*

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Measurement properties of a cognitive web-based test

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Abstract. Cognitive performance depends on multiple factors (e.g., age, education, and health status) and may differ between full cognitive functioning and high impairment. Measuring cognition is necessary for identifying and monitoring cognitive deterioration.

Traditional instruments are often ineffective for large-scale cognitive screening and continuous monitoring. Innovative digital tests capable of monitoring cognitive functioning and scalable to large populations have recently been developed. Such digital instruments must demonstrate reliability and validity, key measurement properties of any measurement instrument.

This study investigates the measurement properties of a digital test, the Brain on Track (BoT), for longitudinal cognitive assessment in the general population.

Participants were recruited from a population-based cohort (n = 639 participants). Sociodemographic (e.g., sex, age, and education) and cognitive data were collected. Cognitive data included the Montreal Cognitive Assessment (MoCA) and the BoT, a self-administered, web-based test for cognitive assessment. BoT was administered in four different time points throughout a 1-year period in a subsample of participants. BoTs measurement properties, including internal consistency, test-retest reliability, measurement error (Standard Error of Measurement, Smallest Detectable Change and Bland-Altman plots), criterion validity, and structural validity, were evaluated.

The BoT test demonstrated good internal consistency, as indicated by a Cronbachs alpha of 0.83. The Intraclass Correlation Coefficient for test-retest reliability was 0.91, the Standard Error of Measurement was 16.28, and the Smallest Detectable Change was 45.13, suggesting good reliability and acceptable measurement error. A symmetrical distribution around the mean was observed in the Bland-Altman plots, indicating an absence of bias. The BoT showed a moderate positive correlation with the MoCA total score (r = 0.51) for criterion validity. Exploratory Factor Analysis results suggest a unidimensional structure.

Keywords: *Cognitive assessment; measurement properties; digital solutions*

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Institutionalization in aging: an exploratory study on the wishes of older adults and their families

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Abstract. Aging is one of the most significant challenges of the 21st century. Portugal, as the fourth most aged country globally and second in Europe, exemplifies this demographic shift. While increased life expectancy provides opportunities for personal development, it is often accompanied by chronic conditions requiring long-term care. Families typically act as primary caregivers, sometimes supported by home care services. When care needs intensify, Long-Term Care Units and Residential Care Homes (ERPI) become necessary alternatives. Understanding families and dependent older adults perceptions of institutionalization is crucial, as such decisions often arise from a lack of options to meet physical, emotional, or behavioral needs. Given limited research in this area, it is essential to also consider older adults own perspectives when facing potential institutionalization. This study aims to identify the desire for institutionalization and its predictors from both family and older adult perspectives. By adopting a mixed-methods design, this research includes both qualitative and quantitative approaches, structured in three tasks:
1. A qualitative study exploring perceptions of community-dwelling older adults regarding institutionalization, through semi-structured interviews.
2. A cross-sectional, observational, descriptive-correlational study on the desire for institutionalization and its predictors among family caregivers of older adults on ERPI waiting lists, using semi-structured interviews and questionnaires.
3. A cross-sectional study with older adults on ERPI waiting lists, employing semi-structured interviews and questionnaires.
Data for the second and third tasks will be collected in northern Portugal through facilities affiliated with the União das Misericórdias Portuguesas. Challenges are anticipated, especially regarding family caregiver participation and access to dependent older adults.
This study is vital for improving care responses and informing public policies addressing the true needs of an aging population. The results are expected to guide future strategies for funding care infrastructures and interventions facilitating the transition from home to institutional care.

Keywords: *Desire for institutionalization, Older adults, Family caregivers, Residential Care Home Structures*

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Health-related quality of life in older stroke survivors: a longitudinal study in an integrated continued care unit in portugal

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Abstract. Stroke is a serious clinical condition and one of the leading causes of death and disability in Portugal and worldwide. Stroke survivors may experience physical, cognitive, emotional, or social complications that negatively impact their health-related quality of life (QoL). Integrated Continued Care Units can play a key role in the holistic recovery of individuals, based on a biopsychosocial approach oriented toward rehabilitation.

An observational, longitudinal, and descriptive-correlational study was conducted to assess the health-related quality of life of stroke survivors over the age of 65 living in the central region of Portugal. Data were collected at four time points: upon admission to the hospital unit, on the seventh day of admission to the Integrated Continued Care Units, and during two follow-up stages at 6 and 12 months.

Considering follow-up losses, a total of 128 individuals were included (mean age 71.5 years; 62.3% men). Ischemic stroke was the most prevalent type, and the most common comorbidities included hypertension, dyslipidemia, and diabetes. Over the follow-up period, significant improvements were observed in neurological function, overall functionality, gait, and swallowing, as well as a reduction in severe aphasia. Functional recovery was accompanied by an improvement in HRQoL, particularly in the social and mental dimensions, although high levels of anxiety, depression, and caregiver burden persisted.

This study underscores the importance of implementing dynamic and personalized rehabilitation programs with a sustained, multidimensional approach. It also highlights the relevance of Integrated Continued Care Units in providing coordinated care, supporting rehabilitation, and promoting family reintegration. There is a clear need for greater investment in generating evidence on effective post-stroke rehabilitation interventions, as well as in identifying regional disparities in services across Portugal

Keywords: *Stroke; Quality of Life; Integrated Continued Care Unit; Rehabilitation*

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Unmet social needs of community-living older adults with dementia: a scoping review

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Abstract. Background: Unmet social needs in community-living older adults with dementia remain underrecognized (Van Aerschot et al., 2022), despite growing acknowledgement of their importance in healthy ageing. Dementia-related cognitive decline and ageing-related challenges impact their ability to engage in social activities and maintain relationships (Costa et al., 2022). Recognizing and addressing unmet social needs is essential, as they are associated with a lower quality of life (Black et al., 2013).
Objective: To map the existing evidence on the unmet social needs of community-living older adults with dementia, including how these needs vary across different stages of dementia.
Methods: A scoping review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) and Joanna Briggs Institute (JBI) guidelines. Four databases (PubMed, Scopus, Web of Science and Academic Search Complete) were searched for publications from year 2000 to April 2025, in English, Portuguese and Mandarin, resulting in 24 included articles.
Results: Seven themes of unmet social needs were identified: (i) participation in out-of-home activities, (ii) support for maintaining independence in daily life (iii) companionship, (iv) meaningful relationships, (v) respectful and dignified social interactions, (vi) emotional support, and (vii) social needs during the pandemic. Differences were observed across the stages of dementia. In early stages, unmet social needs clustered around participation in out-of-home activities. In later stages, needs related more to daily activities, companionship and emotional support.
Conclusion: Some social needs identified in this review are under-represented in commonly used instruments. Unmet needs evolve across the stages of dementia, shifting from active social participation to greater reliance on structured environments, and are influenced by relational, socio-cultural and structural factors. Future research should aim to include individuals in more advanced stages, from diverse socioeconomic backgrounds, and explore coping strategies from the perspectives of older adults with dementia themselves.

Keywords: *Dementia, Neurocognitive disorder, Unmet needs, Social, Participation, Community- living, Older adults.*

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Factors contributing to screen exposure in preschool children and its associated outcomes: preliminary findings of a systematic review

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Abstract. With the aim of synthesizing the existing evidence on the reasons that lead to prolonged screen use in preschool children and to identify its developmental outcomes, a systematic review was conducted. Following the PRISMA 2020 guidelines and using four electronic databases, 124 observational studies published between 2017 and 2025 were included. Data were analyzed through the lens of the Dimensional Model of Early Experience.

The preliminary results revealed that parental behaviors, such as excessive parental screen use, phubbing, and lack of screen-time rules, predominantly lead to prolonged screen exposure in preschoolers. Additionally, contextual risk factors (e.g., low socioeconomic status and lower parental education) along with child-level characteristics (e.g., easy screen accessibility), were significant contributors to prolonged screen exposure. In contrast, only a small proportion of studies reported protective factors, including parental limitations on screen use, shared reading practices, and educational screen engagement.

A total of 126 adverse developmental outcomes were preliminarily identified, with language delays, cognitive deficits, psychosocial difficulties, obesity risk, and impaired sleep being the most prevalent. A minority of studies (10) highlighted potential benefits when digital media was used intentionally and interactively within supportive environments.

This first round analysis highlights the significance of context, content, and parental mediation in shaping the effects of screen exposure. It suggests that early screen exposure is a complex phenomenon shaped by multiple determinants, highlighting that prolonged and uncontrolled media use can lead to developmental delays but also that intentional and mediated media interaction can support developmental benefits.

Keywords: *screen time; risk factors; protective factors; child development*

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Efficacy of a speech and language therapist-led breastfeeding intervention for migrant women

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Abstract. Migrant women often face challenges to breastfeeding, including linguistic and structural barriers that limit access to adequate support (Jack et. Al., 2024). This research addresses how culturally responsive, interdisciplinary interventions, led by a speech and language therapist (SLT), can improve breastfeeding outcomes. The study has 5 phases. 1) The investigation began with a systematic review identifying limited and methodologically weak interventions targeting migrant mothers. Remarkably, none involved SLTs, despite their expertise in infant feeding. 2) Then, a cross-sectional survey with migrant women in Lisbon (n = 20) confirmed these findings: only 40% received antenatal counselling, and many showed fair levels of knowledge (50%), attitudes (70%), and practices (60%) around breastfeeding (Lopes ; Lousada, 2024). 3) In response, a culturally adapted intervention program was designed and delivered by an SLT, whose feasibility, acceptability, and effects were assessed in a pilot study (n = 18). Breastfeeding self-efficacy improved significantly (M = 55.6 to 67.2; t(15) = 5.89, p < 0.001), as maternal postpartum quality of life (M = 62.3 to 72.1; t(15) = 6.23, p < 0.001). Exclusive breastfeeding rates reached 100% at 1, 3, and 6 months. Participants described the intervention as trustworthy, inclusive, and empowering (Lopes ; Lousada, 2025). 4) Later, a survey of healthcare professionals working in primary care (n = 53) revealed that 62.3% lacked access to SLTs and 71.7% rarely or never referred infants with breastfeeding challenges, despite acknowledging the relevance of SLT involvement. These findings underscored systemic barriers to interdisciplinary collaboration and highlighted the need to strengthen evidence for SLT-led interventions. 5) In response, a randomized controlled trial (n = 74) is currently underway to rigorously evaluate the interventions effectiveness against standard care. Early trends confirm the pilots results. Altogether, this research highlights the potential of SLT-led breastfeeding interventions to reduce health inequities.

Keywords: *Speech-Language Pathology, Breast Feeding, Transients and Migrants, Health Inequities, Primary Health Care*

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Electron beam welding optimization for copper pipe joints in advanced thermal systems

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Abstract. As the demand for efficient thermal management systems increases, particularly in HVAC and heat pump applications, the reliability of copper pipe joints becomes crucial. Conventional joining methods, such as manual or semi-automated brazing, remain common but are often associated with inconsistent quality, fatigue failures, and potential refrigerant leakage. Electron Beam Welding (EBW) has emerged as a high-precision, vacuum-based technique that produces deep, clean welds with minimal defects, making it suitable for both copper and dissimilar metal joints. However, coppers high thermal conductivity and low electron beam absorptivity present challenges, including heat loss and keyhole instability during welding, particularly in circular pipe applications where geometry influences complex heat flow (Kanigalpula et al., 2018). Experimental investigations on oxygen-free copper pipes show that complete fusion requires precise adjustment; a beam current of 9.5 mA at 55ř/s yields optimal results, while slight parameter changes can cause incomplete bonding. Studies have quantified beam currents impact, showing it accounts for over 80% of bead width variation and half of penetration depth in Cu-Cr-Zr joints (Kanigalpula et al., 2016). Controlling these variables, alongside oscillation and tailored travel speeds, is vital for minimizing defects in tubular geometries. Future research will focus on integrating advanced preheating protocols to moderate thermal gradients and enhance weld stability in circular configurations. Preheating reduces porosity and prevents keyhole collapse at elevated welding speeds. Additionally, dynamically adjusting welding speed will be explored to maintain thermal equilibrium throughout the weld path. These innovations aim to stabilize the melt pool and promote uniform microstructure for copper pipe assemblies in demanding thermal environments. Such process optimization will accelerate the transition from traditional brazing to EBW, delivering superior mechanical strength and reliability for next-generation energy systems, while supporting digital automation in advanced welding operations (Choudhury ; Chandrasekaran, 2023; Pavlík et al., 2023).

Keywords: *electron beam welding, copper pipes, copper joining, process optimization,heat pumps*

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Electromagnetic compatibility in thermoformed magneto-piezoelectrets: modeling and functional characterization

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Abstract.
Thermoformed magneto-piezoelectrets (MPTs) represent an innovative class of lightweight and flexible transducers, offering simultaneous response to mechanical, electrical, and magnetic stimuli. These devices combine air-filled tubular cavities with magnetized vinyl layers, enabling their application in current sensing, structural monitoring, and energy harvesting (Santos et al., 2024; Altafim et al., 2012). Despite their potential, their functional stability under electromagnetic interference (EMI) remains insufficiently studied, hindering integration in electronic systems exposed to harsh environments (Paul, 2006).
This work proposes a comprehensive investigation of the electromagnetic compatibility (EMC) of MPTs, focusing on their behavior under external electric and magnetic fields. The fabrication process involves thermoforming fluorinated ethylene propylene (FEP) films using laser-structured polytetrafluoroethylene (PTFE) molds, creating organized tubular channels. A magnetic vinyl layer is then laminated into the polymer stack, as established by the teams prior work (Santos et al., 2024; Altafim et al., 2012).
Functional characterization will include piezoelectric (d) and magnetoelectric (dpm) response measurements, as well as electrical, mechanical, and thermal stability analysis using methods such as laser Doppler vibrometry and electric field sensing (Santos et al., 2025). Additionally, 3D multiphysics modeling will be carried out in COMSOL® to simulate the coupled electro-magneto-mechanical behavior of the devices and optimize internal geometries.
To assess EMI resilience, the MPT prototypes will be tested according to IEC/IEEE international EMC standards (e.g., IEC 61000-4-2), with emission and immunity evaluations under controlled laboratory conditions. The outcomes will support the development of robust, EMI-tolerant sensors for critical environments, contributing to future technical guidelines and the standardization of piezoelectret-based transducers.

Keywords: *Thermoformed piezoelectrets; electromagnetic compatibility; multifunctional sensors; IEC/IEEE standards*

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Desenvolvimento de piezoeletretos avançados para aplicações de engenharia

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Abstract. This research project focuses on the development of innovative piezoelectrets with potential for engineering applications, such as electromechanical actuators, sensors, and energy harvesters (Ramadan, Sameoto, ; Evoy, 2014). Piezoelectricity is the property of certain materials to generate an electric voltage when subjected to mechanical stress, or to deform when exposed to a strong electric field (Bailato, 1996). This phenomenon forms the basis for a wide range of technological and engineering applications. Since the discovery of the piezoelectric effect in quartz crystals, a long path of technological evolution has led to the development of the first devices based on synthetic polymers (Pukada, 2000). Layered devices composed of thin films fabricated through thermoforming processes have emerged as a promising area that aligns closely with global trends in innovation and sustainability (Altafim et al., 2006). One of the main objectives of this research plan is to increase the effective area of the fabricated samples without compromising their efficiency or performance. Due to either equipment limitations or scientific challenges, the samples produced so far have small dimensions (approximately 2 cmš). From an operational standpoint, this restricts their applicability on large surfacessuch as in the aerospace industry and wind energy systemswhere the piezoelectric effect could be used for structural vibration monitoring (Holzmann, Schmelz, Atzrodt, ; Park, 2021). This operational limitation hinders the application of these materials over large areas. The success of this study will represent an important contribution to the development of strategies that promote energy efficiency and innovation in a sustainable manner.

Keywords: *Piezoeletretos Termoformados, Polímeros, Processos de termoformação*

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Monitoring of energy efficiency in power transformers with magneto-piezoelectret transducers

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Abstract. Since the discovery of piezoelectricity by the Curie brothers in 1880, electroactive materials capable of retaining permanent charge have evolved, from electrets to the structural ferroelectrets of Bauer et al. (2004). The thermoforming technique was introduced in 2010 and refined in 2015 by Assagra, producing lightweight and efficient polymeric piezoelectrets. The combination of piezoelectric and magnetic responses led to the development in 2021 of the Thermoformed Magneto-Piezoelectrets (TMP) by Altafim and Santos.

This doctoral research project proposes the development and validation of a system for monitoring electrical energy losses in Power Transformers, using the TMP transducer under development (not yet commercialized), which simultaneously possesses piezoelectric and magnetic characteristics. The scientific contribution to advancing the state of the art is related to the detection of magnetic variations associated with electrical energy losses, with an emphasis on applying electronic, digital, and mathematical techniques for signal filtering in order to separate vibrational components from magnetic ones and derive the transducers operating curves.

The mathematical modeling of the transducer's behavior will be carried out, correlating the output signal with the magnetic field, enabling the characterization of losses. It is expected that this system will contribute as an additional viable tool for monitoring energy efficiency and reducing electrical waste in power systems, offering an innovative and sustainable solution. The project will involve the prototyping of transducers with testing of new materials, laboratory trials, data collection and analysis, field testing, and comparisons of the results with existing commercial systems.

Keywords: *Loss detection, Energy efficiency, Transducer modeling, Signal processing, Power systems*

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Characterization and computational modeling of 3d printed structure via fused filament fabrication

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Abstract. Additive Additive Manufacturing (AM) have been showing significant advantages on raw materials saving, fast operation, and customized geometries for complex structure components [1]. The final properties of 3D printed parts differ from those of parts fabricated by the traditional manufacturing methods, mainly due to the variation of their mesostructures, such as anisotropy, internal void array and infill design. In the present work, a multiscale analysis of fused filament fabrication 3D printed carbon nanotube (CNT) reinforced polylactic acid (PLA) composites was developed. In macroscale, homogeneous FEM model and model considering internal void array were built. With more accurate modeling, the later model showed closer numerical results to experimental results than the homogeneous one, while taking more consumption, which could not be extended to complex and large-scale engineering cases. In mesoscale, the mesostructure of layers of the printed parts was considered for finite element modeling of the representative volume element (RVE), and to determine their elastic moduli. The mechanical behavior of the printed parts is governed by the constitutive behavior of the material. The constitutive material modeling of the printed parts using numerical homogenization procedure is emphasized in this work. The elastic moduli of the present method accurately characterized the mechanical behavior of printed parts using laminate theory. Since the filler chosen in the present work is CNT, which cannot be characterized in mesoscale model, therefore, nanoscale modeling considering geometry and distribution of CNT was also carried out. The effect of CNT walls, CNT numbers, curvature, wave numbers, wave direction of CNT on elastic moduli of nanocomposites. In summary, the multiscale computational models provided more insights on the final properties of 3D printed parts for different materials, representing an important step towards enabling the effective design and analysis of 3D printed structures using both experimental investigation and computational methodology.

Keywords: *Additive manufacturing; Mechanical properties; Carbon nanotube; Microstructure; Multiscale analysis*

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Driving innovation: circular city initiatives and the adoption of modular integrated construction (mic)

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Abstract. Circular City Initiatives are emerging as a critical framework for addressing global sustainability challenges in urban development. These initiatives aim to create self-sustaining urban ecosystems by closing material and energy loops, reducing environmental impacts, and fostering systemic regeneration. However, achieving these ambitious goals requires innovative methodologies to address urban complexities. Modular Integrated Construction (MiC) presents a promising solution, offering prefabricated and modular approaches that reduce waste, improve efficiency, and support adaptability in urban infrastructure. This study systematically evaluates the role of MiC in advancing Circular City Initiatives through a structured literature review (SLR). This research uncovers significant potential for MiC to contribute to circular principles, such as reducing urban resource consumption, enabling material reuse, and minimizing construction-related environmental impacts. The findings revealed that MiC aligns with key circular city objectives, including the adaptability and lifecycle efficiency of built structures. However, significant barriers such as regulatory constraints, high initial costs, and fragmented adoption frameworks hinder their widespread implementation. Despite their alignment, the integration of MiC into Circular City Initiatives remains underexplored. The existing literature often treats MiC and circular cities as separate domains, lacking a cohesive framework to unite them. This research addresses this gap by emphasizing the importance of understanding MiCs potential to enhance circular urban systems and drive sustainable innovation. By synthesizing insights from the literature and stakeholder perspectives, this study provides actionable recommendations to overcome these challenges. It identifies critical success factors, including the need for standardized guidelines, policy support, and stakeholder collaboration, to maximize the impact of MiC on urban sustainability.

Keywords: *Circular City Initiatives, Modular Integrated Construction (MiC), Urban Sustainability.*

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From simulation to solution: improving in-mould electronics through advanced moulding control

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Abstract. In-mould Electronics (IME) is an advanced technology that integrates printed electronic circuits into plastic parts during injection moulding. It merges the flexibility and material savings of printed electronics with the large-scaling capabilities of injection moulding. IME has benefits such as lower weight and thickness, fewer assembly steps, and lower material and energy consumption, which leads to an eco-friendly electronics industry. However, this process faces challenges, especially with complex shapes like high thickness gradients along the IME components and the need for surfaces without defects due to issues arising from embedding the electronic films.

Numerical simulation can help with these issues by enabling precise process parameter tweaking and defect minimization. This study aims to assess and improve the quality of IME components. Therefore, Autodesk Moldflow Insight (AMI), a multi-physics simulation tool for polymer processing, was used to numerically simulate the moulding stage of the IME process focusing on rheological modelling. The study investigated the filling patterns, the pressure distribution, and the clamp force by aiming to achieve an even flow and reduce defects like weld lines and warpage. Also, temperature evolution through the insert and at the insert/substrate interface was studied to ensure it wasn't damaged during the process.

The simulations results showed that using sequential valve gates significantly improved the plastic flow, reduced weld lines by minimizing or moving them to less critical areas, and improved dimensional stability of the part. This study highlights that numerical simulation, combined with techniques such as sequencing valve gates, is a valuable tool for predicting defects and finding the best processing conditions to improve the quality of IME components.

Keywords: *In-mould electronics, Injection moulding, Numerical simulation, Autodesk moldflow insight*

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Effect of material reprocessing on the thermo-induced bending of 4dprinted polylactic acid/thermoplastic polyurethane structures

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Abstract. 4D printing combines additive manufacturing with stimuli-responsive materials to produce structures that change shape over time. When combined with certain plastics, this technology enables the creation of low-cost, lightweight, and programmable mechanisms. It shows great potential in fields such as soft robotics, biomedical devices, deployable systems, and smart textiles, where time-dependent responsiveness is essential (Aldawood, 2023). Typically, the intelligent behaviour of such structures is embedded during the printing process through geometric design, material selection, spatial distribution, and even specific printing parameters. This behaviour is then activated post-fabrication by external stimuli such as heat. While significant progress has been made in enhancing the functionality of 4D printed systems, the use of reprocessed polymers has received little attention. These materials may offer new opportunities to tailor the mechanical response or even activation dynamics of shape-morphing structures. However, it remains unclear how reprocessing affects key functional parameters such as curvature magnitude and actuation timing in 4D printed components. This work proposes to evaluate the effect of reprocessing cycles on the functional response of PLA (polylactic acid)/TPU (thermoplastic polyurethane) bilayer structures. The aim is to assess if reprocessed materials (Romani et al., 2024; Smorawska et al., 2023) can still produce controlled curvature and retain time-dependent responsiveness. To address this, bilayer strips will be fabricated using Fused Deposition Modelling (FDM), both with virgin and reprocessed PLA and TPU. Recycled filaments will be obtained by grinding and extruding previously printed parts. Samples will be exposed to a thermal stimulus, and curvature will be tracked over time using image analysis. The materials will be characterised in terms of mechanical, thermal, viscoelastic, and rheological properties. It is expected that due to thermal and mechanical degradation, reprocessed materials will exhibit diminished curvature and slower activation response. However, the results will clarify their functional viability for sustainable 4D printing applications.

Keywords: *Polylactic acid, Thermoplastic polyurethane, Reprocessed polymers, 4D printing*

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Time series classification using parallel cnns: method and application in industrial spark quality assessment

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Abstract. Recent years have seen a widespread digitalisation in industry, with technologies such as Internet of Things, Digital Twins, and Machine Learning (ML) increasingly employed to automate industrial data acquisition, organisation and processing (Rai et al., 2021). Within processing, Deep Learning (DL) methods have shown great promise in automating various industrial tasks, including time series forecasting and anomaly detection (Zhang et al., 2021; Tan et al., 2020). Among these, time series classification - assigning labels to short sequences of data over time - remains relatively underexplored despite its relevance to numerous domains, including healthcare (e.g. disease diagnosis), finance (e.g. fraud detection), and manufacturing (Ismail Fawaz et al., 2019).

This work proposes a novel DL architecture for time series classification, validated on a real-world use case: assessing ignition spark quality from electrical signals in collaboration with Bosch Termotecnologia S.A. A Parallel Convolutional Neural Network (Parallel CNN) is introduced. Unlike standard CNNs, which only leverage the final convolutional feature map for classification, this architecture concatenates the outputs from each convolutional operation, directly using all information for the classification task. This multi-scale design captures short-, medium-, and long-term dependencies by using varied kernel and filter sizes, thereby improving feature representation for subsequent classification. The Parallel CNN was benchmarked against several models: Logistic Regression, XGBoost, and four DL architectures Multilayer Perceptron (MLP), dense neural network with dropout, standard CNN, and GRU-based recurrent neural network (RNN). Experiments on three publicly available datasets and the industrial use case showcase improved training stability, better generalisation capabilities, lower overfitting, and consistent 1-5% performance gains over a standard CNN. Furthermore, training and inference times are considerably smaller than those of the RNN. In addition, to support deployment, a Docker-based simulator was developed emulating the factory shop-floors environment, validating the practical viability of the proposed model and overall framework for real-time implementation.

Keywords: *Parallel CNN; Deep Learning; Time Series Classification; Industrial Digitalisation*

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Development of a continuous processing strategy for thermoplastic starch foams

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Abstract. Imagining a future without plastic pollution has driven the development of alternative materials and scalable processing strategies that reduce environmental impact without compromising functionality. In this context, thermoplastic starch (TPS) has gained attention for its use in loose-fill foam packaging, where it has gradually replaced foamed polystyrene by combining effective cushioning with low cost and biodegradability. To expand TPS foam applications and enable its broader adoption alongside conventional plastic foams, further technological development focused on scalable processing strategies and consistent material properties is required. This work pioneers a continuous extrusion-based approach for producing bio-based TPS foams, aiming to bridge the gap between laboratory-scale innovation and industrial implementation. The goal is to establish a robust and stable process capable of producing lightweight, bio-based foam structures with reliable performance. The experimental design explores the optimization of key variables, including plasticizer content, temperature profiles, and blowing agent concentration, to fine-tune melt rheology and foam expansion behavior. Preliminary results indicate that foam morphology and expansion are highly sensitive to the interaction between material formulation and processing parameters. Initial trials demonstrated stable extrusion with partial foaming, revealing critical factors influencing cell nucleation and growth, while challenges such as cell coalescence and collapse remain. These findings provide a foundation for advancing biodegradable foams in continuous and scalable processing technologies, marking an important step toward industrially viable alternatives to fossil-based foamed plastics and further contributing to the broader transition toward circular and sustainable materials.

Keywords: *extrusion foaming; twin-screw processing; starch-based materials; biodegradable packaging; circular economy*

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Demand forecasting in the automotive industry using ai and statistical methods: a systematic literature review

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Abstract. The automobile industry is one of the worlds largest manufacturing sectors and a key contributor to economic growth. In the European Union (EU) it represents over 7% of EU GDP and employs around 13.8 million people, 6.1% of total EU employment (European Commission, 2022). As in many industries, demand forecasting plays a critical role in supply chain management within the automotive sector. Reliable forecasts are essential for production planning, inventory control, and meeting market demands efficiently. Despite advancements in forecasting techniques, accurately predicting demand remains a persistent challenge due to the impact of numerous external factors.

Most of the existing literature reviews on the demand and sales forecasting are primarily focused on specific sectors such as power, tourism and fashion industries (Kopyt, 2020; Swaminathan ; Venkitasubramony, 2024). To date, no studies or reviews have been found that focus specifically on forecasting within the automotive industry. This systematic literature review seeks to fill this gap, and aims to identify, organize and summarize published scientific research on forecasting in the automotive industry. The review spans a range of forecasting approaches, including traditional statistical methods such as Autoregressive Integrated Moving Average (ARIMA), as well as advanced artificial intelligence techniques like artificial neural networks and long short-term memory (LSTM) models. Additionally, it explores the various external variables influencing demand and highlights recurring challenges reported in the literature, such as issues related to forecasting horizons and integration of diverse data sources.

The review concludes by outlining future research directions aimed at enhancing the accuracy and adaptability of demand forecasting models, with a focus on integrating external variables and leveraging emerging AI-based technologies.

Keywords: *Automotive industry, Demand forecasting, Artificial intelligence, Statistical forecasting methods, Neural networks, Supply chain management*

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Peek and alumina composite structures using polymer-infiltrated ceramic network (picn) process

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Abstract. This work presents the investigation and development of a hot-pressing system for the manufacturing of high-performance composite materials. The system is designed to optimise the processing of engineering thermoplastics, particularly PEEK (polyether-ether-ketone) infiltrated on digital light processing alumina gyroid structures, using the polymer-infiltrated ceramic network (PICN) process (Fabris et al., 2019; Zhang et al., 2024), for use in demanding impact applications, as in protective, automotive, and aerospace sectors.

The research involved the design, implementation, and validation of an experimental setup capable of simultaneously applying heat, pressure, and vacuum in a controlled and repeatable manner. A series of parametric tests were carried out to assess the influence of different processing conditions on the final quality of the molded parts, with a particular focus on the density and interfacial adhesion of the final parts (Pomès et al., 2021).

The results show that the correct application of temperature and pressure during hot pressing contributes significantly to reducing internal porosity and improving the structural integrity of the parts. Microstructural and dimensional analyses validated the effectiveness of the proposed system, highlighting its potential for future industrial applications in the production of advanced composite components.

This work represents a valuable contribution to the advancement of composite forming technologies, via the polymer-infiltrated ceramic network (PICN) process, offering practical solutions to improve product quality and feasible process.

Keywords: *PEEK, Alumina gyroid structures, Polymer-infiltrated ceramic network (PICN), Composites*

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Enhancing constitutive model calibration through a novel strain path changing test

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Abstract. Accurate modelling of material behaviour is essential for reliable numerical simulations in sheet metal forming. Since forming operations often consist of complex strain states and strain path changes, conventional mechanical tests, which are limited to constant stress states, are not sufficient in providing the complete material behaviour. To overcome this, novel testing methods were developed that introduce heterogeneous strain fields and employ full-field measurements with techniques such as Digital Image Correlation (DIC) and coupled with inverse identification procedures such as Finite Element Model Updating (FEMU). This integrated approach, popularly referred to as Material Testing 2.0 (Pierron ; Grédiac, 2021), enables the calibration of advanced constitutive models using fewer enriched with kinematic data.
This work presents a new mechanical test that can change the strain path during the test without unloading the specimen. The intention is to mimic the non-linear path of strain encountered in real forming processes and evaluate their influence on parameter identifiability for anisotropic elastoplastic models. The performance of the test is evaluated using numerical simulation concerning a benchmark of the Arcan test. Two heterogeneity criteria (Souto, Thuillier ; Andrade-Campos, 2015; Oliveira, Thuillier ; Andrade-Campos, 2022) are used to assess the richness of the strain fields. Material parameters for dual-phase steel are determined via FEMU, and the calibration quality of both tests is compared. Synthetic speckle patterns are generated based on FEA results and processed using DIC to produce synthetic strain fields, making the numerical analysis more representative of real experiments. The results show that the new test offers more complex and representative strain paths, yielding higher sensitivity to material anisotropy and leading to more robust constitutive model calibration. It contributes towards the development of more precise digital twins in metal forming operations.

Keywords: *Sheet metal forming, Inverse identification, Strain path changes, Heterogeneous test, Anisotropic plasticity.*

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Towards virtual forming and design: standardization of material characterization and numerical model calibration through material testing 2.0

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Abstract. Abstract-
Mechanical material characterization is a cornerstone of mechanical design, engineering, and innovation. Although classical mechanical tests remain widely used, they rely on outdated standards and a one-dimensional mindset that fails to capture the complexity of material behavior, particularly in metal forming processes (Dixit, 2020).
This PhD project aims to advance standardization of material characterization and numerical model calibration through the emerging Material Testing 2.0 (MT2.0) (Pierron et.al., 2021) framework. It will develop both updated and new test standards for homogeneous and heterogeneous tests, exploiting full-field measurements and advanced metrology tools such as Digital Image Correlation (DIC) (Grediac, 2004). Emphasis is placed on dual-phase steels (Goncalves et.al., 2023), validated through combined numerical and experimental campaigns.
Expected outcomes include improved material behavior indicators, standardized MT2.0 test protocols, and robust model calibration methodologies. These advances will promote a faster and more reliable MT2.0 adoption by industry, enhance simulation accuracy, reduce development costs, and contribute to future international standardization efforts in material testing.
The results of this work will significantly impact the global standardization landscape for material testing and numerical model calibration. It will contribute to developing reproducible and universally accepted testing protocols through collaborations with bodies such as Versatile Projects on Advanced Materials and Standards and the American Society for Testing and Materials. Further outcomes of this work will create a synergy in practices across research institutions and industries. It will again harmonize standards aimed at improving global comparability, traceability, and reliability of material data, thereby reinforcing the academic and industrial impact and relevance of this study.

Keywords: *material characterization,; material testing 2.0; simulation; standardization; numerical model calibration*

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Coupling tool to assist mould design andengineering during hybrid fabrication

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Abstract. The use of tailored Temperature Control Systems (TCS) in injection moulding (IM) is increasing due to their ability to meet stricter part requirements with increase process productivity (Paraye ; Sarviya,2025). Nevertheless, designing these TCS is challenging, and requires guidelines with a compromise between thermal and structural constraints. This PhD work was designed to tackle these issues, aiming to develop a tool to assist the design of tailored TCS. Previous work has shown that a comprehensive understanding of the thermal, fluid dynamics and mechanical processes intrinsic to the IM process can lead to the development of new guidelines for optimal channel design. The thermal analysis of TCS was previously studied and depicts that the cooling process is governed by two heat transfer mechanisms convection and conduction. Having identified the key parameters for the thermal analysis, the structural analysis was investigated to determine the stress distributions around the cooling channels (CC) during an IM cycle. The latter is modelled considering CC enclosed in a mould and subjected to the process representative distributed load. To ensure proper coupling between both models, the same assumptions and simplifications were considered. Moreover, it was assumed that the mould was a homogeneous, isotropic, linear elastic semi-infinite solid. The analysis was undertaken considering the combination of two problems, using the principle of superposition: (1)the mould was taken as a semi-infinite solid without CC, but subjected to a uniformly distributed load, and (2) the CC were considered enclosed in the mould, a semi-infinite solid, loaded by prescribed displacements along its boundary (Gao et al.,2021). Following the definition of the structural model, the subsequent steps will involve its validation and integration with the thermal model via optimisation algorithms. The resulting coupled thermo-mechanical model is expected to enable the design and evaluation of TCS solutions across a range of component geometries.

Keywords: *Injection moulding; Temperature Control System; Analytical model*

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Environmental assessment of fischer-tropsch fuel production via gasification: a cradle-to-gate lca

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Abstract. Fossil-based liquid fuels are a major contributor to climate change and hence there is an urgent need for alternatives (U.S. Energy Information Administration, 2025). One promising route is the production of Fischer-Tropsch (FT) fuels from Municipal Solid Waste (MSW) (Okeke ; Mani, 2017). While this is a well-researched idea, there remains limited clarity on which process configuration leads to the lowest environmental impact.

This study addresses the above mentioned problem by analyzing the environmental impacts associated with producing FT-fuels from MSW via gasification. A cradle-to-gate life cycle assessment compared 4 production routes, direct and indirect gasification coupled with a solid oxide electrolyzer cell (SOEC) and water gas shift (WGS) reaction for H2/CO ratio correction. The outputs of the gasification process are calculated using the Gibbs free energy minimization method (Khalilarya, Chitsaz, ; Mojaver, 2021) and the LCA is conducted on SimaPro 10.2.0.0.

Among the four configurations, direct gasification coupled with an SOEC has the lowest environmental impact. The hotspots in the production process are the drying of the MSW and the H2/CO ratio correction steps. The scenario analysis shows that the recirculation of tail gas from the FT-process with a recirculation ratio of 0.8 can reduce GWP by 42%, OFP by 51%, FPMFP by 46%, TAP by 47%, and FRS by 51% as compared to the baseline. An ideal configuration of direct gasification with an SOEC completely powered by renewable energy and the recirculation of tail gas leads to a GWP of 0.83 kg CO2 eq, which is 58% lower than the baseline scenario. Similar reductions are seen in four out of five other impact categories. These results show that an optimized MSW to FT-fuel process can be a promising path to alternate liquid fuels.

Keywords: *Lifecycle Assessment, Alternate fuels, Gasification, Fischer-Tropsch synthesis.*

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Customized gyroid bone grafts based on patient dexa t-scores via machine learning for enhanced cranioplasty outcomes

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Abstract. This work introduces a patient-specific strategy for developing customized gyroid bone grafts to improve cranioplasty procedures by utilizing DEXA T-score assessments. By integrating clinical bone mineral density data across healthy, osteopenia, and osteoporosis classifications, the study establishes a scaffold design model that personalizes implant density to align with individual patient bone quality. Machine learning models, trained on a curated clinical dataset from Harvard University [1,2], predict femoral neck BMD using accessible clinical variables including demographic, biochemical, and lifestyle information. These predictions serve as input to a parametric optimization framework that tailors gyroid scaffold geometry, ensuring appropriate porosity and mechanical properties for additive manufacturing of customized implants. This personalized approach aims to improve implant integration, biomechanical compatibility, and clinical outcomes by closely matching scaffold density to patient-specific bone characteristics. Planned future efforts include 3D printing of these tailored scaffolds and micro-CT-based evaluation of their density, facilitating iterative model refinement and potential clinical translation. This work complements ongoing research in ML-driven osteoporosis risk prediction and scaffold development [3].

Keywords: *Bone mineral density (BMD), T-score, ML optimisation, Gyroid structures*

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Smart predictive digital twins for real-time optimization of wastewater wreatment plants

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Abstract. Wastewater treatment plants (WWTPs) are among the highest energy-consuming infrastructures in urban systems, with over 233 GWh consumed annually across the sector (IWA, n.d.). Their operational inefficiency, compounded by climate-induced inflow variability and stricter environmental regulations, require intelligent and adaptive solutions (Sabia et al., 2020). This PhD research proposes a Smart Predictive Digital Twin (SPDT) as an innovative methodology to dynamically optimize WWTP operations in real-time, using advanced data analytics and machine learning. The SPDT system integrates data-driven models with physics-informed engineering knowledge to forecast influent behavior and simulate plant responses. Model Predictive Control (MPC) algorithms will close the loop between prediction and action, optimizing energy usage while ensuring effluent quality and environmental compliance. The architecture is modular, comprising global models for system-level forecasting and local models for each treatment stage (e.g., aeration, sludge digestion), to ensure scalability across diverse plant configurations. Real-time sensor integration and IoT infrastructure enable dynamic data acquisition, essential for robust control strategies.
This work will outline the methodological roadmap, research questions, architecture design, control strategies, and validation plan. It will also highlight how the research aligns with several UN Sustainable Development Goals, particularly clean water, energy efficiency and associated cost, and climate resilience. By bridging data science with mechanical and environmental engineering, this project introduces a scalable, intelligent, and sustainable operational paradigm for modern wastewater treatment systems.

Keywords: *Wastewater Operation; Machine Learning; Digital Twin; Cost and Energy Reduction; Climate Change Impact*

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Experimental approaches to combustion and emission performance in hydrogen-enriched domestic gas ovens

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Abstract. The decarbonization of domestic energy systems is essential to achieving global climate goals, particularly within the European Unions strategy to reach 75% renewable energy use by 2050 (European Commission, 2011). A promising route to reducing emissionswhile maintaining compatibility with existing infrastructureis the partial blending of hydrogen into natural gas (Yang et al., 2023).

This transition, however, introduces challenges related to thermal behavior, combustion dynamics, emissions control, and appliance's efficiency. This work analyzes experimental methodologies used to assess the thermal and combustion performance of domestic gas ovens, focusing on their ability to adapt to hydrogen-enriched fuel mixtures.

Zhao et al. (2019) investigated the effects of hydrogen enrichment and reported improved flame stability, increased burner temperatures, and significantly reduced CO emissions with up to 25% hydrogen by volume. A flashback threshold was also identified near this concentration, highlighting safety constraints.

While the combustion-related impacts of hydrogen are being actively studied, research on airflow behavior and emission measurements remains limited. Particle Image Velocimetry (PIV) has been applied to visualize internal convection patterns, but these studies often require structural modifications (Smolka, Bulinski, ; Nowak, 2013).

Overall, hydrogen integration into domestic gas ovens appears promising for reducing environmental impact and increasing sustainability. However, further experimental research is required to ensure safe and efficient operation under real conditions. In particular, greater attention is needed to understand how hydrogennatural gas blends affect cavity temperature distribution, as this directly influences cooking performance and the practical viability of fuel switching.

Keywords: *Domestic gas ovens; Hydrogennatural gas blends; Combustion emissions; Experimental methods*

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Influence of heat transfer processes on the biomass gasification process

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Abstract. The global effort for sustainable energy solutions needs efficient technologies for converting biomass into clean fuels. Biomass gasification in Bubbling Fluidised Bed (BFB) reactors is a promising technology to produce a gas suitable for producing renewable fuels (Pio et al., 2017). Nevertheless, current approaches focus on a macro-scale approach, neglecting more fundamental aspects, like the influence of heat transfer processes and particle distribution dynamics on the gasification efficiency, limiting optimisation efforts.

This research proposes to address these limitations through an integrated experimental and numerical investigation focused on the influence of heat transfer processes on the biomass gasification process. The core objective is to elucidate the role of thermal heterogeneities in the bed and freeboard regions, and how hydrodynamic behaviours influence heat transfer processes and thus gas composition.

The methodology involves conducting experiments in a pilot-scale BFB reactor, employing optical diagnosis, probe-based analyses, and binary mixture experiments. These measurements will enable the characterisation of bubble dynamics, particle mixing, and thermal gradients in the regions under analysis (Jaiswal et al., 2020; Wang et al., 2022). These data will support the development and validation of a Computational Fluid Dynamics model based on the Discrete Element Method, allowing for detailed simulation of gassolid interactions and heat transfer processes (Oevermann et al., 2009).

The expected outcomes include the identification of operational conditions that promote homogeneous and effective and efficient heat transfer, enhanced understanding of biomass behaviour during gasification, and the development of predictive models to support process optimisation. The results will contribute to improving the efficiency of gasification systems, thereby advancing the viability of this process.

This research aligns with the United Nations Sustainable Development Goals and the European Unions climate and energy strategies, aiming to foster innovation in clean energies and support the broader objectives of carbon neutrality and sustainable development.

Keywords: *Gasification, Bubbling fluidized bed, Gas produced, Energy, Heat transfer*

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A review of performance and robustness in smart predictive digital twins for water supply systems

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Abstract. Water Supply Systems (WSS) are critical systems that ensure water supply to our homes, agricultural and industry in sufficient quantity and quality. 1.13% of all energy consumed in Europe is used by WSS, of which at least 60% is consumed by pumping stations (International Energy Agency, 2018). Therefore, it is essential to manage these systems in the most possible efficient way. However, the management of these systems is challenging although complex, due to the need of considering multiple variables, including pump speed, local energy production and dynamic daily tariffs. With the loss of specialised knowledge to operate these systems, due to the retirement of the workforce, Digital Twins (DT) can help in the decision-making process of WSS (Kalyani et al., 2023). DT are digital replicas that can synchronise the physical and the virtual world in real time (Sharma et al., 2022). They have evolved with time and may contain other components, such as cloud computing, predictive analysis and optimisation model (Segovia ; Garcia Alfaro, 2022). In the context of this work, a DT that contain these three components is considered a SPDT. Given the limited number of real-world applications of DT not only in the water sector but in other fields, this work aims to systematize and critically analyse existing evaluation frameworks and robustness-enhancing techniques. The results of this review reveal an absence of a complete strategy for the evaluation of SPDT not only in the water sector but also in other sectors. By synthesising current methodologies and identifying key limitations, this review provides foundations for the development of more robust DT implementation, leading to a larges acceptance in the industry.

Keywords: *Performance Evaluation; Robustness Enhancement; Smart Predictive Digital Twins; Water Supply Systems*

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4d printing of an anchor-shaped hydrogel microneedle patch for enhanced gingival tissue adhesion

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Abstract. Maintaining good oral health is essential for overall well-being but is often undervalued in healthcare systems. Periodontal diseases like gingivitis and periodontitis, caused by bacterial infections and inflammation, affect nearly half of the worlds population. In Portugal, the prevalence of periodontitis mirrors the global trend, affecting 50% of adults (World Health Organization, 2024; Relvas et al., 2022).

Current treatments involve invasive mechanical procedures and adjunctive antibiotics, often administered systemically. While systemic delivery ensures patient compliance, it requires higher doses, leading to adverse effects, drug resistance, and limited drug concentration at the disease site (Zhang et al., 2022; Dubar et al., 2021). Local drug delivery in the oral cavity offers a targeted approach to improve therapeutic outcomes and reduce systemic side effects, particularly in immunocompromised individuals. Microneedles (MNs) emerge as a promising technology for localised and controlled transgingival drug delivery (Zhang et al., 2022; Sekar et al., 2024). This study aims to develop hydrogel MNs using polyethylene glycol diacrylate (PEGDA) via vat photopolymerisation 3D printing. PEGDA was selected for its biocompatibility and stability in humid environments. The microneedle patch features an anchor-shaped design for improved gingival fixation and includes an internal reservoir to store and release drugs gradually. Three 3D printers with different light-curing technologies were tested: FormLabs and Prusa (SLA) and Anycubic (DLP). After optimising printing parameters and analysing the morphology via scanning electron microscopy (SEM), the Prusa printer was chosen. Dimensional control was assessed by SEM (microneedles) and micro-computed tomography (reservoir). Swelling tests were conducted in a simulated oral environment, using artificial saliva, to control dimensional variations. Insertion/pull-out tests in an artificial model to analyse the mechanical resistance of the microneedles. A colourimetric indicator test was designed to perform a sustained and controllable drug release profile control.

Keywords: *Vat-Photopolymerization; Microneedles Patch; Polyethylene glycol diacrylate (PEGDA); Gingival application*

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Comparative analysis of driving behaviour and tailpipe emissions in urban roads with shared space traffic

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Abstract. Road transport is a major source of pollutant emissions and accidents, especially in complex urban environments where motor vehicles and active modes interact (Singh ; Kathuria, 2021), posing critical environmental and road safety challenges. This research examines real-world naturalistic data on driving behaviour, vehicle dynamics, and exhaust emissions in urban shared spaces. To comprehensively assess these impacts, the authors propose an integrated Driving Indicator (iDI) combining safety metrics (time headway, stopping distance), volatility parameters (acceleration, acceleration rate vehicular jerk), and emission variables (carbon dioxide - CO2</sub>, nitrogen oxide -NOx). Data were collected from three diesel vehicles equipped with a Portable Emissions Monitoring System, on-board diagnostic reader, global positional system device, and cameras on an urban avenue in Aveiro (Portugal) featuring a single-lane roundabout, a 160-meter shared road section, two mini-roundabouts, and urban section outside the influence area of the intersections. Results confirmed that roundabout influence areas produced the highest levels of CO2</sub>, NOx, and frequency of vehicular jerk violations, while shared spaces yielded the lowest emission values and driving volatility failures. The iDI analysis revealed that emission-related failures dominated across all road types (>60%), followed by safety failures (~30%), with roundabouts recording the highest driving volatility failures compared to shared spaces, which effectively functioned as low-emission and maximum safety zones (Karndacharuk et al., 2014). This validated methodology offers valuable insights for designing safer, more environmentally sustainable urban environments by assessing driver behaviour that can guide decarbonization and safety policies through identifying emission hotspots and promoting shared spaces as effective low-emission, high-safety solutions.

Keywords: *Driving behaviour, Volatility, Emissions, Shared space, Sustainable mobility*

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New bioelectronic capacitive implant for monitoring bone fracture healing

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Abstract. Bone fractures represent a prevalent global health issue, significantly affecting patient mobility, productivity, and quality of life, especially among individuals with osteoporosis. The increasing number of people diagnosed with this condition at active age highlights the need for improved treatment and monitoring strategies (Pires et al., 2024). Current techniques rely on imaging analysis, which is subjective, exposes patients to cumulative radiation, incurs high maintenance costs, and fails to provide biomechanical or continuous data on the healing process (Conceição et al., 2023). Due to these limitations, this work proposes a novel bioelectronic osteosynthesis plate equipped with capacitive sensors, capable of monitoring the bone fracture healing process by detecting electrical capacitance changes associated with different biological tissues (Pires et al., 2025).
To evaluate this solution, four computational models were developed using SolidWorks and COMSOL Multiphysics, each representing a distinct healing phase: hematoma, soft callus, hard callus, and bone remodeling. The designed electronic system, developed in EAGLE, includes: (i) an AD7745 analog-to-digital converter for capacitance acquisition; (ii) an ADG1606 multiplexer to manage multiple sensors; (iii) an RN4871 Bluetooth module for data transmission; (iv) a PIC16LF1847 microcontroller for signal processing; and (v) a CR1216 battery. A 2x7 matrix of interdigitatedcapacitive sensors was integrated into the system. The structural design of a commercialized plate was modified to include a compartment for the electronics and was sealed with a biocompatible polymer to ensure mechanical compatibility with current clinical plates.
In vitro tests using porcine samples, replicating each healing stage, revealed a progressive decrease in capacitance variations patterns for each healing stage. Computational simulations showed low prediction errors, with good correlations compared with the experimental results.
These results validate the proposed systems potential to provide quantitative, personalized, and continuous monitoring, paving the way for next generation of bioelectronic implants with significant clinical applicability (Pires et al., 2025).

Keywords: *Instrumented Implant, Bone Fracture Healing, Bioelectronic Implants, Capacitive Sensing, Healing monitoring*

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Detection and localization of water leakage in water supply system using machine learning techniques: application to the battledim benchmark

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Abstract. Water leakage issue is a global preoccupation in the field of Water Supply System (WSS) field, particularly given the present-day scarcity of water resources. The detection and localization of water leaks is a complex challenge, predominantly due to their potential to remain undetected for long periods of time. The occurrence of this phenomenon depends on the level of system maintenance, as it manifests in junction and/or pipes due to uncontrolled actions and it can range from 3% to over 50% (Puust et al. 2010). Furthermore, the Portuguese regulator ERSAR (ERSAR, 2024) reported in 2023 that the actual water leakage in Portugals supply system was 5.5 m³/(km day) for the bulk side and 2.4 m³/(km day) for the distribution side. Several leakage management measures can be implemented to minimize the water leakage, including preventive measures, assessment protocols, regulatory and control measures, detection and localization techniques, and repair initiatives (Zaman et al. 2020). The detection and localization techniques comprise hardware- and software-based methods which, integrating Machine Learning (ML) models, can represent a powerful automated data analysis and hydraulic simulation tool. These developments can also lead to substantial advancements for a faster leakage detection and localization.
This work aims to provide a scientific overview of the detection and localization methodologies in WSS. A sub-framework based on ML techniques has been proposed for the detection of anomalies in pressure data time series. This is implemented in a benchmark case study presented by Vrachimis et al. (2022) called BattLeDIM network, where various ML models were tested and compared with previous baseline results.

Keywords: *Water Supply Systems, Water Leakage, Detection and Localization Techniques, Machine Learning, BattLeDIM Benchmark Case Study*

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Advanced therapy medicinal product classification a case study on spinal cord injury

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Abstract. This communication aims to discuss the European classification of Advanced Therapy Medicinal Products (ATMPs), focusing on their application in spinal cord injuries (SCI), an area with no approved treatments in Europe (Hofer et al., 2015). ATMPs are in early development and face substantial biological, manufacturing, and regulatory challenges that hinder clinical translation (Wang et al., 2021). Regulatory flexibility for ATMPs can lead to approvals with gaps in clinical evidence, complicating risk assessment (Barker et al., 2023). The uncertainty around the type and amount of non-clinical information needed for development is a critical challenge (Elsallab et al., 2020).

Academic institutions play a crucial role in advancing ATMP research and development across the EU. However, despite significant contributions, there remains a gap in regulatory science knowledge within academia. Many promising outcomes fail to progress due to insufficient understanding of regulatory pathways (Priesner ; Hildebrandt, 2022).

Non-clinical studies are crucial for evaluating the pharmacological and toxicological effects of ATMPs, determining safe doses for exploratory clinical trials integrating phases I and II (Chien et al., 2024; . Schuessler-Lenz et al., 2023). Compliance with Good Manufacturing Practice (GMP) and Good Laboratory Practice (GLP) is emphasized as necessary for Market Authorization (MA) (E. Medicines Agency, 2025).

This communication addresses the classification example of a hydrogel for tissue regeneration and discusses challenges in translating promising preclinical findings into clinical practice, highlighting the need for collaboration between between researchers and regulatory authorities (Bartlett et al., 2020; Fischer, Dulin ; Lane, 2020).

The results will serve as a basis for ATMP classification, which is a critical step to obtain MA. Future work will focus on non-clinical and clinical requirements, and the long-term goal is to develop a tool that assists researchers in conducting their work in alignment with predefined guidelines, facilitating effective translation of findings into practice.

Keywords: *Advanced Therapy Medicinal Products, Spinal Cord Injury, Classification, Non-clinical Development, and Clinical Development.*

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Buddies4mentalhealth: initial feasibility and acceptability assessement

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Abstract. Background: Promoting Mental Health Literacy (MHL) in adolescence may be an important preventive approach to support young people's mental health, by enhancing their self-awareness and ability to act towards personal well-being.
Though peers play an important role in promoting MHL, they have seldom been used as a resource before. This study assessed the feasibility and acceptability of the Buddies4MentalHealth program, which was developed to promote MHL among adolescents through psychologist- and then peer-led intervention.
Method: Two focus groups were conducted, one with six 11th/12th graders representing peer supporters, and another with six 9th/10th graders representing those receiving support. The focus groups explored the core principles underlying the program, anticipated methodological aspects and themes to be addressed, as well as duration and frequency of sessions, and forms of contact between supporters and supportees.
Results: Participants highlighted the relevance of the Buddies4MentalHealths overall principles and the themes that were suggested as part of the intervention. They validated the face-to-face and group format of the intervention, and the biweekly scheduling of 1h30 sessions. Participants made adjustment sugestions: adding five monthly informal meetings between peers (either face-to-face or via online interactions) to cultivate relationships and increase willingness to share support, and pairing supporters with their peers in the presence of all participants when they had had the chance to get to know each other.
Conclusions: Potential participants perceptions of the intended intervention enabled adjustments to better align with adolescent's expectations. These may, in turn, promote greater adherence to Buddies4MentalHealth and enhance its impact on adolescent MHL and well-being.

Keywords: *Feasibility, Adolescents, Mental health literacy, Peer-led intervention, Focus group.*

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Onset repulstion effect as evidence of embodied cognition

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Abstract. The Onset Repulsion Effect (ORE) describes the systematic backward displacement of a moving targets perceived onset position, opposite to its motion direction (Actis-Grosso ; Stucchi, 2003). This effect is particularly pronounced for upward-moving targets, suggesting a vertical anisotropy in spatial localization (Thornton, 2002). Recent findings propose that ORE may reflect a cognitive tendency to attribute a "natural history"to dynamic events, similar to the preparatory windup before throwing an object (McCloskey, 1983), leading to backward overcompensation of onset location. This study aimed at further exploring this interpretation of ORE. Participants first performed a preliminary task involving the individual handling of two plastic balls separately. There was a heavy ball and one light, distinguished by colour (blue and red). In the Blue Experimental Group, the heavy ball was blue, and the light ball was red, whereas, in the Red Experimental group, the colour weight association was reversed. Each participant threw both balls upward, one at a time, and was encouraged to freely interact with them until they developed a clear sense of the difference in weight and the associated movement dynamics. Afterwards, all participants performed a standard ORE task in which the moving target was represented by images corresponding to the plastic balls used in the preliminary task. Results revealed that, in both groups, the ORE was significantly increased for the ball colour coded as heavier. This finding not only suggests that the ORE is cognitively penetrable but also aligns with the expectation that heavier objects require greater force when launched upwards, in accordance with implicit models of gravity. Furthermore, these findings open new avenues for considering how the ORE may be shaped motor processes and sensorimotor interactions, offering empirical support for theories of embodied cognition (Wilson ; Golonka, 2013; Lakoff, 2012).

Keywords: *Onset Repulsion Effect; Dynaimc events; Cognitive Penetrability; Embodied Cognition*

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