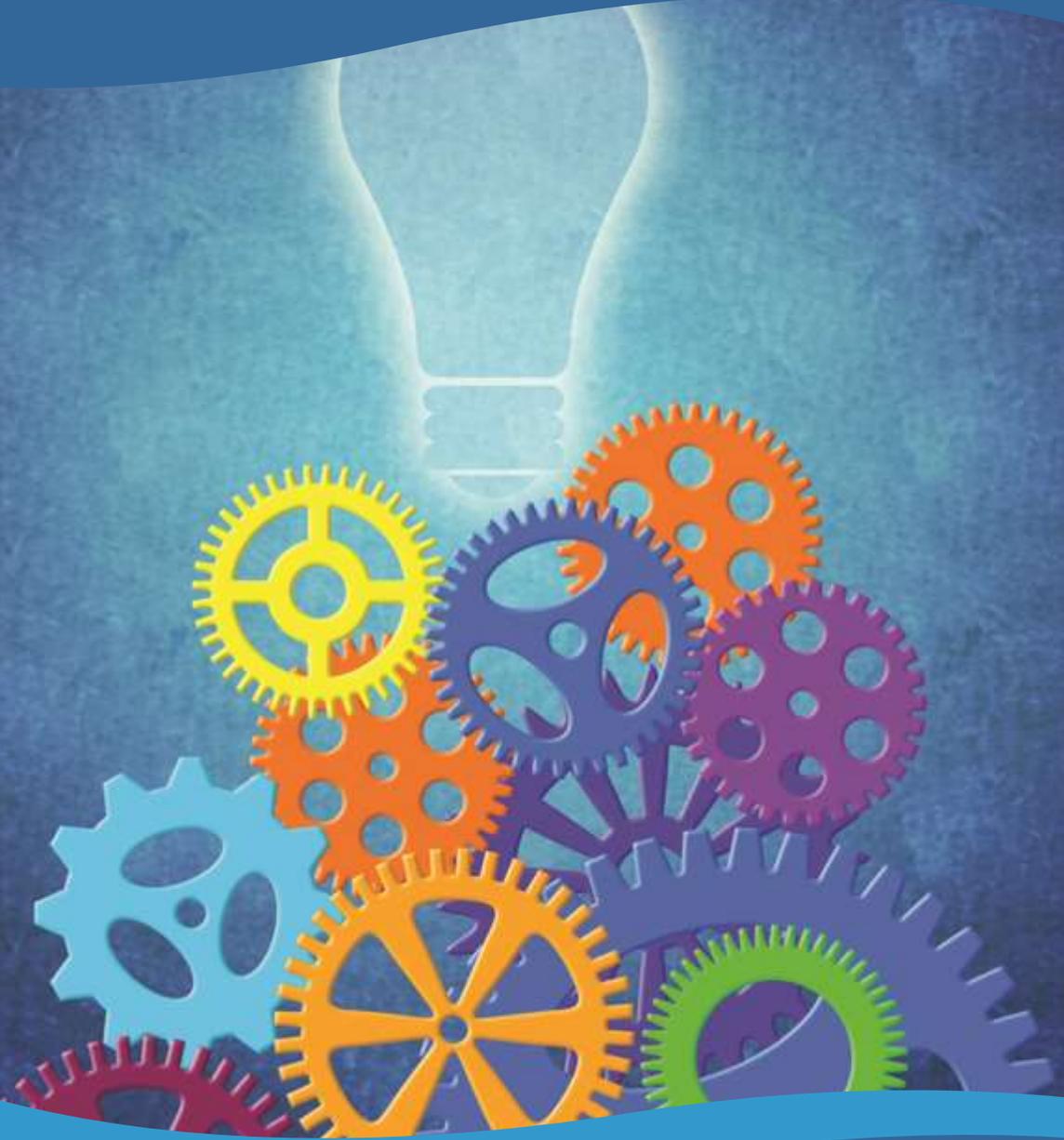


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Abstract Book

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INTRODUCTION

We had the great honor of 7th International Conference on Engineering, Natural and Social Sciences ICENSOS 2026. It was truly a great pleasure for us to greet a lot of participants from many different countries to attend ICENSOS 2026! We firmly believe that the conference will become an important international event in the field of cross-industry discussion about innovations in Academic Studies.

Three cooperating organizations supported the two-day conference. There were 165 papers accepted for presentation at ICENSOS 2026, contributed from different countries. We had plenary speeches and several well-known scientists and experts, to give invited talks at different sessions.

The purpose of ICENSOS 2026 was to provide a forum for the participants to report and review innovative ideas, with up-to-date progress and developments, and discuss novel approaches to the application in the field of their own research areas and discuss challenges of doing science.

We sincerely hope that the exchange of ideas on doing research, science and improving education will help the participants, and international cooperation sharing the common interest will be enhanced.

On behalf the Organization Committee of ICENSOS 2026, we would like to heartily thank our cooperating organizations for all they have done for the conference. We would also like to thank the authors for their contribution to the proceedings; the participants and friends of ICENSOS 2026, for their interest and efforts in helping us to make the conference possible; and the Editorial boards for their effective work and valuable advice, especially the ICENSOS 2026 secretariat and the ICENSOS 2026 staff, for their tireless efforts and outstanding services in preparing the conference and publishing the Proceedings.

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287-292	Okul Ortamlarında Arduino Tabanlı Geiger-Müller Sayacı ile Çevresel İyonlaştırıcı Radyasyon Ölçümü	Nur Hilal AKYOL, Mehmet SERTKAHYA	Turkey, Turkey	Submission 589
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301-309	Arduino Tabanlı Geiger-Müller Sayacı ile Metro Hatları ve Alışveriş Merkezlerinde Ortam İyonlaştırıcı Radyasyon Ölçümü	Nur Hilal AKYOL, Mehmet SERTKAHYA	Turkey, Turkey	Submission 591
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**7TH INTERNATIONAL CONFERENCE
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FEBRUARY 06-07, 2026**

15.02.2026

06-07 Şubat 2026 tarihlerinde MEET üzerinden çevrimiçi olarak gerçekleştirilen 7th International Conference on Engineering, Natural and Social Sciences ICENSOS 2026 konferansı akademik teşvik yönetmeliğinin 9. Maddesine istinaden “Tebliğlerin sunulduğu yurt içinde veya yurt dışındaki etkinliğin uluslararası olarak nitelendirilebilmesi için Türkiye dışında en az beş farklı ülkeden sözlü tebliğ sunan konuşmacının katılım sağlaması ve tebliğlerin yarıdan fazlasının Türkiye dışından katılımcılar tarafından sunulması esastır.” kriterlerini sağlamaktadır. Toplam 165 adet bildirinin yer aldığı kongre iki gün boyunca çevrimiçi olarak gerçekleştirilmiştir.

Türkiye dışından toplam 19 farklı ülkeden (Fas, Cezayir, Pakistan, Arnavutluk, Ukrayna, Çin, Hindistan, Tunus, Fransa, Romanya, Gürcistan, Irak, Bulgaristan, Kırgızistan, Gana, Hindistan, İspanya, Sırbistan, Filistin) katılım sağlanmış olup, 165 adet bildirinin 94 (%56,96) tanesi yabancı katılımcı tarafından sunulmuştur. *Kongremize ilginiz için teşekkür ederiz.*

Saygılarımızla,



All Sciences Academy

**7TH INTERNATIONAL CONFERENCE
ON ENGINEERING, NATURAL AND
SOCIAL SCIENCES ICENSOS 2026
FEBRUARY 06-07, 2026**

15.02.2026

06-07 Şubat 2026 tarihlerinde MEET üzerinden çevrimiçi olarak gerçekleştirilen 7th International Conference on Engineering, Natural and Social Sciences ICENSOS 2026 Konferansı, 2025 MART DÖNEMİ DOÇENTLİK BAŞVURU ŞARTLARI yönetmeliğinin 2. bölümde yer alan Uluslararası Bilimsel Toplantı tanımlaması “Farklı ülkelerden bilim insanlarının bilim kurulunda bulunduğu ve sunumların bilimsel ön incelemeden geçirilerek kabul edildiği toplantı.” şeklindedir.

7TH ICENSOS 2026 konferansı bilimsel komitesinin çoğunluğu yabancı bilim insanlarından oluşmaktadır. Aşağıdaki link ile bilimsel komite incelenebilir:

<https://www.icensos.com/com>

Ayrıca konferansımızda hakem değerlendirmesi olup hakem değerlendirmesi olumlu sonuçlanmadan ücret talebinde bulunulmamaktadır.

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<https://drive.google.com/file/d/1eZalxRl8q6-eXATZzwUraH9KOhtQzFho/view>

Ayrıca görevlendirme yazıları ilgili konferansın özet ve tam metin kitapçıklarında yer almaktadır.

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Saygılarımızla,



All Sciences Academy



04.09.2023

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We confirm that Ing. Ondrej Takáč, PhD. working at J. Selye University takes part in the organization committee of the conferences organized by of All Sciences Academy.

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Name of Responsible Person and Signature:

Name and Surname

Sign:

PhDr. Imrich Antalík, PhD.

Date: 04.09.2023

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04.09.2023

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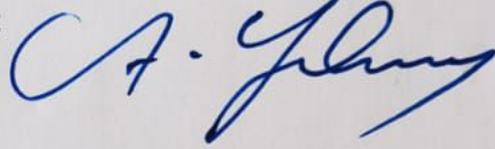
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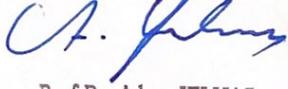
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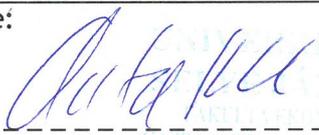


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Neutrosophic exponentiated ZLindley distribution with applications to engineering data

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Abstract – In this work, we introduce a new extension of the ZLindley distribution within a neutrosophic framework to more effectively handle datasets characterized by uncertainty, imprecision, and incompleteness. We derive several properties of the proposed model and estimate its neutrosophic parameter using the method of maximum likelihood. A simulation study is performed to evaluate the estimator's performance. Finally, the advantages of the proposed model are demonstrated through applications to real engineering datasets.

Keywords – Data analysis, Imprecise data, Maximum likelihood method, Neutrosophic random variable, ZLindley distribution.



Experimental–Computational Insights into Bioactive Thiourea Derivatives

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²Department of Chemistry/Laboratory of Technology and Solid Properties (LTPS), Abdelhamid IbnBadis University of Mostaganem, Algeria

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Abstract – This work investigates the structural and biological properties of thiourea derivatives using single-crystal X-ray diffraction and molecular docking studies. X-ray analysis enabled accurate determination of molecular geometry and intermolecular interactions, providing detailed insight into the structural organization of the synthesized compounds. In parallel, molecular docking simulations were performed to evaluate their potential biological activity by analyzing binding interactions with selected target biomolecules. The integration of experimental and computational approaches deepens the understanding of structure–activity relationships and supports the rational design of bioactive thiourea-based compounds.

Keywords – X-ray diffraction (XRD), Thiourea derivatives, Molecular docking, Structure-activity relationship (SAR), Bioactive compounds



Hypersurfaces in Weighted Gradient Ricci Solitons: Minkowski-Type Integral Formulae

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Abstract – We study hypersurfaces immersed in weighted manifolds carrying a Ricci soliton structure. Through the introduction of weighted elementary symmetric functions and Newton-type transformations, we obtain new integral identities of Minkowski type, covering both Ricci soliton and gradient Ricci soliton cases.

Keywords – *weighted manifolds; weighted Newton transformations; weighted mean curvature; Minkowski integral formulae.*



Teaching in the Digital Age: Rethinking Pedagogy through Technology

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Abstract – The growing presence of digital technology in educational settings has profoundly reshaped the ways teaching and learning are designed and delivered. While digital tools offer new possibilities for interaction, flexibility, and access to knowledge, their pedagogical value depends largely on how teachers integrate them into their instructional practices. This paper examines the role of digital technology in contemporary teaching, with a focus on moving beyond technology as a mere instructional aid toward a more pedagogically driven and reflective use. Grounded in teaching experience and current educational perspectives, the study explores how digital platforms, learning management systems, and interactive tools can support active learning, collaboration, and learner autonomy. Particular attention is given to blended and online learning environments, which have become increasingly prominent in higher education. The paper also addresses key challenges faced by teachers, including insufficient digital training, resistance to pedagogical change, time constraints, and disparities in access to technological resources. The discussion highlights the importance of teachers' digital mindset and continuous professional development in ensuring meaningful technology integration. Rather than focusing on technical skills alone, effective digital teaching requires pedagogical awareness, adaptability, and reflective practice. The paper argues that digital transformation in education is primarily a human and pedagogical process, not a purely technological one. By aligning digital tools with pedagogical objectives, educators can create more engaging, inclusive, and effective learning environments that respond to the evolving needs of learners in the digital age.

Keywords – *Digital technology, Teaching practices, Teacher professional development, Blended learning, Higher education, Student engagement*

Optimization of Gravity Separation Parameters Using Jigging and Spiral Concentration for Upgrading Low-Grade Iron Ore

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Abstract – This work investigates the optimization of gravity concentration for upgrading low-grade iron ore (48–52% Fe) using a conventional jig and a spiral concentrator. The study quantifies the effects of key operating parameters—feed size distribution, density contrast, pulsation characteristics, and hydrodynamic regime—on separation performance in terms of concentrate grade, iron recovery, and separation efficiency. Laboratory-scale experiments were conducted under controlled conditions, followed by pilot-scale validation to confirm the robustness of the optimized settings.

The methodology combines granulometric characterization, settling behavior analysis accounting for deviations from Stokes' law, and metallurgical mass balances to evaluate partitioning and separation sharpness. Results indicate that a feed size window of 0.5–2.0 mm yields the best stratification and selectivity, while increasing pulsation amplitude enhances the formation of a stable heavy-mineral bed in jigging. Under optimized conditions, iron recovery increased from 71% to 87%, and concentrate grade improved from 56% to 64% Fe. Comparative tests further show that spirals enable higher throughput, whereas jigs provide slightly higher selectivity under equivalent feed conditions.

Overall, the findings demonstrate that properly optimized gravity separation can effectively upgrade medium- to low-grade iron ores while reducing energy demand and minimizing reagent consumption. The outcomes provide practical guidelines for process design and scale-up of sustainable gravity-based beneficiation circuits.

Keywords – Gravity separation; Jigging; Spiral concentrator; Low-grade iron ore; Process optimization.



Raman analysis of hydrogen encapsulated in metallic single walled carbon nanotubes

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Abstract – Hydrogen is considered one of the most promising alternative energy carriers for the future due to its high energy density and environmentally friendly nature. However, safe and efficient hydrogen storage remains a major challenge for its widespread application. Carbon nanotubes (CNTs), owing to their unique structural, mechanical, and electronic properties, have emerged as potential candidates for hydrogen storage. In this work, we use the Spectral Moments Method (SMM) to study the potential applications and mechanisms of hydrogen storage in carbon nanotubes (CNTs), and investigate how factors such as chirality, tube diameter, number of walls, and defect structures influence hydrogen storage capacity...

Keywords – Carbon nanotube (CNTs), Spectral Moments Method (SMM), hydrogen storage capacity



Traveling Wave Solutions and Asymptotic Models for Nonlinear Dispersive Wave Equations with Higher-Order Time Effects

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Abstract – In this work, we investigate traveling wave solutions of a nonlinear dispersive wave equation that includes a fourth-order time derivative. We begin by establishing the existence of traveling wave solutions for the equation with a quadratic nonlinearity and obtain solitary wave solutions. By employing the generalized $\exp(-\phi(\xi))$ expansion method, we derive classical unidirectional nonlinear dispersive wave equations in the small-amplitude regime. In particular, the Korteweg–de Vries (KdV) equation is shown to govern the propagation of long acoustic waves, whereas the nonlinear Schrödinger (NLS) equation describes the evolution of the envelope of short optical waves. Furthermore, under a long-wave–short-wave resonance condition, we derive a coupled system that characterizes the nonlinear interaction between long acoustic waves and short optical waves. Traveling wave solutions of these asymptotic models are analyzed in order to evaluate the relative influence of temporal nonlocality compared to spatial nonlocality.

Keywords – Nonlinear dispersive waves; Traveling wave solutions; Fourth-order time derivative; Solitary waves; Korteweg–de Vries (KdV) equation; Nonlinear Schrödinger (NLS) equation; Generalized $\exp(-\phi(\xi))$ expansion method.



Mechanical Performance and Durability Characteristics of Virgin Cork Concrete

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Abstract - The United Nations Climate Change Conference (COP27) concluded with a declaration reaffirming the urgent need to limit the global temperature increase to 1.5 °C. The declaration emphasized the critical role of energy efficiency, the transition toward sustainable energy sources, and the integration of green energy across all sectors of development. In this context, Algeria's *Horizons 2035* strategy reflects the country's commitment to strengthening the forest sector and integrating it into the national economic framework.

This study investigates the potential of cork concrete as a sustainable cement-based material that combines structural performance with enhanced thermal properties, thereby contributing to improved building energy efficiency. Building on previous experimental work conducted in our laboratory—where virgin cork granules replaced up to 25% (by volume) of mineral aggregates—we sought to further improve the material's performance through the incorporation of 10% fine limestone filler and by assessing the influence of the water-to-binder (W/B) ratio.

An extensive experimental program was carried out in the EOLE laboratory, encompassing physical, mechanical, and durability assessments of six concrete mixtures. At a W/B ratio of 0.45, all formulations exhibited a notable reduction in plastic viscosity compared with conventional concrete. Furthermore, the combined use of cork aggregates and limestone filler resulted in slight enhancements in compressive and tensile strengths at 28 and 90 days, primarily attributed to reduced porosity and water absorption. These improvements were accompanied by a measurable decrease in chloride diffusion, indicating enhanced durability.

Keywords – Bio-based concrete, Virgin cork, Limestone, Diffusion coefficient, Durability.



Solvability of Multi-Order ψ -Hilfer Fractional Langevin Equations with Infinite Delay in Weighted Phase Spaces

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Abstract – This work introduces a new class of fractional Langevin equations with infinite delay by incorporating generalized Hilfer derivatives within a weighted Banach space framework. Unlike existing studies that rely on standard Caputo or Hilfer operators without incorporating delay-weight interactions, the proposed formulation simultaneously accounts for nonlocal memory and non-uniform decay effects. This dual mechanism enables the modeling of long-term hereditary responses in systems where past states contribute with varying intensity over time, a behavior unattainable in traditional fractional models. Existence and uniqueness of solutions are established using Banach's fixed point theorem and the Leray--Schauder alternative, both adapted to the weighted setting. Two illustrative examples are provided to demonstrate how generalized weighted Hilfer derivatives alter the dynamical behavior compared to classical formulations. These results offer a new perspective on delayed fractional systems, expanding the analytical toolkit available for modeling complex memory-driven processes.

Keywords – *Fractional Langevin equations , generalized Hilfer derivative , infinite delay , fixed point theorem , weighted Banach space.*

Optimizing Dairy Production through Integrated Computational and Biological Approaches: Enhancing Scheduling and Product Innovation with Local Resources

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Abstract – Scheduling within the dairy sector presents significant challenges due to the need to concurrently address technical manufacturing limits and dynamic biological factors. These complex interdependencies frequently cause operational instability, compromised product quality, and financial losses. This research investigates the development of a decision-support framework that aligns production logistics with the inherent variability of biochemical processes to achieve reliable, cost-effective, and novel outputs. A combined interdisciplinary method, implemented in a live yogurt manufacturing environment, is detailed. The approach involves two key components: (1) an advanced hybrid planning system that employs the Electromagnetism-like Mechanism (EM) and Tabu Search (TS) metaheuristics, structured within a dedicated Flexible Synchronized Scheduling for a Chained Graph (FSSChG) model designed for biological production flows; and (2) a concurrent, rigorous biological research initiative to formulate and evaluate a yogurt supplemented with indigenous date cultivars, verifying its physicochemical properties, microbial safety, and sensory profile. Outcomes reveal that the fusion of computational and biological strategies effectively turns system limitations into advantages, markedly reducing production durations and enhancing operational consistency. The study confirms the viability of a sustainable food product that utilizes regional agricultural inputs. This project highlights the importance of merging computer science and biology to advance food manufacturing, linking efficient process management with the creation of valuable end products.

Keywords – Operational Planning; Hybrid Metaheuristic Algorithms (EM-TS); Smart Dairy Manufacturing; Biological Process Variables; Novel Food Development; Physicochemical and Microbiological Analysis; Local Agri-Resource Enhancement; Interdisciplinary Integration; Multi-Criteria Optimization.



Prediction of the shelf life of a traditional cheese: Klila

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Abstract - Klila cheese is one of the most appreciated traditional dairy products in Algeria. It is a low-fat fresh cheese obtained through spontaneous lactic fermentation driven by the natural activity of endogenous lactic acid bacteria. Despite its cultural and nutritional importance, limited scientific data are available regarding its microbiological stability and shelf life under controlled storage conditions.

The aim of this study was to determine the shelf life of Klila cheese stored at 4 °C under refrigerated conditions. Comprehensive physicochemical analyses were performed, including measurements of pH, titratable acidity, total dry matter, fat content, and protein content. In parallel, a complete microbiological characterization was conducted to quantify total aerobic mesophilic flora, *Lactobacillus* spp., and to detect potential pathogenic microorganisms, namely *Salmonella* spp., *Staphylococcus aureus*, *Escherichia coli*, and sulfite-reducing *Clostridium*. A challenge test using *Staphylococcus aureus* ATCC was carried out to assess the behavior of this pathogen within the cheese matrix.

Physicochemical results showed that dry matter, fat, and protein contents were consistent with literature data, although pH and titratable acidity were slightly higher than recommended standards. Microbiological analyses revealed high levels of total mesophilic flora, *Lactobacillus* spp., and *E. coli*. No sulfite-reducing *Clostridium* spores were detected, while pathogenic bacteria (*Salmonella* spp. and *S. aureus*) appeared from day 20 of storage. Shelf-life validation using accelerated aging tests with Sym'Previous software indicated an optimal shelf life of approximately 18 days at 4 °C.

Keywords: Klila cheese, shelf life, challenge test, aging test, lactic fermentation, food microbiology.

Artificial Intelligence for Smart and Sustainable Cattle Farming

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Abstract : Agricultural sustainability is a critical challenge for ensuring global food security amid environmental pressures and a growing population. Traditional farming practices, in both crop and livestock production, often face limitations in efficiency, disease management, and resource optimization. Artificial intelligence (AI) has emerged as a key tool to transform agricultural systems toward smarter, more sustainable, and resilient practices.

AI-based technologies enable the analysis of large datasets, including weather conditions, soil status, yield history, and the physiological and behavioral parameters of livestock. In cattle farming, AI supports herd management, early disease detection, reproductive and feeding optimization, and overall production performance, while reducing labor and operational costs. In crop production, the integration of agronomic knowledge enhances predictive models, enabling early detection of diseases and more precise yield forecasting.

The Internet of Things (IoT) facilitates real-time data collection through connected sensors, creating intelligent and interconnected agricultural systems. This approach allows timely and informed decision-making, improving animal welfare, resource efficiency, and overall sustainability. Case studies demonstrate the effectiveness of AI-driven solutions in enhancing farm productivity and resilience.

In conclusion, artificial intelligence represents a strategic lever for the development of smart and sustainable agricultural and cattle farming systems. Its successful implementation requires adaptation to the technical, economic, and human realities of farms, as well as collaboration between farmers, researchers, technology developers, and policymakers.

Keywords :Artificial intelligence; Sustainable agriculture; Smart cattle farming; Precision livestock farming; IoT; Animal health monitoring; Yield optimization.

Microstructural and Mechanical Properties of SiC-Reinforced Al₂O₃ Matrix Ceramic Composites with Varying SiC Content

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Abstract – Alumina-based ceramic composites reinforced with silicon carbide (SiC) were produced to investigate the effect of SiC content on microstructure and Vickers hardness. Four compositions containing 0, 10, 20, and 30 wt% SiC in an Al₂O₃ matrix were prepared using conventional powder processing followed by sintering. Phase constitution was examined by X-ray diffraction and FTIR spectroscopy. The results confirmed the presence of the Al₂O₃ matrix and SiC reinforcement without evidence of additional reaction products, indicating that the constituents remained stable during sintering. The phase composition was assessed using X-ray diffraction (XRD) and Fourier transform infrared (FTIR) spectroscopy. The analyses confirmed the coexistence of the Al₂O₃ matrix and SiC reinforcement and did not indicate the formation of additional reaction products, suggesting that the constituents remained stable during sintering. The monolithic Al₂O₃ specimen exhibited a hardness of approximately 1200 HV. Introducing 10 wt% SiC increased hardness to about 1350 HV, and the maximum hardness of ~1600 HV was achieved at 20 wt% SiC, corresponding to an overall improvement of roughly 35% relative to the matrix. Optical micrographs indicated that 10 wt% SiC provided a largely homogeneous dispersion but with noticeable residual pores. At 20 wt% SiC, the reinforcement appeared denser and more uniformly distributed, the pore population decreased, and matrix–particle bonding was improved. When the SiC content was further increased to 30 wt%, hardness slightly decreased to ~1550 HV, which is attributed to reinforcement agglomeration and locally increased porosity. The results indicate that an SiC content of approximately 20 wt% provides the most favourable combination of microstructural uniformity and enhanced hardness in Al₂O₃–SiC ceramic composites.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the financial support provided by the Gazi University Research Fund (FGA-2024-9139).

Keywords: alumina-based ceramic composites; silicon carbide reinforcement; powder processing; sintering; Vickers hardness; microstructure

Performance Evaluation of Machine Learning Models for Industrial Applications

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Abstract – Machine Learning (ML) has emerged as a powerful tool for enhancing efficiency, reliability, and decision-making in industrial applications. This paper presents the implementation and evaluation of several machine learning models for industrial process optimization, predictive maintenance, and quality control. Supervised learning algorithms, including Random Forest, Support Vector Machines, and Neural Networks, were trained and tested on real-world industrial datasets. Model performance was assessed using standard evaluation metrics such as accuracy, precision, recall, and Root Mean Square Error (RMSE). Experimental results show that the proposed ML-based approach achieves an average classification accuracy of 92.4%, with a precision of 90.8% and a recall of 91.6%, outperforming traditional statistical methods by approximately 12–18%. For regression-based tasks, the models achieved an RMSE reduction of 25% compared to baseline methods. These results demonstrate the effectiveness of machine learning techniques in improving industrial system performance and highlight their potential for deployment in intelligent industrial environments

Keywords – Machine Learning; Industrial Systems; Predictive Maintenance; Process Optimization; Data-Driven Modeling



Numerical Assessment of Landslide: Case of the Embankment Supporting CREAD New Headquarters in Tipaza (Northern Algeria)

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Abstract –Landslides are movements that affect natural embankments and slopes; they can cause significant damage to structures and engineering projects, with a significant economic impact, and sometimes cause casualties. Natural slopes occur following a several natural events including heavy rain, volcanic processes, bank erosion, height relief, earthquake and others. Today, this problem is one of the major concerns of civil and geotechnical engineers in Algeria given its high frequency, especially in northern Algeria (e.g. Algies, Bejaia and Tipaza), which is renowned for its multiple land movements because of its geological, geomorphological, seismic and climatic character. Over the time, several calculation methods have been proposed in two and three dimensional analyses to deal with the slope stability problem. In recent years, the development of numerical analysis based on Finite Elements Method (FEM) led to an effective approach for assessing the safety factor of soil slopes within its strength reduction. Consequently, a long experience has been acquired in numerical analysis, such that slope stability problems can now be solved with fairly good reliability. In this context, this research deals with the stability assessment of a landslide occurred in 2013 at the new headquarters building of the Center for Research in Applied Economics for (CREAD) in Tipaza (Northern Algeria). Numerical analysis were performed using PLAXIS software code based two dimensional (2D) to assess the factor of safety (FS) and horizontal displacements in different cases. The findings indicate that the FS was found to be significantly less than 1.0 for both sutured and dry cases confirming the slope's instability manifested by disorders observed on the structure.

Keywords –Tipaza landslide; Finite elements method ; Factor of safety, Slope stability, Limit equilibrium



A Simple and Efficient Gewald Approach to Naphthalene-Substituted 2-Aminothiophenes

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Abstract – The Gewald reaction is a well-established multicomponent synthetic method for the construction of functionalized 2-aminothiophene derivatives, which are valuable scaffolds in medicinal chemistry and materials science. In this work, we report an efficient synthesis of naphthalene-based 2-aminothiophene derivatives via the Gewald reaction using **2-acetonaphthone, malononitrile, and elemental sulfur** as starting materials. The reaction was carried out under mild conditions in a one-pot procedure, offering operational simplicity and good reaction efficiency.

The condensation of 2-acetonaphthone with malononitrile, followed by cyclization in the presence of sulfur, afforded the desired thiophene derivatives in satisfactory yields. The progress of the reaction was monitored by thin-layer chromatography, and the products were isolated using standard purification techniques. Structural characterization of the synthesized compounds was achieved using infrared spectroscopy, proton and carbon nuclear magnetic resonance (¹H and ¹³C NMR), and elemental analysis, confirming the formation of the targeted 2-aminothiophene framework.

The incorporation of a naphthalene moiety into the thiophene core is expected to enhance the electronic properties and potential biological activity of the resulting compounds. Owing to their structural features, these molecules represent promising candidates for further studies in pharmaceutical research and functional material development. The present study highlights the versatility and effectiveness of the Gewald reaction as a practical synthetic route to complex heterocyclic systems and provides a basis for the synthesis of related analogues with potential applications.

Keywords – Gewald reaction, 2-Aminothiophenes, Multicomponent synthesis, Naphthalene derivatives, Heterocyclic compounds.



DC-bias-dependent admittance and charge transport mechanisms in Nb-doped La–BaTiO₃ nanoparticles

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Abstract – The effect of DC bias voltage on the admittance (Y) and electrical conductivity (σ) of Nb-doped lanthanum barium titanate nanoparticles with composition Ba_{0.97}La_{0.02}Ti_{1-x}Nb_{4x/5}O₃ (x = 0.00–0.07) was investigated over the frequency range 40 Hz–10⁶ Hz. X-ray diffraction combined with Rietveld refinement confirmed the formation of a single-phase tetragonal structure with P4/mmm symmetry, with crystallite sizes decreasing from 102 to 78.99 nm as Nb content increased. The optical band gap (3.31–3.37 eV) indicates semiconducting behavior suitable for visible-light applications. Admittance analysis revealed charge carrier accumulation at the electrode interface, while conduction mechanisms were well described by Jonscher’s power law, indicating correlated barrier hopping and small polaron tunneling processes.

Keywords – DC bias voltage; admittance; electrical conductivity; optical band gap; Jonscher’s power law.



Oxygen Vacancy Rich VO_{2-x}/CuF Electrocatalysts for Highly Selective and Stable Nitrate to Ammonia Conversion

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Abstract – Electrocatalytic nitrate reduction remains challenging due to sluggish reaction kinetics, insufficient product selectivity, and poor catalyst stability, which collectively limit its viability for sustainable nitrate (NO₃⁻) remediation and the valorization of nitrogen-containing products. In this work, a one-step hydrothermal strategy is developed to decorate copper foam (CuF) with VO₂ nanobelts, followed by N₂ annealing to introduce oxygen vacancies (OVs), yielding an oxygen-deficient VO_{2-x}/CuF electrocatalyst for the selective reduction of NO₃⁻ to ammonia (NH₃). Comprehensive structural and morphological characterizations reveal that the VO_{2-x}/CuF catalyst exhibits a highly crystalline, defect-rich, bundle-like nanobelt architecture, arising from oxygen atom removal during annealing. These oxygen vacancies provide abundant active sites and facilitate enhanced electrochemical nitrate reduction. As a result, the VO_{2-x}/CuF catalyst delivers outstanding electrocatalytic performance, achieving a nitrate conversion of 78.7%, an NH₄⁺ yield rate of 1.833 mmol h⁻¹ cm⁻², a Faradaic efficiency of 77.9%, and an exceptional NH₄⁺ selectivity of 99.7% at -1.3 V versus the reversible hydrogen electrode (RHE). Isotopic labeling experiments further confirm that the produced NH₄⁺ originates exclusively from NO₃⁻ during the electrocatalytic process. This confinement-assisted defect engineering strategy effectively constructs accessible, oxygen vacancy rich metallic catalysts, enabling highly active, selective, and stable electrocatalytic nitrate to ammonia conversion.

Keywords – VO_{2-x}/CuF sample; Electrocatalyst; Oxygen vacancies; Electrocatalytic NO₃⁻ reduction; NH₄⁺



THE ROLE OF ACCOUNTING IN PROMOTING SUSTAINABLE INVESTMENT AND PRACTICES

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Abstract - The existence of sustainable investments and practices is not only a business responsibility but also an opportunity for economic development that combines financial, social, and environmental benefits for society. Accounting, as a fundamental part of an organization's financial management, is essential in promoting these sustainable approaches and shaping sustainable policies. In this context, accounting provides the necessary information to assess the risks and opportunities in business practices that affect the environment and the social responsibility of businesses.

The report examines the opportunities that accounting provides to build sustainable development strategies and stimulate investments that comply with environmental and social standards.

It also examines how the proper implementation of accounting practices can support the accountability, transparency and social responsibility of enterprises by providing the necessary data to assess their contribution to sustainable development. The possibilities for improving accountability through sustainable accounting systems, as well as the importance of transparency and accountability to stakeholders, are key problem areas raised in the report.

Keywords: sustainable accounting, investments, sustainable practices, corporate social responsibility, environmental accountability.



LABOR COSTS IN INDUSTRIAL ENTERPRISES

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Abstract - In recent years, labor costs have become a determining factor for the development of enterprises in Bulgaria, given their direct link to the socio-economic status and well-being of the workforce. This article examines the impact of socio-economic factors on the evolution of labor costs within industrial enterprises. The sustainable development of these enterprises is critically analyzed, emphasizing the necessity for resilience, particularly during periods of socio-economic crisis.

The primary objective of this paper is to identify the challenges associated with labor costs in the industrial sector and, more specifically, the difficulties companies face in securing the necessary resources for competitive remuneration. The focus is directed towards enterprises affected by recurring crises, exploring strategies for job preservation, business promotion, and the sustainable payment of wages and additional benefits.

Keywords: labor costs, productivity, development, enterprises, industry.



REMUNERATIVE OCCUPATION AND REMUNERATION IN COOPERATIVES IN BULGARIA

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Abstract - From both a historical perspective and within the context of the contemporary economic landscape, the cooperative business model serves as a vital alternative for realizing business initiatives through collective effort. This paper explores strategies to enhance the capacity of cooperatives as a preferred vehicle for entrepreneurship, focusing on remunerative occupation, the optimization of social security and health insurance, and the overall improvement of members' living standards.

The primary objective of this study is to analyze the critical challenges cooperatives face in balancing the pursuit of profitability with the provision of fair remuneration and social benefits for their members. Furthermore, the paper proposes strategies for effectively leveraging the unique strengths of the cooperative model. The expected outcomes include practical recommendations for optimizing payment methods, social insurance contributions, and dividend allocation. These improvements aim to ensure a competitive advantage and the long-term sustainability of the cooperative sector in Bulgaria.

Keywords: cooperatives, remunerative occupation, wages, employment relationships, social insurance, sustainability.



Mathematical Mechanisms of Pattern Formation: Turing Instability and Hysteresis in Developmental Systems

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Abstract – This study employs mathematical modeling, specifically reaction-diffusion equations, to investigate the mechanisms underlying spatially heterogeneous pattern formation and symmetry breaking in development. We analyze two principal pattern-forming mechanisms: a hysteresis-driven mechanism and diffusion-driven instability (Turing instability). Our analysis reveals their respective potentials and limitations for explaining structure generation in cellular systems. Furthermore, we demonstrate how specific nonlinearities govern distinct outcomes—such as Turing patterns with spike-like or plateau-like maxima, and stable transition layer solutions. These theoretical concepts are contextualized within the developmental biology of the freshwater polyp Hydra.

Keywords – Hysteresis, pattern formation, reaction-diffusion system, Turing instability



Finite-Time Quenching and Global Existence for a Singular Reaction-Diffusion Model

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Abstract – This paper provides a theoretical analysis of a singular parabolic reaction-diffusion system modeling the quenching phenomenon. Critical in materials science, biology, and medicine, quenching rapidly alters material states to change properties or preserve samples. The study establishes, under positive Dirichlet boundary conditions, sufficient criteria to distinguish between solutions that quench in finite time and those that exist globally. These results extend the foundational theory of quenching that originated in the 1970s.

Keywords – Reaction-diffusion system, quenching, singular parabolic equations



On the Combined of Four Types of Synchronization in 4-D Hyperchaotic Dynamical Systems

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Abstract – Chaotic systems are more and more used in system engineering because of their attractive features, namely a noise like wave form, a broad band spectrum, an unpredictable behavior and an extreme sensitivity to initial conditions as well as parameter variations. Nowadays, chaos has become a focal point for nonlinear problems in subjects ranging from physics and chemistry, to mechanics and communications. Furthermore, synchronization of chaotic systems have several important applications in science and engineering such as oscillators, lasers, cryptosystems, secure communications, biology, robotics, networks, transmission, electronics, mechanics, etc. Many different types of synchronization phenomenon have been intensively investigated and a lot of theoretical results have been obtained in the past two decades, such as complete synchronization (CS), projective synchronization (PS), hybrid projective synchronization (HPS), full state hybrid projective synchronization (FSHPS), etc. The synchronization methods can be achieved using different types of control scheme such as linear and non linear feed-back synchronization, adaptive control, active control, sliding mode control, backstepping control, etc. In this paper, based on the Lyapunov stability theory, different schemes of synchronization for hyperchaotic dynamical systems, such CS, PS, HPS and FSHPS, are combined to derive and achieve synchronization of two coupled hyperchaotic dynamical systems in 4-D continuous-time. Numerical simulations were carried out to validate the theoretical result and verify the effectiveness of the proposed scheme of synchronization.

Keywords –Hyperchaotic dynamical systems; Chaos; Synchronization; Lyapunov method; Continuous-time



Urban Bird Management Through Innovative Ecological Strategies: A Case Study from Abdelhafid Boussouf University Campus, Mila

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Abstract - Birds constitute one of the most widely distributed taxa on Earth. Owing to their flight capability, they colonize nearly all ecosystem types and are widely acknowledged as reliable bioindicators of environmental quality. Nevertheless, the excessive abundance of certain opportunistic species in specific contexts, particularly in agricultural and urban environments, may generate disturbances and various forms of nuisance.

This study, conducted between 2025 and 2026 at the campus of Abdelhafid Boussouf University in Mila (northeastern Algeria), aimed to inventory and analyze the spatial distribution of avifauna within an urban setting. A noticeable increase in bird abundance on campus in recent years prompted a comprehensive assessment. Avifaunal surveys were performed using the Point Count Method (IPA) according to Blondel *et al.* (1970), complemented by an ethnozoological survey designed to assess human perceptions of urban birds. The inventory identified 39 bird species, predominantly belonging to the order Passeriformes. The sociological survey, involving 120 respondents, indicated that approximately 70% of participants perceive urban birds as a source of disturbance and environmental pollution. Based on these findings, practical ecological management measures were proposed, notably the installation of wooden pigeon lofts to regulate pigeon populations while facilitating the collection and reuse of droppings as organic fertilizer.

These results underscore the necessity of developing innovative and ecologically sustainable strategies for managing opportunistic bird populations in urban campuses while preserving overall biodiversity balance.

Keywords – Urban birds-Bioindicators-Spatial distribution-Point Count Method (IPA)- Ecological management

Sliding Mode Speed Control of a Doubly Fed Induction Machine

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Abstract – This paper investigates the speed control of a doubly fed induction machine (DFIM) using field-oriented control with input–output decoupling. The DFIM is supplied by two PWM voltage source inverters connected to the stator and rotor circuits, allowing independent control of flux and speed. Two control approaches are analyzed and compared: the conventional proportional–integral (PI) controller and the sliding mode controller.

The study focuses on evaluating the dynamic performance and robustness of these controllers in the presence of machine parameter variations and uncertainties. Key performance indicators such as speed tracking, response time, and disturbance rejection are examined through simulation. The results demonstrate the advantages and limitations of each control strategy, highlighting the improved robustness and disturbance rejection capability of the sliding mode controller compared to the classical PI regulator.

Keywords – Doubly Fed Induction Machine (DFIM), field oriented control, stat space input-output decoupling, classical regulator PI, sliding mode regulator, voltage source inverters.



Bridging Bytes and Bites: Advancing Nutrition Science through Computational Innovation

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Abstract – The convergence of computer science and nutrition offers unprecedented opportunities to transform dietary research, public health, and personalized nutrition. Traditional nutrition science has long relied on observational studies and manual data collection, which often limit scalability and precision. In contrast, computational tools—including machine learning, artificial intelligence, big data analytics, and digital health platforms—enable the integration of diverse datasets ranging from food composition databases and genomic profiles to consumer behavior and real-time dietary tracking. This interdisciplinary interface allows researchers to uncover hidden dietary patterns, predict nutrient deficiencies, and design personalized interventions with greater accuracy. Emerging applications include predictive modeling for diet-related diseases, intelligent food recommendation systems, and mobile applications that leverage image recognition to assess portion sizes and nutrient intake. Furthermore, computational simulations can optimize food supply chains, enhance fortification strategies, and support sustainable dietary planning at population levels. Ethical considerations, such as data privacy and equitable access, remain critical to ensuring that technological advances benefit diverse communities. By embedding computational methodologies into nutrition science, researchers and practitioners can move toward evidence-based, scalable, and personalized solutions that address global challenges such as obesity, malnutrition, and food insecurity. This abstract highlights the transformative potential of integrating computer science with nutrition, emphasizing the need for collaborative frameworks that unite technologists, nutritionists, and policymakers. Such synergy will not only accelerate discovery but also foster innovative strategies to improve human health and well-being in the digital age.

Keywords – computer science; nutrition; machine learning; personalized nutrition; big data; digital health; food supply chain; predictive modeling; dietary assessment; public health



High-Performance and Cost-Effective Lead-Free CZTSSe/B- γ -CsSnI₃ Dual-Absorber Solar Cells

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Abstract – Low-cost and environmentally friendly CuZnSnSSe (CZTSSe)based solar cells suffer from relatively low power conversion efficiencies. In contrast, solar cells based on B- γ -CsSnI₃ perovskite exhibit higher performance; however, their efficiencies remain below expectations and their fabrication relies on costly cesium. This study aims to reduce the cost of B- γ -CsSnI₃-based perovskite solar cells without compromising performance by incorporating a CZTSSe absorber layer while thinning the perovskite layer. A novel lead-free solar cell architecture is proposed with the following structure: ZnO-Al/i-ZnO/CdS/CZTSSe/B- γ -CsSnI₃/MoSe₂/Mo. This strategy has not been previously reported as a cost-reduction approach for B- γ -CsSnI₃-based systems. Density Functional Theory (DFT) is employed to predict the crystalline structure as well as the electronic and optical properties of the materials, which are subsequently used as input parameters for device simulation using the SCAPS-1D software.

The effects of varying the CZTSSe absorber thickness (1-2 μm) and the perovskite layer thickness (0.1-2 μm) are investigated, along with doping concentrations ranging from 1×10^{15} to $1 \times 10^{19} \text{ cm}^{-3}$. At a doping concentration of $1 \times 10^{17} \text{ cm}^{-3}$, the dual-absorber solar cell achieves a high efficiency of 23.80% with a perovskite thickness of 0.1 μm , which increases to 29.20% at a thickness of 1.0 μm . These efficiencies are higher than those reported in the literature for mono-absorber B- γ -CsSnI₃ solar cells with comparable thicknesses.

The results demonstrate the significant added value of incorporating a CZTSSe absorber layer in high-cost solar cell architectures, enabling both cost reduction and enhanced power conversion efficiency.

Keywords – CZTSSe, B- γ -CsSnI₃, Dual-Absorber Solar Cells, DFT, SCAPS-1D software.



Development of sustainable precast concrete by renewable energy

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Abstract – Precast architectural concrete using solar energy is one of the highest-performing materials currently available for realizing architectural visions for buildings and structures. Its durability contributes to the preservation of natural resources. This construction process consists of prefabricated elements, produced in a factory, delivered to the construction site, and assembled as building components. In addition to their structural advantages, precast modules are also recognized for their environmental and social benefits. Our research aims to accelerate the hardening of fresh concrete to achieve, within a few hours, strength values equivalent to 70-80% of the strength achieved after 28 days of normal curing. The use of a renewable, non-polluting energy source as a heat source meets the requirements of sustainable development; this is why we chose this technique. The method and hardening system offer the following characteristics: simple equipment, low manufacturing and production costs, significantly reduced energy consumption, energy savings, and low overall cost.

Keywords – Concrete, Solar Energy, Hardening Concrete, energy savings, overall cost.

Using Petrel Software for Geological Modeling

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Abstract – Geological modeling is an integral part of modern research in Geology, Geophysics, and other Earth Sciences. It is necessary to solve various complex problems related to deep structure. The transition from traditional two-dimensional profiles to three-dimensional digital models enables a more comprehensive representation of the spatial structure of geological objects and an enhanced understanding of their internal composition, facilitating the subsequent identification of promising geological structures for deposits, reserve calculations, and other applications.

The main purpose of the abstract is to show the features of using the Petrel software package to create geological models of small areas based on various available data (geological, geophysical, well data, etc.). The process of building geological models using the Petrel software is demonstrated using the example of sites within the Carpathian region.

The Petrel software complex is one of the leading digital platforms for implementing geological modeling, enabling the integration of various data types within a single environment. The basis for creating geological models is the systematization and generalization of a large amount of diverse available specialized information about the deep structure. The Petrel environment implements a full cycle of geological modeling of available data: from creating a structural framework to building lithological and reservoir models. Using Petrel increases the objectivity of interpreting geological information and helps reduce uncertainty when analyzing the structure of geological objects. The use of digital geological modeling technologies in Petrel corresponds to modern trends in the development of Geology and Earth Sciences.

Keywords – geological data, geophysical data, geological modeling, Petrel software, 3D modelling



Manufacturing of Functionally Graded Graphene Nanoplatelet-Reinforced Composite Beam

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Abstract – In this study, functionally graded graphene nanoplatelet-reinforced composite beam (FG-GPLRCB) specimens were fabricated using a controlled layer-by-layer production method designed to achieve the desired reinforcement distribution and thickness variation. The composite material was prepared by dispersing a prescribed amount of graphene nanoplatelets into the polymer matrix, followed by sequential casting of individual layers. To ensure distinct functional layers and prevent undesired interlayer mixing, a fixed downtime was maintained between successive layer depositions, allowing partial curing before the next layer was applied. This fabrication strategy enabled accurate control of lamina thickness and reinforcement gradation through the beam thickness.

Following specimen preparation, the microstructural characteristics of the FG-GPLRCB samples were examined using Scanning Electron Microscopy (SEM). SEM analysis was performed to evaluate the dispersion quality of graphene nanoplatelets within the matrix, the integrity of the interfacial bonding, and the continuity between adjacent layers. The observed images reveal a relatively smooth surface morphology for the neat epoxy matrix. In contrast, this smooth morphology is not evident in the GPL-reinforced samples. This difference is attributed to the interaction between the graphene nanoplatelets and the epoxy, whereby the GPLs bond with the surrounding matrix and locally gather epoxy around themselves, resulting in a more irregular and cracked surface appearance. These microstructural findings provide essential insight into the effectiveness of the production method and form a basis for interpreting the mechanical behavior of the fabricated FG-GPLRCB specimens.

Keywords – Functionally graded graphene nanoplatelet reinforced composite beam; Graphene nanoplatelet; Scanning electron microscopy; Carbon nanotubes; Reinforcement Distribution Pattern



Application of Nanofluids for Enhanced Oil Recovery: Mechanisms, Performance, and Reservoir Implications

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Abstract – Nanofluids have gained increasing attention as potential agents for enhanced oil recovery (EOR) due to their ability to modify interfacial and rock surface properties at the nanoscale. In this study, the performance of silica-based nanofluids for EOR applications was investigated under reservoir-relevant conditions. Stable nanofluids were prepared and evaluated through contact angle measurements, interfacial tension (IFT) analysis, and core flooding experiments in oil-wet porous media. The results indicate that nanofluids significantly alter rock wettability toward a more water-wet condition and enhance oil displacement efficiency. Oil recovery improvement was primarily attributed to wettability alteration and structural disjoining pressure, while IFT reduction played a secondary role. The findings demonstrate that nanoparticle properties such as size, surface chemistry, and dispersion stability strongly influence EOR performance. This study highlights the potential of nanofluids as an effective and economically viable approach for improving oil recovery in conventional reservoirs.

Keywords – Enhanced Oil Recovery (EOR), Nanofluids, Silica Nanoparticles, Interfacial Tension, Wettability Alteration



Is the Stock Market Sensitive to Changes in the Exchange Rate? The Case of Japan

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Abstract – Understanding the relationship between exchange rates and stock markets is critical for several reasons: first, it influences monetary and fiscal policy decisions; second, the linkage between these two markets can be utilized to forecast the trajectory of either exchange rates or stock prices; and third, currency is increasingly included as an asset class in investment portfolios. This study examines the lead-lag relationship between the exchange rate and stock prices in Japan using causality tests and time-series methods. This study considers three distinct dimensions: First, it examines local, regional, and global stock market prices, allowing us to observe the relationship between the Japanese stock market and the exchange rate while accounting for regional and global effects. Second, the study covers the period from 2003 to 2016, beginning with Japan's return to positive growth following the Asian financial crisis. The data period ends in 2016 because the Bank of Japan introduced Yield Curve Control (YCC), which altered the monetary policy transmission mechanism. Third, the paper seeks to extend the existing literature on this nexus. The results suggest that the exchange rate is the leading variable for the local stock market index. The primary policy implications suggest that investors holding both currency and equity assets should monitor exchange rate fluctuations to form expectations about the local stock market. Furthermore, policymakers might target exchange rates to influence the stock market, thereby boosting the performance of the industrial sector and fostering economic growth.

Keywords – Exchange rate, Stock Market, Japan, Causality, Time series



Modeling a chemostat under inhibitory effects

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Abstract – The chemostat is a fundamental model in microbiology, ecology, and biotechnology, widely used in applications such as wastewater treatment and industrial fermentation. Classical models of microbial competition in chemostats predict the principle of competitive exclusion when multiple species compete for a single limiting nutrient. Although this principle is well supported by theoretical and experimental studies, empirical observations reveal that microbial coexistence can occur under such conditions. In this paper, we analyze a mathematical model describing the competition between two microbial species for a single nutrient in a chemostat. We investigate the system's dynamics and identify mechanisms that promote coexistence, thereby providing insight into the maintenance of biological diversity in competitive environments.

Keywords – Chemostat; Coexistence; Inhibition



Intrinsic properties of γ -graphyne: a first-principles study by DFT-GGA

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Abstract – Graphene (GY) is an artificial allotrope of carbon composed of sp and sp² hybridized atoms. Many of its structures have been predicted using density functional theory (DFT) within the framework of the generalized gradient approximation (GGA). Among these structures, γ -graphyne (γ -GY) has attracted particular interest due to its remarkable intrinsic properties, such as a direct band gap, a tunable electronic structure, high charge carrier mobility, an ultrathin two-dimensional structure, and nanoporosity. This study focuses on the theoretical analysis of the structures and electronic properties of γ -GY obtained through DFT-GGA calculations, as well as exploring its potential applications. The results highlight the strong potential of γ -GY as an advanced two-dimensional material, while emphasizing the importance of theoretical approaches for understanding and predicting its physical and electronic performance.

Keywords – γ -graphyne; DFT; GGA approximation; electronic properties; two-dimensional materials.



Tunable Magnetic and Thermoelectric Properties of Mn_2Co_xZ Alloys: A First-Principles Study

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Abstract – We investigated the electronic, thermoelectric, and magnetic properties of Mn_2Co_xZ ($Z = Al, Ga, In, Si, Ge, Sn, Sb$) compounds with Hg_2Cu_xTi -type structure using DFT with the mBJ potential. Our calculations indicate that compounds with $Z = Al, Si, Ge, Sn,$ and Sb are semi-metallic ferrimagnets. The Mn_2Co_xZ compounds were successfully synthesized, and X-ray diffraction with Rietveld refinement confirmed the Hg_2Cu_xTi structure, rather than the conventional $L2_1$ structure. Electronic structure analysis reveals two mechanisms generating the minority-spin band gap, with the d-d gap determining its final width. Magnetic interactions are complex: Mn(C)-Co hybridization controls the Co magnetic moment and the sign of Mn(B)-Co exchange. The Mn_2Co_xZ alloys follow the Slater-Pauling rule $M_H = N_V - 24$, and the molecular magnetic moment M_H increases with valence mainly due to the reduction of the antiparallel Mn(C) moment, while Mn(B) and Co moments remain unchanged.

Keywords – Mn_2Co_xZ ($Z = Al, Ga, In, Si, Ge, Sn, Sb$) ; Heusler; semi-metallic ferrimagnets; DFT; optoelectronic properties



Covalency-Driven Stabilization of Hexagonal SrMnO₃: Insights from DFT and Experiments

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Abstract – SrMnO₃ exhibits a cubic perovskite structure at high temperature and a hexagonal structure at low temperature, with MnO₆ octahedra in the cubic phase and face-sharing Mn₂O₉ bioctahedra in the hexagonal phase. DFT calculations show both polymorphs are insulating at 0 K, but with different band gaps (0.3 eV cubic vs. 1.6 eV hexagonal). The hexagonal phase is antiferromagnetic within Mn₂O₉ dimers and between octahedra, while the cubic phase has G-type antiferromagnetism and is 260 meV per formula unit higher in energy. Although Sr–O bonds are mainly ionic, Mn–O covalency stabilizes the hexagonal phase. Additional stabilization comes from a small Mn displacement in face-sharing octahedra (~0.012 Å) and charge redistribution that reduces Mn–Mn repulsion. The hexagonal phase is more compressible, and the calculated bulk modulus agrees with experimental high-pressure X-ray diffraction, validating the DFT results.

Keywords – SrMnO₃; cubic perovskite structure; DFT; high-pressure X-ray diffraction



Designing highly efficient heterocyclic inhibitors for SARS-CoV-2 3C-like proteinase: a comprehensive in silico study

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Abstract – To address the limitations of current COVID-19 treatments, we conducted an integrated in-silico investigation to design potential drugs with proven efficacy against the virus. We developed Quantitative Structure-Activity Relationship (QSAR) models using a database of 63 Aromatic heterocyclic compounds, focusing on key parameters Effective Diameter (ED) and Diameter Maximum (DM). Our models, utilizing multi-linear regression (MLR) and Artificial Neural Network (ANN), were validated according to OECD principles and successfully used to predict unexplored aromatic heterocyclic compounds with Pyridine Cores. Compound 4 (Dexbrompheniramine) exhibited high inhibition against the SARS coronavirus 3 C-like protease, leading to the design of two new molecules (compounds 15 and 16) with enhanced activity based on structural enhancements from the QSAR model. Docking studies and molecular dynamics simulations confirmed the improved binding energies and stability of compounds 15 and 16, with compound 15 showing remarkable stability and strong binding affinity with the 3 C-like proteinases (1P9U). Furthermore, in silico ADMET and toxicity evaluations indicated that compounds 15 and 16 possess favorable pharmacokinetic properties, including acceptable absorption and distribution profiles, low predicted toxicity, and minimal safety concerns.

This comprehensive in-silico review identifies compound 15 as a promising candidate for experimental evaluation as a potential COVID-19 drug, highlighting a significant advancement in our battle against the pandemic.

Keywords – 3C-like protease (3CLpro); ANN; linear regression; MLR; QSAR; SARS coronavirus.



Accounting Education in Algeria: Opportunities and Challenges

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Abstract – This study aims to highlight the necessity of transitioning from a traditional educational model to a modern, dynamic one capable of producing accountants who combine solid theoretical knowledge with the applied and technical skills demanded by the modern era. In facing the existing challenges, accounting education in Algeria is witnessing significant transformations imposed by global and local changes, which have led to the creation of an environment full of both challenges and opportunities. This field is vital for preparing a workforce capable of keeping pace with labor market requirements and supporting economic development. This can be achieved by working to bridge the gap between academic curricula and market needs through aligning course syllabi with international standards, providing modern technological equipment and up-to-date sources and references, and additionally, by working to develop human competencies.

Furthermore, efforts are needed to reduce the disparity between Algerian accounting legislation and international standards, which creates an urgent need to update the financial accounting system. It is also crucial to leverage digital transformation and the rapid development of technology, reform the financial and tax systems, and enhance partnerships between universities, vocational training centers, and the institute of chartered accountants. Emphasis should be placed on developing soft skills such as critical thinking, communication, and professional ethics.

Algeria possesses tremendous potential to develop accounting education and make it a cornerstone for supporting the national economy. Success in this field requires political will and constructive dialogue among all stakeholders (the state, universities, the professional body, and the private sector) to advance accounting education.

Keywords – Education International Standards, Professional Ethics, Digital Transformation, Educational Reform, Financial Accounting System.



Açık İşletmelerde Patlatma Tasarımı ve Çevresel Etkilerin Python Gui Yardımlarıyla Modellenmesi

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Özet – Açık işletmelerde patlatma tasarımı ve çevresel etkilerin hesaplanması için Python tabanlı arayüz (GUI) uygulamasını kullanarak bir yazılım modeli geliştirilmiştir. Model patlatma tasarımını ve çevresel etkileri sayısal olarak hesaplamaktadır. Modele, ilk aşamada çalışma yapılacak maden sahasının işletme türü (kömür, taş ocağı vs.), yıllık üretim miktarı, çalışma süreleri (yıllık, aylık, günlük ve patlatma aralığı) ve basamak geometrileri (basamak yüksekliği ve delik eğimi açısı) veri olarak girilmektedir. Model bu verileri kullanarak aylık ve günlük üretim miktarları ile aylık ve yıllık patlatma sayılarını hesaplamaktadır. Model, bir atımdaki delik sayısına bağlı olarak patlatma kaynaklı çevresel etkileri belirlemektedir. Model ile, patlatma kaynaklı çevresel etkilerin matematiksel olarak hesaplanmasının uzun alması ve olası işlem hatalarının önüne geçilerek işlemler çok daha kısa ve anlaşılır bir şekilde çözülmektedir. Model ayrıca üretim faaliyetine geçmeyen ve patlayıcı madde kullanmayı planlayan açık maden işletmeleri için alternatif üretim planlarına bağlı olarak patlatma tasarımı ve çevresel etkileri de önceden çok kısa zamanda ve doğru bir şekilde yapmaktadır.

Anahtar Kelimeler – Patlatma tasarımı, Patlatmalı Kazı, Çevresel etkiler, GUI, Modelleme



Determination of stresses in the casing of a downhole jet pump

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Abstract – According to the nature of the influence of operating conditions on the mechanical characteristics, the components of the ejection system are grouped into elements subject to wear due to the hydroabrasive action of the working medium, and body parts that perceive forces from axial load, pressure, and friction. The operating conditions of downhole jet pumps are complicated by the peculiarities of their working process, which consist in the increased probability of their operation in cavitation mode. In the process of analyzing the operating conditions of downhole over-bit ejection systems, it was found that the annular stresses during drilling remain unchanged, and the compressive and tangential stresses are characterized by an asymmetric nature. Constant stresses from the action of the working fluid pressure and axial load and variable asymmetric stresses are characteristic of the body elements of the jet pump, which implements the face cleaning process. During the elimination of drill string sticking, constant stresses from the action of pressure and tension at certain stages of using the jet pump are transformed into asymmetric, decaying variable stresses. The casing elements of packer oil production jet pumps are characterized by the action of constant compressive stresses, and two-pipe oil production systems are characterized by constant tensile stresses. The annular stresses in the casing of the well ejection system and the density of the flushing solution, the depth of the well, the flow rate of the working stream, and the radius of the jet pump wall are directly proportional.

Keywords – Well jet pump, ejection system, mechanical characteristics, wear, stress



Scaler–Sampler–Cost Interactions in Classical Sleep Staging: Utility- Based Trade-offs for N1 on Sleep-EDF

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Abstract – Automated sleep staging is still difficult. Because of its transitional nature and overlap with adjacent stages, stage N1 shows the lowest reliability. In this work, we examine whether N1 performance under leakage-safe evaluation can be enhanced by cost-sensitive learning. We also look at how it affects SMOTE-family resampling and feature scaling. We use a multilayer perceptron with five stages and 30-s epochs from Sleep-EDF Expanded dataset. 28 handcrafted features from Fpz-Cz EEG channel are used to train the model. Three scalars— z-score, robust, and min-max—are assessed. Additionally, we assess three cost formulations (Inverse-frequency, Effective-number, and Log-scaled) and three resampling techniques (SVMSMOTE, SMOTETOMEK, and SMOTE with AllKNN). Every experiment is carried out using subject-wise 5-fold cross-validation. The best-performing global option, according to the results, is inverse-frequency sample weighting without resampling. Compared to SMOTE-based methods, it achieves competitive N1 improvements. On the other hand, SVM-based resampling with effective-number weighting is most advantageous for min-max scaling. Additionally, a within-cell added-value analysis indicates that cost-sensitive learning yields its greatest benefits when resampling is not used. Once SMOTE-family sampling is used, it provides little additional benefit. Reducing misclassifications into W/N2/REM is the main source of N1 improvements, according to confusion-matrix inspection. All things considered, the study offers useful advice for choosing N1-oriented configurations. Under realistic, leakage-safe evaluation, it also takes into consideration trade-offs in non-target stages.

Keywords – Automated sleep staging, Cost-sensitive learning, Feature scaling, N1 detection, SMOTE, Subject-wise CV



Lead and Copper Extraction Using The Cloud Point Technique

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Abstract – Metals often appear in very high concentrations in many solid (complex matrix) or liquid (organic and/or inorganic) industrial waste streams, posing definite pollution risks due to their high toxicity and widespread environmental distribution.

Lead is often present in copper ores, so it is useful to study the selective extraction of these two metals. To this end, the aim of this work is to study the influence of operating parameters on the extraction and pre-concentration of Pb(II) and Cu(II).

The problem of environmental pollution remains a pressing issue, as many industrial activities continue to generate various pollutants, including organic substances and heavy metals, which can cause significant harm.

Surfactants have properties that enable them to be used in several unit operations and processes, such as two-phase aqueous liquid-liquid extraction, also known as cloud point extraction (CPE), whose effectiveness has been proven in numerous previous studies.

Polyethylene glycols (PEGs) also have satisfactory toxicological and ecotoxicological properties. This paves the way for 'green' chemistry, which involves designing non-polluting, energy-efficient processes. In addition to their adsorption and association properties (which are responsible, for example, for micellar solubilisation), polyethoxylated alcohols (AE, abbreviated formula: CiEj), which may be propoxylated with fewer than four propylene oxide units, and even derivatives of OXO synthesis, are readily biodegradable and inexpensive.

The cloud point technique was tested for extraction of lead ions using a polyethoxylated alcohol C₁₃E₁₀ as a nonionic liquid. Extraction optimization was determined by optimizing one parameter at a time. Lead was found to be 82.78% extracted.

Keywords – Lead, Extraction, Cloud point technique, polyethoxylated alcohols, nonionic liquid.



Transparency and Accountability: Strengthening Corruption Reporting Mechanisms in Institutions

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Abstract –Enhancing corruption reporting mechanisms within institutions is a fundamental pillar of any effective good governance strategy, serving as the cornerstone for achieving two intertwined objectives: transparency and accountability. By providing secure and effective reporting channels, institutions evolve from closed structures that may tolerate harmful practices into entities capable of internally detecting misconduct and holding those involved to account. Consequently, reporting is no longer merely an individual act but has transformed into a preventive institutional mechanism aimed at curbing corruption at its source. Recognizing this proactive importance, many countries have moved to integrate comprehensive systems for encouraging reporting and protecting whistleblowers into their legislation and institutional frameworks. The forms of this encouragement range from negative to positive incentives, collectively designed to overcome the prevailing culture of silence and fear in many regulatory environments. Among the most prominent are: **Legal Incentives:** Such as granting immunity from prosecution or reduced penalties for internal whistleblowers who were complicit in the offense, aiming to break the wall of collusion. **Protection Incentives:** These include guaranteeing full confidentiality and protection from harassment or professional retaliation, commonly known as "whistleblower protection," which is a fundamental requirement for ensuring the mechanism's credibility. **Material Incentives:** Allocating conditional financial rewards to incentivize reporting of major or complex crimes. This legislative evolution demonstrates that effective reporting is no longer solely a matter of ethics but one of institutional design. The success of strengthening these mechanisms is measured by their ability to generate a consistent and reliable flow of information. This, in turn, creates an environment that deters corruption and enhances the trust of suppliers, partners, and the public in the institution's integrity and transparency.

Keywords – Incentives– Corruption, Immunity, Reward , Reporting

Mathematical approaches to the propagation of *Xylella fastidiosa* in Mediterranean olive orchards

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Abstract – In this work, we study the dynamics of a mathematical model de-scribing the spread of *Xylella fastidiosa* disease in an olive orchard. We begin by in-troducing an agestructured model composed of two equations: an ordinary differential equation (ODE) describing the evolution of healthy olive trees, and a partial differential equation (PDE) modeling infected olive trees according to their age of infection. Referring to the work of P. Magal ([1]), this system is reduced to a delay differential equations model, where a delay term appears on the infected olive trees variable. We show that this model is well-posed and establish the existence of two equilibrium points: the disease-free equilibrium and the endemic equilibrium. An analysis of local stability is carried out, and for the disease-free equilibrium, a global stability analysis is performed using a Lyapunov-Krasovskii functional, using the basic reproduction number R_0 depending on the delay τ . This number depends also in particular on the implantation rate Λ as well as on the mortality rates of healthy, infected and uprooted olive trees. Numerical simulations illustrate the theoretical results.

Keywords – hybrid mathematical model, delay differential equations, local and global stability, Lyapunov-Krasovskii functiona



Preventing Process Accidents Through Proactive Maintenance Strategies: A Refinery Case Study

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Abstract – Process accidents occurring in refinery systems can result in injuries and fatalities, cause severe environmental damage, and lead to significant economic losses. A substantial number of major accidents in high-risk industries are related to inadequate maintenance, loss of mechanical integrity, and reliance on reactive maintenance practices. Against this background, proactive maintenance strategies play a critical role in accident prevention by addressing equipment degradation and system weaknesses before hazardous conditions develop.

This study examines the relationship between maintenance practices and process accidents through a refinery-based case study. The analysis focuses on deficiencies in maintenance planning, limited condition monitoring, and weakened safety barriers. These factors are evaluated in terms of their role in the development of major accident scenarios. Proactive maintenance is discussed within strategic frameworks such as Total Productive Maintenance (TPM) and Reliability-Centered Maintenance (RCM), which aim to improve equipment reliability, availability, and mechanical integrity.

Accident causation and failure propagation are evaluated using Failure Modes and Effects Analysis (FMEA) as the primary analytical method. The FMEA framework enables the systematic identification of maintenance-related failure modes, their underlying causes, and their effects on process performance and safety. Through structured assessment of failure modes, existing controls, and detection mechanisms, critical maintenance deficiencies are identified and prioritized. This approach clearly shows how maintenance-related failures lead to hazardous conditions, supporting risk-based decision-making and improvements in preventive maintenance.

Keywords – Process Safety, Proactive Maintenance, Failure Modes and Effects Analysis (FMEA), Mechanical Integrity, Refinery Operations



Comparative Study of Selective Active Filtering Techniques Based on the Synchronous d–q Park Reference Frame and the FMV Approach

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Abstract – This paper presents a comparative study of two selective shunt active power filtering techniques designed for adjustable speed drive applications, aimed at minimizing the total harmonic distortion (THD) and, consequently, improving the power factor (PF). Both techniques are based on the selective compensation of low-order current harmonics, specifically the 5th and 7th components. In the first approach, the reference harmonic components are identified using the synchronous d–q Park reference frame, while in the second approach, they are extracted using a modified synchronous d–q Park reference frame based on a multivariable filter (MVF). The selective active filtering is applied simultaneously to the 5th and 7th load current harmonics. Simulation results obtained using MATLAB/Simulink, including waveform analysis and THD values, demonstrate the effectiveness of the proposed methods and highlight the superior performance of the most efficient selective filtering technique.

Keywords – selective shunt active power filter (APF), Total harmonic distortion (THD), Power factor (PF), Multivariable filter (MVF), synchronous d–q Park reference frame



Mechanical Properties of Crumb Rubber–Modified Sand Concrete

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Abstract –The rapid increase in vehicle tire production has led to a significant accumulation of waste rubber, prompting growing interest in its valorization in cement-based materials. This study investigates the mechanical performance of sand concrete incorporating crumb rubber (CR) as a partial replacement for fine aggregates at different substitution levels (0%, 3%, 6%, 9%, and 12%). The experimental program focused on evaluating the effects of rubber incorporation on workability, density, compressive strength, and flexural strength of sand concrete.

The results indicate that the inclusion of crumb rubber leads to a gradual reduction in density and workability with increasing rubber content. Mechanical test results reveal a decrease in compressive and flexural strengths as the rubber substitution level increases, which is attributed to the lower stiffness of rubber particles compared to natural sand and to the weaker interfacial bonding within the cementitious matrix. However, at low substitution levels, particularly at 3% rubber content, sand concrete exhibits acceptable mechanical performance, maintaining sufficient strength for non-structural and selected structural applications.

Overall, the findings demonstrate that crumb rubber can be effectively incorporated into sand concrete at limited dosages without excessively compromising its mechanical properties, offering a promising pathway for sustainable waste rubber utilization in construction materials.

Keywords – Crumb rubber, Sand concrete, Mechanical behavior, Compressive strength, Flexural strength



Mechanical Properties of Sand Concrete Containing Aqua Heat-Treated Crumb Rubber

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Abstract –The rapid accumulation of waste tire rubber has motivated its reuse in cement-based materials. This study investigates the influence of aqua heat-treated crumb rubber (TR) on the mechanical properties of sand concrete, used as a partial replacement for fine aggregates at 0%, 3%, 6%, 9%, and 12% dosages. The experimental program focused on workability, density, compressive strength, and flexural strength. Results demonstrate that incorporating treated rubber improves the mechanical performance compared to untreated rubber. Specifically, sand concrete containing 3% treated rubber exhibited the best balance between workability and strength. Higher dosages led to reductions in compressive and flexural strengths due to the lower stiffness of rubber and weaker interfacial bonding with the cement matrix. Overall, aqua heat treatment enhances the compatibility of crumb rubber with the cementitious matrix, mitigating strength loss and allowing sustainable incorporation of waste rubber in sand concrete.

Keywords –Crumb rubber, Aqua heat treatment, Sand concrete Compressive strength, Flexural strength, Mechanical performance



Influence of Aqua Heat-Treated Crumb Rubber on Porosity and Water Absorption of Sand Concrete

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Abstract –The growing accumulation of waste tire rubber has encouraged its reuse in cement-based materials. This study investigates the effect of aqua heat-treated crumb rubber (TR) on the porosity and water absorption of sand concrete, used as a partial replacement for fine aggregates at 0%, 3%, 6%, 9%, and 12%.

Experimental results show that the incorporation of treated rubber modifies the internal pore structure of sand concrete. While untreated rubber tends to increase porosity and water absorption, aqua heat treatment significantly mitigates these effects, leading to a denser microstructure and improved water resistance. The optimal content of treated rubber was found to be 3%, which provided the most favorable balance between porosity and absorption without compromising the concrete's integrity. These findings highlight the potential of treated crumb rubber to enhance the durability-related properties of sand concrete while promoting sustainable waste reuse.

Keywords –Crumb rubber, Aqua heat treatment, Sand concrete porosity, water absorption, waste tire recycling



Effect of Crumb Rubber Content on Porosity and Water Absorption of Sand Concret

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Abstract –The increasing generation of waste tire rubber has encouraged its reuse in cement-based materials as an alternative to natural aggregates. This study investigates the effects of incorporating crumb rubber (CR) as a partial replacement of fine aggregates on the porosity and water absorption behavior of sand concrete. Crumb rubber was introduced at different substitution levels of 0%, 3%, 6%, 9%, and 12%. The experimental program focused on the evaluation of open porosity and water absorption as key indicators of the material's internal structure and transport properties. The results indicate that the incorporation of crumb rubber leads to an increase in porosity and water absorption with increasing rubber content. This behavior is mainly attributed to the lower density of rubber particles and the presence of additional voids within the cementitious matrix caused by the rubber–paste interface. At low rubber contents, particularly at 3% substitution, sand concrete exhibits a moderate increase in porosity and water absorption, remaining within acceptable limits for practical applications. However, higher rubber dosages result in a more pronounced increase in these properties, which may negatively affect long-term performance. Overall, the findings highlight the influence of crumb rubber content on the pore structure of sand concrete and provide useful insights for optimizing rubber incorporation levels in sustainable construction materials.

Keywords –Crumb rubber, Sand concrete, Porosity, Water absorption ,Waste tire recycling



Comparative Study of Untreated and Aqua Heat-Treated Crumb Rubber in Sand Concrete: Mechanical and Durability Performance

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Abstract –The increasing generation of waste tire rubber has led to growing interest in its sustainable reuse in cement-based materials. This study investigates the influence of untreated (UTR) and aqua heat-treated (TR) crumb rubber as partial replacements for fine aggregates in sand concrete at 0%, 3%, 6%, 9%, and 12% dosages. The experimental program evaluated both mechanical properties (workability, density, compressive and flexural strength) and durability-related properties (porosity and water absorption) to provide a comprehensive comparison.

Results show that the incorporation of untreated rubber generally reduces density and workability while increasing porosity and water absorption. Mechanical strengths also decrease with higher rubber content due to the lower stiffness and weaker bonding of untreated particles. In contrast, aqua heat-treated rubber mitigates these adverse effects, leading to improved compressive and flexural strengths and reduced porosity and water absorption compared to untreated rubber. An optimal replacement of 3% treated rubber achieved the best balance between workability, mechanical performance, and durability-related properties.

Overall, the findings demonstrate that aqua heat treatment enhances the compatibility of crumb rubber with sand concrete, allowing sustainable incorporation of waste rubber while maintaining satisfactory structural and durability performance.

Keywords –Crumb rubber, Aqua heat treatment, Sand concrete porosity, water absorption, Mechanical properties



Effect of Novaluron on the reproductive fitness of *Aedes aegypti* L. (Diptera: Culicidae)

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Background: *Aedes aegypti*, a disease vector, represents a critical public health challenge. Reliance on chemical interventions has made mosquitoes resistant and adversely affected the environment and human health. Consequently, there is a growing emphasis to explore alternate strategies leading to investigations with insect growth regulators (IGRs) for managing resistant insect vectors. The current study assessed the efficacy of novaluron, an IGR (at EI₃₀ and EI₅₀) on the reproductive fitness of *Aedes aegypti* emerged from the novaluron-treated fourth instars. **Methods:** Adults emerged from control, EI₃₀ (0.02 ug/L) and EI₅₀ (0.03 ug/L) novaluron-treated larvae were crossed in seven different combinations. Key parameters like fecundity, egg hatchability, and cycle durations were evaluated and recorded on daily basis across three consecutive gonotrophic cycles. **Results:** The findings indicated that effective inhibition of the reproductive capacity of *Aedes aegypti* females emerged from the treated larvae. The novaluron-treatment resulted in prolonged gonotrophic cycles, the control adults showing an average total duration of 9.37 days for three consecutive gonotrophic cycles. Furthermore, the oviposition from cross between treated adults was significantly reduced by 30-50%, and egg hatchability was declined up to 61% as compared to control. **Conclusion:** The study suggests that novaluron exposure leads to longer gonotrophic cycles and delays the life cycle of *Aedes aegypti*. Reduced fecundity and fertility rates among treated mosquitoes indicate diminished reproductive activity. The reproductive effects showed different patterns between different crosses. These results provide valuable insights into the potential application of novaluron as a control measure that effectively reduces the reproductive capacity of *Aedes aegypti*, thereby contributing to the management of mosquito-borne diseases.

Keywords: *Aedes aegypti*, gonotrophic cycle, fecundity, novaluron, hatchability, fertility.



Control of damage mechanisms under tension shear loading in friction stir spot welding of Aluminium alloy and Steel

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Abstract – This study investigates the control of fracture and damage of a single lap friction stir spot welding assembly formed from thin sheets of aluminum alloy and steel. For fixed process parameters, two configurations are taken into account for the analysis of the global mechanical behaviour of the link. An experimental approach was carried out in order to analyse the sequence of damage mechanisms using acoustic emission and measurement of fields by digital image correlation techniques simultaneously. The acoustic emission technique allows the monitoring of the evolution of acoustic activities. The digital image correlation technique confirms the damage scenarios after the treatment of strain field at any point near the fastener and especially between the exit hole and the shoulder footprint. The coupling of those two techniques allows identifying characteristic points and a breakdown of the load displacement curve in phases.

Keywords – Control of damage; acoustic emission; correlation techniques; damage mechanisms; digital image; steel.



Antibacterial Performance of a Chitosan-Based Nanocomposite Loaded with Green Silver Nanoparticles: MIC and MBC Studies

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Abstract – Metallic nanoparticles, including gold, silver, zinc oxide, titanium dioxide, and copper, have emerged as pivotal materials across a multitude of fields such as medicine, biology, chemistry, cosmetics, and food processing. Their unique properties—ranging from antibacterial, antifungal, antiviral, and antioxidant activities to optical characteristics—make them valuable in various applications. For instance, these nanoparticles are utilized in drug delivery systems, diagnostic imaging, and as preservatives in food packaging due to their efficacy against pathogens and ability to enhance product stability. Traditionally, metallic nanoparticles have been synthesized through various chemical and physical methods. However, many of these approaches are not environmentally friendly, raising concerns about their sustainability. As a result, there is a growing interest in developing eco-friendly synthesis methods using biological materials such as plant extracts. In this context metallic nanoparticles were greenly synthesized then they were incorporated in a biopolymer with the aim of forming an ecofriendly film with antibacterial activity. Therefore UV-Vis and zeta sizer analysis were utilized to confirm their synthesis and their stability, the FTIR technic was used and MIC and MCB were studied for the biofilms against *S.aureus*, *B.subtillus*.

The UV-Vis analysis demonstrated SPB bound for the synthesized nanoparticles confirming their spherical shape meanwhile DLS results revealed a size of 52nm with a PDI equal to 0.1 and a zeta potential of -22 mV. Meanwhile the FTIR proved the presence of the main functions of the polymer and the interaction between it and the nanoparticles without altering its functions, the films with different amounts of AgNPs exhibited an antibacterial activity against *S.aureus* and *B.subtillus*, while they exhibited MIC values of 7.8/ 3.9/1.95/0.97 µg/ml of respectively plain chitosan then chitosan incorporated with different amounts of AgNPs for *S.aureus* strains, and an MCB values of 250/125/62.5 µg/ml for the same strains, in the other hand the values were respectively 7.8/3.9/1.95 µg/ml and 62.5/31.25/3.9 µg/ml for *B.subtillus* strains. These results demonstrated the potential uses of these sustainable polymer nanocomposites for biological and medical fields.

Keywords –nanoparticles, plant extract, chitosan, antibacterial activity, MIC/MCB



Precipitation sequence and determination of kinetic parameters of the metastable β'' phase in an Al-Mg-Si-Cu alloy by DSC analysis

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Abstract –This study investigates the precipitation sequence and the kinetic parameters of the metastable β'' phase in an Al–Mg–Si–Cu alloy, which is well-known for its excellent mechanical properties achieved through precipitation hardening. This research aims to determine the activation energy and the Avrami exponent (n). Thermal analyses were performed using Differential Scanning Calorimetry (DSC) under non-isothermal conditions at heating rates of 5, 10, 20, and 30 °C/min. The resulting thermograms reveal a succession of phase transformations. The shift of the peaks toward higher temperatures with increasing heating rates confirms a thermally activated kinetic process. The activation energy (Ea) for the β'' phase was evaluated using the Kissinger (92.47 kJ/mol), Ozawa (101.63 kJ/mol), and Boswell (97.19 kJ/mol) methods. Furthermore, the Avrami exponent (n) was found to be 1.44. This result indicates that precipitate growth is controlled by solute diffusion from a constant number of nucleation sites. These findings provide a deeper insight into the thermal behavior of the Al–Mg–Si–Cu system and contribute to the optimization of industrial heat treatments.

Keywords – Al-Mg-Si-Cu alloy, Precipitation kinetics, DSC analysis, Activation energy, β'' phase



Analysis of the impact of blade pitch angle on wind turbine power output

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Abstract – The adjustment of wind turbine blades, specifically the angle of attack and the pitch angle, plays a crucial role in optimizing electricity production. By adjusting these angles, lift is maximized while drag is minimized, which significantly improves the aerodynamic efficiency of the rotor. Our study is based on the optimization of the angle of attack, which allows for the most effective use of wind energy by maintaining an optimal balance between the force exerted by the wind and the aerodynamic resistance of the blades. Furthermore, the dynamic adjustment of the blades, for example through a twisting or orientation system, enables the adaptation of rotation speed and generated power in response to variations in wind speed. This improves the stability and continuity of electricity production. This control also helps to limit mechanical stresses and reduce noise, while facilitating better integration of the wind turbine into the electrical grid.

Keywords – Wind turbines, blades, pitch angle, angle of attack, dynamic adjustment.



Morpho-ConvNext: Robust Road Extraction from Satellite Imagery via Hybrid Deep Learning and Mathematical Morphology

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Abstract – Extracting roads from high-resolution satellite imagery is essential for GIS mapping, urban planning, intelligent transportation systems, and smart city development. However, automated extraction faces significant challenges: incomplete roads, poor connectivity, inconsistencies, and obscuration by trees, buildings, and shadows all severely degrade segmentation quality. While deep learning methods like ConvNeXt are robust, they require large volumes of training data and suffer from false positives and long computation times. We propose Morpho-ConvNext, a novel hybrid approach that enhances ConvNeXt-UPerNet with mathematical morphology. The preprocessing phase applies morphological skeletonization and dilation to widen narrow roads, particularly in peri-urban areas, thereby improving their detectability without increasing the data required. The core network integrates CBAM (spatial before, channel after) attention modules to capture both local spatial features and global contextual information on multiscale (C2-C5) feature maps. The post-processing phase uses morphological aperture to eliminate noise and false detections. Tested on five diverse Kaggle datasets (DeepGlobe, Paris Road Network, Mumbai, Shanghai SpaceNet-3, and Vegas), Morpho-ConvNext achieves 98.81% accuracy, 94.09% correctness, an F1 score of 92.77%, and a mIoU of 86.58%, outperforming more than 15 leading methods by 3% to 29% across all metrics. Visual results demonstrate superior performance in complex urban environments with vegetation and shadows.

This hybrid approach combines the representational power of deep learning with the structural refinement of mathematical morphology, offering a robust and efficient solution for extracting road networks from satellite images.

Keywords – Road extraction, deep learning, mathematical morphology, ConvNeXt, remote sensing, semantic segmentation.



Savunma Sanayiinde Dijital Dönüşümün Ar-Ge Ekosistemi Üzerindeki Etkileri

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Özet – Savunma sanayii, doğası gereği uzun soluklu Ar-Ge faaliyetlerine, yüksek teknoloji kullanımına ve çok sayıda paydaşın eş zamanlı katkısına dayanan bir sektördür. Son yıllarda hız kazanan dijital dönüşüm süreci, bu yapıyı yalnızca kullanılan teknolojiler açısından değil, Ar-Ge faaliyetlerinin planlanma, yürütülme ve yönetilme biçimleri açısından da belirgin biçimde etkilemiştir. Dijitalleşme ile birlikte Ar-Ge faaliyetleri, kurum içi sınırların ötesine taşınarak ana yükleniciler, alt yükleniciler, üniversiteler, araştırma merkezleri ve kamu kurumları arasında daha yoğun ve etkileşimli bir yapıya dönüşmektedir. Bu yapı, savunma sanayiinde Ar-Ge ekosistemi kavramını daha görünür ve işlevsel hale getirmiştir. Bu çalışmada, savunma sanayiinde dijital dönüşümün Ar-Ge ekosistemi üzerindeki etkileri; Ar-Ge süreçlerindeki değişim, insan kaynağına yönelik yetkinlik beklentileri ve organizasyonel yapıdaki dönüşüm boyutları çerçevesinde ele alınmaktadır. Dijital tasarım, simülasyon veri analitiği ve entegre proje yönetim sistemlerinin Ar-Ge süreçlerine dâhil edilmesiyle birlikte, karar alma mekanizmalarının daha veri temelli hale geldiği, kurumlar arası koordinasyonun arttığı ve proje sürelerinin yeniden şekillendiği görülmektedir. Bu dönüşüm, Ar-Ge personelinin beklenen yetkinliklerde de belirgin bir değişime yol açmaktadır. Çalışma kapsamında yapılan değerlendirmeler, dijital dönüşümün savunma sanayiinde Ar-Ge ekosistemi üzerinde yalnızca teknolojik bir iyileşme yaratmadığını, aynı zamanda organizasyonel yapıların ve çalışma kültürünün yeniden tanımlanmasına yol açtığını göstermektedir. Bu çerçevede elde edilen bulguların, savunma sanayiinde faaliyet gösteren kurumların Ar-Ge yönetimi ve dijital dönüşüm stratejilerine yönelik karar süreçlerine katkı sunması beklenmektedir.

Anahtar Kelimeler – Savunma sanayii, dönüşüm zorluğu, Ar-Ge ekosistemi, Ar-Ge süreçleri, organizasyonel dönüşüm



Cellular Proliferation and Apoptosis in Canine Palatine Tonsils: An Immunohistological Study

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Abstract - The palatine tonsils are essential peripheral organs of the immune system, providing both local and systemic immunological surveillance. The aim of this study was to investigate the morphofunctional organization of lymphoid tissue in the palatine tonsils of clinically healthy dogs using immunohistochemical methods. It was established that the palatine tonsils consist of a diffuse T-cell-dependent zone and a B-cell-dependent zone represented by lymphoid follicles of various shapes, sizes, and morphofunctional states. The submucosal layer is thickened and infiltrated with diffuse lymphoid tissue and lymphoid follicles, among which secondary (morphofunctionally active) follicles predominate, accounting for more than 90% of the total follicular population. Immunohistochemical analysis revealed high proliferative activity of lymphocytes, particularly pronounced in the mantle zone of secondary lymphoid follicles, where the majority of cells exhibited Ki67- and PCNA-positive reactions. The Ki67 marker demonstrated more distinct and specific visualization compared with PCNA. Apoptosis of immunocompetent cells was detected in small quantities and identified using Caspase-3 and Lamin A markers, predominantly in follicles with partially disrupted morphological organization. Thus, the palatine tonsils of clinically healthy dogs are in a state of continuous morphofunctional activity, as evidenced by the predominance of proliferative processes over apoptotic ones. The obtained data confirm the role of the palatine tonsils as a key barrier component of immune defense and may be used as reference indicators in studies of infectious and non-infectious pathologies.

Keywords – palatine tonsils; immunohistochemistry; lymphoid follicles; proliferation; apoptosis



Effect of brackish water on hematological parameters and selected blood electrolytes in sheep

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Abstract - Water scarcity and progressive salinization of natural water sources pose significant ecological and veterinary challenges in arid and semi-arid regions. In the western part of the Issyk-Kul basin (Kyrgyz Republic), limited freshwater availability forces livestock to consume brackish water from Lake Issyk-Kul, yet the long-term physiological effects of such exposure remain insufficiently studied. This study evaluated the impact of chronic brackish water intake on hematological parameters and serum electrolytes in sheep. The study was conducted in October 2024 using Kyrgyz fat-tailed coarse-wool sheep. Twenty-four clinically healthy animals (2–3 years old) were divided into a control group receiving freshwater (G1, n = 12) and an experimental group consuming brackish lake water (G2, n = 12). After a 7-day adaptation period, blood samples were collected for complete blood count and serum electrolyte analysis (Na⁺, K⁺, Ca²⁺, Mg²⁺, Cl⁻). Statistical analysis was performed using Student's *t*-test. Sheep consuming brackish water exhibited significant alterations in hematological indices, including decreased erythrocyte count, hemoglobin concentration, platelet count, and plateletcrit, alongside increased mean corpuscular volume and hematocrit ($p < 0.05$). Significant changes were also observed in leukocyte profiles. Electrolyte analysis revealed significantly elevated serum sodium, potassium, magnesium, and chloride levels ($p < 0.01$), while calcium remained unchanged. These findings indicate that chronic intake of brackish water induces measurable hematological and electrolyte disturbances in sheep, reflecting physiological adaptation accompanied by systemic stress responses. The results highlight potential health risks associated with long-term use of saline water sources in livestock production systems.

Keywords – brackish water; sheep; hematological parameters; serum electrolytes; water salinity

Scaling Multi-Objective Search for Clinical-Aware Pathfinding: Theoretical Foundations and ϵ -Dominance Strategies

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Abstract – This paper addresses the fundamental challenge of multi-objective pathfinding in large-scale networks where objectives are inherently antagonistic. In medical logistics, selecting an optimal trajectory requires navigating a critical trade-off between temporal efficiency and the biomechanical integrity of the payload. While traditional single-objective algorithms rely on scalar cost functions that fail to capture such multi-dimensional constraints, we propose a theoretical framework based on the **New Approach to Multi-Objective A* (NAMOA*)** algorithm.

We model the navigation space as a multi-weighted directed graph where edges represent a vector of costs, integrating both travel latency and a **Patient Discomfort Index (PDI)** derived from continuous and discrete vertical stressors. To handle the exponential growth of the search space typical of multi-objective problems, we introduce advanced pruning mechanisms based on **ϵ -dominance**. This theoretical refinement allows for a controlled relaxation of the Pareto front, ensuring that the algorithm maintains computational tractability in high-density graphs while guaranteeing a bounded approximation of the optimal solution set.

Furthermore, we formalize the identification of the **"Knee Point"** within the Pareto front as a mathematical solution for multi-criteria decision-making. By analyzing the curvature of the non-dominated set, we provide a theoretical basis for selecting trajectories that maximize marginal utility across all objectives. This work contributes to the formalization of "clinical-aware" navigation, establishing a rigorous methodology for pathfinding in environments where path quality is as critical as temporal cost.

Keywords – NAMOA*, Multi-Objective Optimization, ϵ -dominance, Pareto Optimality, Graph Theory, Biomechanical Stability, Mathematical Modeling, Decision Support Systems



CFD Investigation of Meandering Open Channel Flow under the Effect of Circular Vegetation Patches

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Abstract – The influence of circular vegetations patches on flow performance within a meandering open channel under steady flow conditions is investigated in this work. A vegetated channel with rigid circular patches positioned at successive bends and a smooth meandering channel were the two cases examined. The findings showed that the presence of vegetation suggestively improved the flow field by reducing the maximum velocity by almost 55% and generating distinct wake regions associated with significant energy dissipation and flow deceleration. Individually, the turbulence intensity and turbulent kinetic energy (TKE) decreased by about 40% and 50%, respectively, suggesting that vegetation effectively lowers large-scale turbulence while attracting restricted mixing close to the branches. In general, vegetation stabilized the flow management, increased hydraulic resistance, and redistributed turbulent energy.. These findings underline the vital role of vegetation in improving eco hydraulic stability, reducing erosion potential, and enhancing sustainable river restoration and channel management practices.

Keywords – Meandering channel, vegetation patch, turbulence, CFD, flow resistance, $k-\epsilon$ model



Utilization of Microbial Phytase to Enhance Phytate Degradation and Mineral Absorption in Equine Nutrition

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Abstract – Enhancing mineral digestibility is a primary concern in equine nutrition, as a significant fraction of dietary phosphorus and trace minerals is encapsulated inside phytate complexes that horses metabolise poorly. Microbial phytase has emerged as an effective dietary agent to improve mineral liberation and absorption by hydrolysing phytate and mitigating its anti-nutritional impacts. This research investigates the processes by which exogenous phytase supplementation enhances mineral bioavailability in horses, focusing on its interactions between the foregut and hindgut digestive environments. Recent in vivo and in vitro investigations indicate that phytase can augment the solubility of phosphorus, calcium, and other trace elements, improve nutrient digestibility, and influence hindgut fermentation dynamics without modifying total mineral inclusion levels. Furthermore, the phytase-induced decrease in phytate-bound minerals may enhance skeletal development, metabolic efficiency, and overall gastrointestinal function. From an environmental standpoint, enhanced mineral utilisation diminishes faecal mineral excretion, hence promoting more sustainable equine management techniques. These findings underscore the potential of microbial phytase as a precision-nutrition approach to improve mineral digestibility and foster both nutritional effectiveness and ecological responsibility in contemporary equine feeding systems.

Keywords – Equine nutrition; microbial phytase; mineral digestibility; phytate degradation; trace minerals; digestion; hindgut fermentation.



Determination of Cephalexin Using a Voltammetric Method via a Green Chemistry Approach

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Abstract – Cephalexin (CFX) is a widely used first-generation cephalosporin antibiotic for treating bacterial infections. The determination of CFX in pharmaceutical formulations and environmental samples is of great importance for public health and environmental ecology. In this study, an eco-friendly, cost-effective, and highly sensitive voltammetric method was developed for the determination of CFX. This work offers a “green” analytical alternative that is faster, more economical, and reduces the chemical impact on the environment compared to traditional chromatographic techniques.

In accordance with the “Green Chemistry” principles, which forms the core focus of this study, the use of toxic organic solvents was minimized, and pH 4.0 Britton-Robinson buffer was preferred as the supporting electrolyte. A polypyrrole-modified pencil graphite electrode (PPy/PGE) was fabricated via electropolymerization using cyclic voltammetry (CV). The electrochemical behavior of CFX was subsequently investigated using differential pulse voltammetry (DPV). Under optimized conditions (pH 4.0, 60 mV/s scan rate, 4 cycles), the oxidation peak current of CFX exhibited a linear response between 0.1–1 ppm, with a limit of detection (LOD) of 0.0344 ppm. Interference studies confirmed the sensor’s high selectivity toward CFX in the presence of common species such as glucose, caffeine, and ascorbic acid, maintaining signal reliability even in complex matrices. This preliminary study demonstrates the potential of PPy/PGE as a sustainable analytical tool for the clinical and pharmaceutical monitoring of cephalexin. Future work will focus on repeatability, stability tests, and real pharmaceutical sample applications.

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Keywords – Cephalexin, Electrochemical Sensor, Green Chemistry, Pencil Graphite Electrode, Polypyrrole.



Current views on the use of nanoparticles in medicine

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Abstract - A current trend in medicine is the use of nanoparticles (NPs) for diagnostic and therapeutic purposes and as carriers for drug delivery. The defining factors of nanoparticles are their size and physicochemical properties, which are crucial for determining the internal safety profiles of NPs. The small size of NPs (from 1 to ≤ 100 nm) results in a large surface area per unit mass, and this surface area often correlates with higher biological reactivity.

An experimental study on the effects of gadolinium orthovanadate nanoparticles with europium was conducted on sexually mature rats.

The experimental study revealed changes in biochemical parameters characterizing kidney function. The appearance of the organ-specific renal enzyme transaminidase in the blood and elevated levels of the end products of urea and creatinine metabolism were detected, indicating functional changes in the kidneys. Activation of prooxidant and reduction of antioxidant system components were detected in kidney tissue. Artifactual accumulations were observed in kidney tissue micro-preparations, suggesting a cumulative effect of NPs. Similar disorders are described in other experimental studies on the effects of various NPs on the reproductive system, lungs, liver, etc. Since modern principles of cancer therapy are based on the introduction of toxic substances, the use of NPs in combination with known chemotherapeutic drugs may be useful for creating new composites and approaches in the treatment of oncological pathologies.

Keywords – nanoparticles, medicine, gadolinium orthovanadate, kidney.



Effects of electromagnetic fields on the reproductive system in experiments

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Abstract - It is known that electromagnetic radiation affects bioelectrical regulation processes at all levels of living organisms. The body's regulatory systems, particularly the nervous, immune, and endocrine systems, are most sensitive to low-intensity electromagnetic fields. Recent studies have shown a link between the effects of electromagnetic radiation and the development of cancer, particularly brain tumors, testicular cancer in men, and breast cancer in women.

An experimental study investigated the intrauterine effects of electromagnetic radiation on the reproductive system of offspring. Changes in the functional state and morphology of the testes were found in adult young males—the offspring of mothers who were exposed to low-intensity electromagnetic radiation in the centimeter range during pregnancy. This indicates the negative impact of intrauterine exposure on the further ontogenesis of male gonads. Microscopic preparations of the testes revealed hypoplastic changes in the cell population and a decrease in the proliferative potential of the spermatogenic epithelium. At the same time, increased blood testosterone levels and an increase in the number of Leydig cells and the size of their nuclei manifested hormonal stimulation of spermatogenesis. This is likely to be compensatory in nature. Thus, prenatal exposure to electromagnetic radiation is critical for the ontogenetic functioning of the male reproductive system.

Keywords – electromagnetic radiation, reproductive system, regulatory systems.



DESIGN AND *IN-SILICO* EVALUATION OF NOVEL PHENYL ANALOGUES OF CABOZANTINIB AS ANTI-CANCER AGENTS

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Abstract – Cancer remains a perilous illness with a significant mortality rate globally. A small-molecule multitargeted tyrosine kinase inhibitor known as cabozantinib has been linked to severe or potentially fatal hepatotoxicity and renal dysfunction over prolonged durations. The bioisosteric approach has been utilized to alter various groups within the Cabozantinib molecule, with the objective of creating new analogues that demonstrate diminished side effects and improved safety profiles. In this research, phenylbioisosteres have been produced using MolOpt software. The pharmacokinetic and toxicity (ADMET) properties of the newly developed analogues are assessed using ADMETlab3.0. The drug-likeness and drug score metrics were evaluated using the Osiris Property Explorer (PEO) software. All the designed analogues comply with the Lipinski rule and display favorable physicochemical and medicinal properties. Cabozantinib was used as the reference compound. Taking into account the physicochemical, medicinal, and ADMET characteristics, along with drug likeness, drug score, and docking studies, the compound GSC01 has been recognized as a candidate for further assessment as an anticancer agent.

Keywords – Bioisosteric Approach; Cabozantinib; ADMET; Anti-cancer Agents; Drug-Likeness

Diabetes Incidence and Related Risk Factors Among Adults in Elbasan County

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Abstract – Background: Diabetes mellitus (DM) represents a growing public health challenge in Albania, driven by urbanization and lifestyle changes. This study aimed to assess the incidence of newly diagnosed diabetes among adults in Elbasan County and to identify key demographic and clinical risk factors. **Methods:** A cross-sectional study was conducted in Elbasan County including 390 newly diagnosed cases of type 2 diabetes (mean age 63.98 ± 10.21 years). Data were obtained from quarterly reports of 24 primary healthcare centers within the National Diabetes Registry framework. Descriptive statistics and bivariate analyses were performed using SPSS version 27.0. **Results:** Of the participants, 52.1% were female and 47.9% male, with 56.2% residing in urban areas. A family history of diabetes was reported by 22.6% of cases, while alcohol and tobacco use were reported by 12.3% and 14.1%, respectively. Mean systolic and diastolic blood pressure were 132.18 ± 10.91 mmHg and 81.63 ± 6.78 mmHg. Based on BMI classification, 39.5% of individuals were overweight and 33.1% obese. Glucose self-monitoring devices were available to 75.6% of participants, and 37.7% reported daily or more frequent glucose measurements. Regarding healthcare utilization, 77.4% consulted an endocrinologist every six months, while 65.1% visited their family physician monthly. **Conclusions:** Newly diagnosed patients exhibited a high burden of cardiometabolic risk factors, particularly overweight and obesity. These findings highlight the need to strengthen primary healthcare services, enhance public awareness, and improve access to diabetes care, especially among high-risk groups. Future studies should explore longitudinal trends and socioeconomic determinants to inform evidence-based prevention strategies.

Keywords – Albania, Diabetes mellitus; Health care; Incidence; Risk factors;



DESIGN OF SOME NEWER ANALOGUES OF ENTRECTINIB, TRK INHIBITOR USING *IN-SILICO* APPROACHES

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Abstract – The study focuses on the design of novel analogues of Entrectinib, a TRK inhibitor, utilizing a bioisosteric approach to create compounds that are less toxic and more potent than the lead drug. The design process involved the use of MolOpt software for in-silico drug design, which allows for the identification of potential bioisosteric transformations by analyzing various molecular structures. The generated analogues were further evaluated for their pharmacokinetic (ADME) and toxicity properties using ADMETlab2.0, which assesses a wide range of characteristics to identify promising lead compounds. Molecular docking studies were conducted using ArgusLab software, where the designed analogues were docked with the TRK A protein. The docking results indicated that analogues, specifically 4, 7, and 17, exhibited binding affinities comparable to Entrectinib, with interactions at key amino acid residues (590GLU, 516GLU, and 592MET). Notably, the analogues demonstrated improved ADMET properties, with several showing a drug-likeness score (QED) greater than 0.67 and a DILI score below 0.3, indicating a lower risk of toxicity compared to Entrectinib. The findings suggest that these newly designed analogues have the potential to serve as lead compounds for further development as effective TRK inhibitors, pending validation through experimental studies. Overall, the bioisosteric replacement approach has successfully yielded analogues that may offer therapeutic advantages over the standard Entrectinib treatment.

Keywords – TRK inhibitor, Entrectinib, bioisosteric transformations, ADMET, Molecular docking.



Artificial Intelligence and Multimodal Communication: Integrating Text, Speech, and Gesture Recognition

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Abstract – In today’s digitalized world, artificial intelligence (Henceforth, AI) has been able preserve its positions world widely by contributing largely to different sectors. The fields of applied linguistics, education, and communication have been affected by such an advancement. Indeed, multimodal communication which combines text, speech, and gestures to mirror natural human interaction, can be enhanced using AI systems and AI agents. This study explores the role of artificial intelligence in advancing multimodal communication through the integration of text, speech, and gesture recognition. AI mechanisms are capable of processing and converting diverse written language, spoken discourse, paralinguistic features, and non-verbal gestures into unified communicative outputs. The theoretical contribution at this level lies in multimodal AI enhances naturalness, inclusivity, and accessibility in digital communication. Combining linguistics features, speech, and gestures with AI can improve cross-cultural communication and facilitate foreign language learning. The generation of system that encompasses humane like interaction features leads to the creation of an atmosphere full of imaginary but real life and vivid interactive situations that can affect the language learning process positively. Ultimately, this research positions multimodal AI as a transformative paradigm in applied linguistics and communication studies, offering new pathways for human-machine interaction that are adaptive, context-sensitive, and culturally responsive.

Keywords – Artificial Intelligence, Multimodal Communication, Language Learning, Digital Communication, Naturalness



İzmir'deki Yangın Vakalarının Makro ve Mikro Ölçekte Analizi

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Özet – Yangın riskinin kent ölçeğinde yalnızca kaç olayın gerçekleştiğiyle değil, bu olayların hangi zamanlarda ve nerelerde yoğunlaştığı ile operasyonel düzeyde nasıl seyrettiğinin birlikte değerlendirilmesi gerekmektedir. Bu çalışma, İzmir Büyükşehir Belediyesi Açık Veri Portalı'ndan elde edilen yangın vakalarını makro ve mikro ölçekte incelemektedir. Makro analiz riskin nerede ve ne zaman yoğunlaştığını meteorolojik bağlamı da dahil ederek; mikro analiz aynı yoğunlaşmanın olay türü, nedeni, müdahale sonucu ve operasyonel yük düzeyinde nasıl biçimlendiğini göstermektedir. Makro ölçekte, yangın sayısı için keşifsel analizler ve Negatif Binom regresyonu uygulanmıştır. Mikro ölçekte, yangın zamanı, türü, nedeni ve kaynak kullanımı gibi özellikler zaman serileri, ısı haritaları ve grafiklerle analiz edilmiştir. Makro ölçekli bulgular, yangın olaylarının yıl boyunca homojen bir şekilde dağılmadığını ve yaz aylarında belirgin bir artış eğilimi gösterdiğini ortaya koymaktadır. İlçe bazlı sabit etkiler, meteorolojik koşullar ve mevsimsellik kontrol edildikten sonra bile devam eden belirgin bir mekansal heterojenliği ortaya koymaktadır. Meteorolojik değişkenler arasında yalnızca bağıl nem istatistiksel olarak anlamlı olup, daha yüksek nem seviyeleri beklenen yangın sayılarında önemli bir azalma ile ilişkilidir. Mikro ölçekli sonuçlar, yangın olaylarının büyük ölçüde insan kaynaklı nedenler etrafında yoğunlaştığını; İzmir, Los Angeles ve New York kentleri için yapılan karşılaştırmalı analizlerde müdahale süreçlerinin günün belirli saatlerinde belirginleştiğini göstermektedir. Mikro ölçekte gözlemlenen ilçe düzeyindeki mekansal ve zamansal örüntüler, makro düzeyde yüksek yangın hacimleri sergileyen ilçelerle ve aylarla yakından örtüşmektedir. Sonuç olarak, makro ve mikro ölçekli bulgular birbirini tamamlayıcı ve karşılıklı olarak güçlendirici olup, İzmir'deki yangın riskinin analitik ölçekler boyunca devam eden sağlam zamansal ve mekansal örüntüler ürettiğini ortaya koymaktadır.

Anahtar Kelimeler – Kentsel yangın riski, Negatif Binom regresyonu, Mekânsal-zamansal analiz, Keşifsel veri analizi, Çok ölçekli yangın riski analizi



The use of recycled asphalt pavements for concrete roads

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Abstract – In public works, roads and highways play a crucial role in the national economy. Reusing recycled asphalt pavement (RAP) instead of natural aggregates reduces the consumption of natural aggregates in concrete mixes and lowers the cost of concrete production. Thanks to its bituminous structure, RAP has a lower water absorption rate than natural aggregates, thus reducing the water requirements of fresh concrete. This study aimed to optimize the use of RAP particles as aggregates in concrete roads. Concrete specimens were formulated with 0-15 mm RAP, at substitution rates of 0, 30, 60, and 100%. Destructive, non-destructive, and durability tests were performed on fresh and hardened concrete specimens to determine the physical and mechanical properties of the concrete.

Keywords – Recycled bituminous mixes, waste, recycling, concrete road, mechanical properties.



Assessment of initial dilution behavior of thermally buoyant wastewater discharges into shallow receiving waters with a 60° inclined port

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Abstract - Thermal effluents from industrial cooling systems are commonly discharged into coastal waters through thermal outfalls to achieve adequate dilution and reduce thermal shock. While shallow-water installations can minimize pipeline length and energy demand, they are more sensitive to boundary effects from the seabed and water surface, which may reduce dilution due to jet impingement and bottom interactions. Proper nozzle inclination and port elevation are therefore required to protect the marine environment and the discharge structure.

This study examines the effect of shallow water depth on the initial dilution of heated water discharged through an inclined circular port into a stagnant receiving environment. Experiments were conducted with a 60° nozzle inclination and normalized water depths (H/dF) ranging from 3.871 to 0.388, using Rhodamine B as a tracer. Results show that decreasing water depth causes jet impingement to occur closer to the nozzle, reducing both horizontal and vertical impingement distances and lowering dilution levels, particularly at impact points. Comparisons with Visual Plumes (VP) model predictions indicate that the VP UM3 model provides realistic and conservative dilution estimates at impingement points, even under restricted depth conditions. The study demonstrates the applicability of the VP UM3 model for predicting dilution behavior of positively buoyant jets in shallow waters.

Keywords : Thermal outfall; Visual plumes; Positively buoyant jet; Initial dilution; Restricted wastewater discharge depth; Impact point dilution; Nozzle inclination



Artificial Intelligence-Enabled Vehicular Ad Hoc Networks for Intelligent Transportation Systems

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Abstract – Vehicular Ad Hoc Networks (VANETs) play a crucial role in enabling intelligent transportation systems by allowing vehicles to communicate with each other and with roadside infrastructure. However, VANETs face significant challenges such as high mobility, rapidly changing network topology, latency constraints, scalability issues, and security threats. Artificial Intelligence (AI) has emerged as a powerful tool to address these challenges by enabling adaptive, data-driven, and autonomous decision-making mechanisms. This paper explores the integration of AI techniques in VANETs to enhance network performance, reliability, and safety. Machine learning and deep learning models are applied for tasks such as traffic prediction, routing optimization, congestion control, intrusion detection, and resource management. Reinforcement learning is also investigated for dynamic spectrum allocation and intelligent handover decisions in highly mobile environments. The results reported in recent studies demonstrate that AI-based approaches significantly outperform traditional rule-based methods in terms of latency reduction, throughput improvement, and robustness against network dynamics. The paper concludes that the synergy between VANETs and AI is a key enabler for next-generation smart transportation systems, paving the way for autonomous and connected vehicles.

Keywords – Smart Mobility, Artificial Intelligence, VANET, Intelligent Transportation Systems, Performance



Economic and reputational indicators in the analysis of economic communication and power relations in times of inequality

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Abstract – In the current context of economic instability and the accentuation of social inequalities, economic communication becomes a strategic tool for managing relations between the state, the economic environment and society. The impact of economic communication influences power relations and the reputation of economies worldwide.

The study uses macroeconomic indicators such as GDP per capita, the unemployment rate and the share of social spending in GDP, correlated with perception and reputation indicators, such as the social trust index, governance indicators and institutional credibility scores. Economic communication is analysed through quantitative indicators, such as the number and content of public messages related to redistributive policies, the assessment of the consistency between economic decisions and official discourse.

The methodology is based on descriptive statistical analysis and correlation analysis, complemented by international case studies, highlighting how communication deficiencies amplify reputational risks and strain social relations. Following the analysis, we obtained results indicating that states with high levels of inequality and poorly structured economic communication experience a sharp erosion of public trust.

In conclusion, the analysis highlights that ignoring reputational indicators and the communication dimension in the development of economic policies leads to an amplification of the inequality crisis, to the deterioration of power relations and to the loss of institutional credibility. The absence of coherent and transparent economic communication transforms public policies into an additional factor of social instability, accentuating polarization and undermining the legitimacy of political decision-making.

Keywords – economic communication, socio-economic indicators, reputation, power relations, inequality.



Political communication and reputational economy in the context of the equality crisis

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Abstract – The socio-economic equality crisis represents one of the main challenges of contemporary economies, amplified by the way in which public policies are communicated and perceived. Analyzing the relationship between political communication, reputational economy, and economic inequality, we use quantifiable indicators to assess the impact of public discourse on social relations and institutional trust.

The comparative analysis between European countries is based on a set of relevant economic and social indicators, such as the Gini coefficient, the at-risk-of-poverty rate, and the human development index (HDI). Also, reputational and communication indicators, such as the level of trust in institutions, the government transparency index, and public perception indicators extracted from social surveys and international reports. Political communication is analyzed through the prism of the frequency of messages related to economic equality, the coherence of the discourse, and the degree of alignment between political messages and the evolution of economic indicators. The results highlight that the deterioration of equality indicators is accompanied by a decrease in the reputational capital of public institutions, especially in contexts characterized by incoherent or defensive political communication.

Following the analysis, we identified the need to use reputational indicators as a complementary tool in the evaluation of economic policies, highlighting the role of communication as an essential factor in maintaining social relations and political legitimacy.

Keywords – political communication, reputational economy, Gini coefficient, equality crisis, institutional trust.



AWARENESS ON THE CULINARY UTILIZATION OF FONIO IN ACCRA, GHANA

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Abstract – Fonio (*Digitaria exilis*) is among the ancient staple crops in West Africa, and is gradually gaining prominence in the literature due to its resistance to climate, short growth period, and applicability in both traditional and modern food systems. Recent research shows that Fonio has potential for dietary diversification, value addition, and culinary innovation, especially in urban settings where indigenous grains are underexploited despite the recent upsurge in interest in sustainable, and culturally rooted foods. This paper evaluated the degree of awareness and trends in the culinary use of Fonio among the inhabitants of Accra, Ghana, to determine exposure pathways and gaps in adoption regarding urban food consumption. A cross-sectional survey design was used, involving 400 residents of Accra selected through probability-based sampling. A self-administered questionnaire based on a structured method was used to gather data. Consistency of the instrument was established internally (Cronbach 0.818 = 0.818). Awareness and information sources were summarised using descriptive statistics, and analysis of variance (ANOVA) was used to test differences in awareness-related responses across the various participant groups. About 68% of the interviewed citizens reported having heard of Fonio, and 32% said they did not know Fonio grain. The main mediating factors were awareness via digital platforms and interpersonal networks, and social media became one of the most critical areas of exposure. Statistical analysis of the data showed a notable difference in reactions to Fonio awareness ($p < 0.05$), indicating an unequal distribution of knowledge among people. Despite moderate levels of Fonio knowledge among urban residents in Accra, there is still a significant gap in knowledge that could restrict its daily culinary use. Using digital media to communicate practical, preparation-based culinary information has the potential to boost adoption and help reposition fonio as a modern urban food ingredient.

Keywords – Awareness, Fonio, Consumption, Culinary uses, Knowledge



Digital Literacy as a Strategic Enabler of FinTech Adoption for Strengthening Financial Inclusion in Pakistan

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Abstract - This study investigates the key factors driving the adoption of financial technology (FinTech) in Pakistan. While FinTech holds transformative potential for expanding access to formal financial services, its uptake in emerging economies such as Pakistan remains inconsistent. To understand this dynamic, the research examines six determinants: Ease of Use, Effort Expectancy, Perceived Security, Perceived Trust, Transaction Speed, and Social & Peer Influence. This study adopts a quantitative, cross-sectional research design and relies on primary data collection. Data analysis will be performed using Partial Least Squares Structural Equation Modeling (PLS-SEM) following a two-stage analytical procedure. In the first stage, the measurement model will be evaluated to establish internal consistency reliability, convergent validity, and discriminant validity. In the second stage, the structural model will be examined to assess the significance of the hypothesized relationships and to evaluate the mediating role of digital literacy. The anticipated findings indicate that all six proposed determinants are expected to exert a positive and statistically significant influence on individuals' intention to adopt FinTech services. Moreover, digital literacy is expected to emerge as a significant mediating variable, implying that individuals with higher levels of digital competence are more likely to recognize and respond to key adoption drivers. By empirically identifying digital literacy as a key mediating mechanism, this research extends technology adoption frameworks and contributes to the financial inclusion literature. The findings will provide policy guidance for policymakers, financial institutions, and FinTech providers in Pakistan to advance inclusive, secure, and digital-literacy-responsive financial solutions.

Keywords: FinTech Adoption, Financial Inclusion, Digital Literacy, Effort Expectancy, Perceived Security, Perceived Trust, Transaction Speed, Ease of Use, Social and Peer Influence



MODERN APPROACHES IN TURKISH DEMOGRAPHIC DATA ANALYTICS: TRANSFORMING INTO AN END-TO-END PANEL WITH STREAMLIT AND ALTAIR

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Abstract – This paper proposes a comprehensive system that automatically extracts, stores, processes, and formats the demographic information from the ADNKS bulletins issued by the Turkish Statistical Institute (TÜİK) into a visual analytics dashboard. This system uses a data pipeline that automatically downloads the files, stores them in a cache that prevents the need for future downloads, accurately extracts the tables, and formats the data in a tidy form that enables cross-year, cross-province comparison. This system uses Streamlit, which provides interactive filtering, time series, and side-by-side comparison options. To make the system more functional, it provides data quality checks, which include checks on the data format, missing data, and the unification of the names of the provinces. This system will be assessed through: (i) the comparison of the system's performance in a cold-start setting versus a cached setting, (ii) the verification of the system's data quality on a variety of bulletins, and (iii) the demonstration of scenario-based analytics tasks that better represent real-world usage, which include the comparison of provinces over time, the top-k comparison, and the demographics.

Keywords – TÜİK, ADNKS, ETL pipeline, data harmonization, tidy data, caching, Streamlit dashboard



TPMS Structures for Heat Transfer and Thermal Management

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Abstract – TPMS (Triply Periodic Minimal Surface) structures have attracted increasing interest in the energy field due to their unique geometric characteristics, such as high specific surface area, interconnected porosity, and excellent mechanical strength. These features make them highly suitable for heat transfer and thermal management applications, including heat exchangers, heat sinks, thermal energy storage systems using phase change materials (PCM), and compact energy reactors. Owing to additive manufacturing technologies, complex TPMS structures can now be fabricated with precise control over porosity and morphology, enabling simultaneous optimization of thermal and hydraulic performance. Numerous studies have demonstrated that TPMS geometries such as Gyroid, Schwarz-P, and Diamond provide a superior trade-off between heat transfer enhancement and pressure drop compared to conventional porous structures, offering promising opportunities for the development of more efficient and compact energy systems.

Keywords –TPMS, Energy systems, Heat transfer enhancement, Thermal management, Pressure drop



Post-Feminizm Perspektifinden Mobil Oyun Karakter Tasarımlarının İncelenmesi

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Özet – Mobil oyunlar, ağ tabanlı ve etkileşimli medyanın tasarlanmış arayüzler ve temsil sistemleri aracılığıyla gündelik anlam üretimini ve kimlik inşasını giderek daha fazla şekillendirdiği çağdaş görsel kültürün öne çıkan alanlarından birini oluşturmaktadır. Bu ortamlarda oyun karakterleri, oyuncular ile oyun dünyaları arasında önemli görsel ve etkileşimli araçlar olarak işlev görmek ve karakter tasarımını cinsiyetlendirilmiş temsillerin incelenmesi açısından kritik bir araştırma alanına dönüştürmektedir. Dijital oyunları ideolojik olarak doymuş metinler olarak ele alan oyun çalışmaları literatüründen hareketle bu çalışma, piyasa odaklı görünürlük ve metalaştırma rejimleri içinde “güçlendirme” söylemlerinin yoğunlaşması bağlamında, mobil oyun karakter tasarımının post-feminist bir analizle ele alınması gerektiğini savunmaktadır.

Çalışma, çağdaş temsil kültüründe seçim, eylemlilik ve pozitifliği merkeze alan post-feminist teori çerçevesinde konumlanmakta ve feminist politik ekonomi yaklaşımlarıyla birlikte değerlendirilmektedir. Araştırma, seçilen mobil oyun karakterlerini niteliksel ve tasarım odaklı bir yaklaşımla inceleyerek, karakter tasarımını görsel ve prosedürel unsurlar aracılığıyla kurulan bir video oyunu söylemi olarak ele almaktadır. Analiz, algılanan eylemliliği ve oyuncu kimliğini şekillendiren kostüm, silüet, animasyon, arayüz çerçeveleme ve oyun mekaniklerine odaklanmaktadır.

Bulgular, yetkinlik kodlu güçlendirmenin sıklıkla bedensel okunabilirlik ve pazara uyumlu estetikle birlikte sunulduğunu göstermektedir. Kadın karakterler eylemli ve yetenekli olarak temsil edilse de, bu güçlenme biçimi ticarileştirilebilir görsel rejimlerle yakından ilişkili kalmaktadır. Çalışma, mobil oyun karakter tasarımını görsel iletişim ve etkileşimli kimlik aracılığı olarak ele alarak, post-feminist güçlendirmenin tasarım pratikleri yoluyla nasıl sınırlandırıldığını ortaya koymaktadır.

Anahtar Kelimeler – Mobile games, character design, post-feminism, gender representation, visual culture



Synthesis and Optoelectronic Characterization of Monocarbonyl Arylidines

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Abstract – The present research work is about the chemical preparation of carbon-carbon bond forming reaction via Aldol condensation reaction. Accordingly, we have synthesized three symmetrical bis-aryl- α,β -unsaturated ketone derivatives DBC, BBC, and PBMP through the aldol condensation approach towards ketones that have two enolizable sites. Spectrometric methods ¹³C-NMR and ¹H-NMR have been used to determine the structures of DBC, BCC, and PBMP. Moreover, the crystal structure of PBMP has been determined by using a single-crystal X-ray diffraction (SC-XRD) technique. PBMP crystal structure has also been analyzed by Hirshfeld surface analysis (HSA) and the results were compared with those of DBC and BCC crystal structures to evaluate their similarity.

Keywords – Monocarbonyl Arylidines, symmetrical bis-aryl- α,β -unsaturated ketones, Chaperonin, Chemotherapeutics, Colorectal cancer, DBC, BBC, PBM

Time, Cost, and Energy-Oriented Strategies for Effective Construction Project Management

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Abstract – Construction projects in Algeria frequently face persistent challenges related to schedule slippage, cost overruns, and inefficient energy use, particularly during the construction phase. While project management practices in the Algerian context have traditionally emphasized time and cost control, energy performance is still rarely addressed as a strategic management variable. This research proposes a technical and integrated framework that considers time, cost, and energy as interdependent objectives for effective construction project management. The primary objective of this study is to analyze and optimize project management strategies through an Algerian case study of public building projects. The research methodology combines quantitative and qualitative approaches. Project data related to planning schedules, financial expenditures, and energy consumption during construction are collected and analyzed using key performance indicators (KPIs). Schedule performance is assessed through time variance and critical path analysis, cost performance through earned value management (EVM), and energy performance through construction-phase energy intensity indicators. In parallel, semi-structured interviews with project managers, engineers, and contractors provide insights into decision-making practices and organizational constraints. The results demonstrate that early integration of energy considerations during planning and design stages, such as energy-aware scheduling, optimization of construction methods, and improved resource allocation, leads to measurable reductions in delays, cost deviations, and energy consumption. The findings also reveal limitations in current Algerian project management practices, including fragmented coordination and limited use of digital decision-support tools. The study concludes that adopting a technically grounded, life-cycle-oriented project management approach can significantly enhance construction project performance in Algeria. The proposed strategies provide practical guidance for professionals and decision-makers aiming to improve efficiency, sustainability, and resource management in the national construction sector.

Keywords – Construction project management; Time–cost–energy optimization; Earned value management (EVM); Energy performance indicators; Algerian construction sector; Life-cycle approach



Haber Kaynaklarından Elde Edilen Trafik Kazası Verilerinin Çok Aşamalı Veri İşleme ve Görselleştirme Yaklaşımları ile Analizi

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Özet - Bu çalışma, İzmir ilinde meydana gelen trafik kazalarına ilişkin verilerin yerel bir haber kaynağı olan İzmir Kent Haber sitesinden (<https://www.izmirkenthaber.com.tr/>) web kazıma (web scraping) yöntemiyle sistematik olarak toplanmasını, elde edilen verilerin işlenmesini ve kazaların zamansal ile mekânsal açıdan analiz edilmesini amaçlamaktadır. Çalışma kapsamında, 2019–2025 yılları arasında yayımlanan ve İzmir ili sınırları içerisinde gerçekleşen trafik kazalarına ait toplam 143 haber kaydı derlenmiştir. Veri toplama sürecinde Python programlama dili kullanılmış; haber sayfalarındaki HTML yapısı üzerinden başlık, tarih ve içerik bölümleri gibi alanlar HTML etiketleri yardımıyla ayrıştırılarak ham metin verileri elde edilmiştir. Bu amaçla, HTML içeriklerinin ayrıştırılması için *BeautifulSoup* kütüphanesinden yararlanılmıştır. Toplanan haber metinleri yapılandırılmamış ham veri niteliğinde olduğundan, çok aşamalı bir veri temizleme ve ön işleme sürecinden geçirilmiştir. Bu süreçte tekrar eden kayıtlar ayıklanmış, eksik ve tutarsız ifadeler giderilmiş; haber metinlerinden tarih ve konum bilgileri otomatik olarak çıkarılarak yapılandırılmış bir veri seti oluşturulmuştur. Tarih çıkarımının başarımı *exact match accuracy* metriği ile, konum çıkarımının başarımı ise *precision*, *recall* ve *F1-score* metrikleri kullanılarak değerlendirilmiştir. Elde edilen yapılandırılmış veri seti üzerinde trafik kazalarının yıllık, aylık, haftalık ve saatlik dağılımları incelenmiş; ayrıca mekânsal yoğunluk analizleri aracılığıyla ilçe bazında riskli bölgeler belirlenmiştir. Analiz sonuçları, etkileşimli bir Streamlit tabanlı gösterge paneli üzerinden görselleştirilerek sunulmuştur. Elde edilen bulgular, trafik kazalarının belirli zaman dilimlerinde ve bazı ilçelerde yoğunlaştığını göstermekte; haber tabanlı verilerin trafik kazası analizlerinde alternatif ve tamamlayıcı bir veri kaynağı olarak kullanılabileceğini ortaya koymaktadır.

Anahtar Kelimeler – Trafik kazaları, web kazıma, veri analizi, zamansal analiz, mekânsal analiz, görselleştirme



Primary School Science Teachers' Perceptions, Instructional Practices, and Challenges in Developing AI-Based Instructional Materials

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Abstract - Increasing use of artificial intelligence in education has transformed the instructional practices and teaching learning resources. This study aims to explore the perceptions, practices and challenges faced by primary school science teachers for developing instructional material at district Lahore. Globally use of AI tools are increasingly incorporating in teaching learning process. This study is conducted by using descriptive survey research. Data was collected through questionnaire via online form. This study is guided by Technology Acceptance Model (TAM) by Fred D. Davis 1989, focusing on perceived usefulness and perceived ease of use to understand adoption of AI tools for developing instructional material. Population of the study were primary school science teachers. 306 teachers were the sample of the study. Findings revealed that teachers have a positive attitude regarding use of AI in their instructional practice. They are using it for making their daily lesson plans and other personalized learning material. Still, they are facing some challenges in use of AI. These include limited AI access to digital resources in some schools. Teachers also have identified need professional development training for AI. They have also showed concerns regarding ethical use of AI. The study conclude that AI holds significant importance for developing science AI instructional material. This research contributes to the growing body of literature on AI integration in school education and offers practical implications for policymakers, teacher educators, and school administrators.

Keywords: AI, Science, practices, perceptions, challenges, instructional material



A Multi-Criteria Decision Support Framework for Supply Chain Performance Improvement: Application of Finite Volume Methods to Hyperbolic Conservation Law Models

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Abstract – This study proposes a decision support approach based on multi-criteria analysis to enhance supply chain performance by employing finite volume methods for solving hyperbolic conservation laws. The research progressively compares finite volume and finite difference methods for elliptic problems, extends the framework to linear transport equations, and finally addresses nonlinear Burgers-type equations to model dynamic flow and wave propagation phenomena in supply networks. The finite volume method is highlighted for its inherent conservation properties, adaptability to complex geometries, and robustness in capturing discontinuities and shock waves—critical features for simulating material flows, demand surges, and disruption propagation in supply chains. Several numerical schemes, including upwind, Lax–Wendroff, Godunov, and Lax–Friedrichs, are evaluated using stability, consistency, accuracy, and computational efficiency as key decision criteria under the Courant–Friedrichs–Lewy (CFL) condition. The results demonstrate that the finite volume method provides reliable and stable simulations for both linear and nonlinear hyperbolic systems, enabling better prediction, risk assessment, and optimization of supply chain operations. This work illustrates how computational fluid dynamics techniques can be leveraged as quantitative decision tools to improve resilience, responsiveness, and efficiency in supply chain management.

Keywords – Supply chain performance, decision support system, multi-criteria analysis, hyperbolic conservation laws, finite volume method, Burgers equation, transport equation, numerical simulation, Godunov scheme, CFL condition.



AI-driven Adaptive Environments for Contextualized Foreign Language Learning

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Abstract – The integration of artificial intelligence (Henceforth, AI) within digital environments may offer new theoretical and practical insights in advancing foreign language pedagogy. Coping with the continuing progression that the world is witnessing due to digitalization, requires exploring, investigating, and diving into AI tendencies in order to bring and assist in the conceptualization of new mechanisms that foster foreign language learning. This paper proposed a conceptual framing of AI-driven adaptive environments as dynamic systems that personalize tasks and feedback based on learner performance and preferences, situating them within sociocultural and constructivist frameworks of language acquisition. Adaptive environments leverage real-time analytics to adjust linguistic input, scaffold communicative tasks, and provide multimodal feedback that aligns with individual learner trajectories. This is the complete opposite to what static instructional methods focus on. Theoretically, adaptive immersion is to an extent connected to task-based learning. To explain, authentic communication scenarios would be generated and simulated via virtual or augmented reality. This can extend to different contexts involving negotiations, medical consultations, and intercultural exchanges. The implementation of this approach can be relevant to fields like English for specific purposes. Merging AI, personalizing content, and contextualization can lead to the creation of tailored AI agents who can function and interact effectively with learners according to their specialization. Ultimately, this theoretical contribution of AI-driven adaptive environments can function as a transformative paradigm for foreign language learning. Bridging applied linguistics, information technology, and cognitive learning theory may lay the foundation for frameworks that would enhance the language learning process.

Keywords – artificial intelligence, adaptive immersion, language pedagogy, contextualization, AI agents.



Modeling a chemostat under inhibitory effects

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Abstract – The chemostat is a fundamental model in microbiology, ecology, and biotechnology, widely used in applications such as wastewater treatment and industrial fermentation. Classical models of microbial competition in chemostats predict the principle of competitive exclusion when multiple species compete for a single limiting nutrient. Although this principle is well supported by theoretical and experimental studies, empirical observations reveal that microbial coexistence can occur under such conditions. In this paper, we analyze a mathematical model describing the competition between two microbial species for a single nutrient in a chemostat. We investigate the system's dynamics and identify mechanisms that promote coexistence, thereby providing insight into the maintenance of biological diversity in competitive environments.

Keywords – Chemostat; Coexistence; Inhibition



SCADA-Based Maintenance Prioritization in Wind Turbines: An Explainable and Multi-Criteria Approach

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Abstract – Predictive maintenance applications are critical for increasing operational reliability and minimizing production losses in wind power plants. However, current approaches generally focus on anomaly detection accuracy and neglect explainable decision-making mechanisms where the obtained technical outputs are translated into maintenance prioritization. This study proposes a hybrid Decision Support System (DSS) integrating unsupervised anomaly detection based on SCADA data, explainable artificial intelligence (XAI), and multi-criteria decision-making (MCDM) methods. In the proposed architecture, anomaly scores obtained with Isolation Forest (IF), AutoEncoder (AE), and LSTM-AutoEncoder (LSTM-AE) models are combined with XGBoost and SHAP analysis to reveal root cause relationships at the sensor level. Technical risk indicators are integrated with operational criteria (alarm rate, false alarm cost, power generation performance) and maintenance priority rankings are created through TOPSIS, VIKOR, MOORA, and SAW methods. The results show that the proposed multi-layered approach makes maintenance decisions more transparent and operationally feasible.

Keywords – Predictive Maintenance, Wind Turbines, Anomaly Detection, Multi-Criteria Decision Making, Explainable Artificial Intelligence.



A Scenario-Based Hybrid Decision Support System for Global Water Risk Prediction and Management

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Abstract – Increasing population, industrialization, agricultural and industrial water demand, and climate change are putting pressure on water resources on a global scale. This study develops a Decision Support System (DSS) that analyzes the water risk profiles of countries using global water consumption data from 2000–2024. The system is evaluated using Multi-Criteria Decision Making (MCDM) methods, including TOPSIS, VIKOR, MOORA, and WSM, based on six criteria: per capita water consumption, agricultural, industrial, and domestic use, precipitation, and groundwater depletion rate. As a complement to the existing risk assessment, a linear regression model is used to analyze the water risk trends of countries for the next ten years. The internal consistency of risk labels obtained from multi-criteria decision-making (MCDM) and regression outputs with the raw data structure was evaluated using nine different Machine Learning (ML) and Deep Learning (DL) models: Random Forest (RF), Gradient Boosting (GB), SVM, Logistic Regression (LR), Decision Tree (DT), K-Nearest Neighbors (KNN), Naive Bayes (NB), Artificial Neural Networks (ANN), and 1D-CNN. The features influencing model decisions were examined using SHAP analysis, an explanatory artificial intelligence (XAI) method. The proposed study offers an integrated assessment framework that addresses country-based water risk assessments using scenario-based time series projections and ML and DL-based analyses.

Keywords – Global water risk, decision support system, multi-criteria decision making, linear regression, machine learning.

Comparative Study of the Physicochemical and Microbiological Characteristics of Cow's Milk and Goat's Milk

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Abstract – Milk is regarded as a complete and balanced food due to its high nutritional value, providing essential nutrients such as proteins, fats, minerals, vitamins, and lactose. The present study aimed to evaluate the physicochemical and microbiological quality of milk from two animal species, goat and cow, which are among the most widely exploited for milk production intended for human consumption. For this purpose, milk samples were collected from two regions of Guelma.

The study comprised both physicochemical and microbiological analyses. The physicochemical results indicated that goat milk was richer in lactose (4.49%), proteins (4.39%), and titratable acidity (21°D) compared to cow milk. Regarding the microbiological analysis, the total aerobic mesophilic flora (TAMF) counts were 4.7×10^2 CFU/mL in goat milk and 5.9×10^2 CFU/mL in cow milk, while fecal coliform counts were 0.6×10^5 CFU/mL and 0.9×10^2 CFU/mL, respectively. These values did not exceed the limits established by the Algerian Official Journal. Furthermore, pathogenic microorganisms (Salmonella spp., Staphylococci, and Clostridium spp.) were completely absent in goat milk, whereas they were detected in cow milk.

Keywords: milk; physicochemical; microbiological; goat; cow; quality analysis.



Integrating Multispectral Imaging and Multivariate Modeling for High-Throughput Phenotyping and Quality Prediction in Semi-Dry Date Varieties

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Abstract – While traditional physical property analysis and mass modeling, as demonstrated in our prior work on Deglet Noor and Arechti dates, provide foundational insights for sorting and grading, emerging precision agriculture demands non-destructive, high-throughput phenotyping methods. This study proposes a novel framework that integrates multispectral imaging (MSI) with advanced multivariate analysis to predict not only mass but also key internal quality traits (sugar content, moisture, texture) in semi-dry date fruits. Building on our previous PLS-based mass models, we will employ hyperspectral and RGB-D imaging to capture spectral and morphological features, which will be correlated with physicochemical quality parameters via machine learning regressors (e.g., Random Forest, CNN-based models). The proposed system aims to enable real-time, non-destructive quality assessment and variety classification, supporting intelligent packing systems and supply chain optimization. This work bridges the gap between post-harvest technology and foodomics, offering a scalable digital tool for date-producing regions under climate stress.

Keywords – *Multispectral imaging, high-throughput phenotyping, date fruit quality, non-destructive prediction, machine learning in agriculture, digital post-harvest grading*



Bağımsız Arka Tahrikli Elektrikli Taşıtlar için Dinamik Yük Tabanlı Elektronik Diferansiyel Sistemi ve Alan Yönlendirmeli Kontrol Analizi

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Özet – Elektrikli taşıtlarda tahrik sistemi, farklı mimarilerle tekerleklere entegre edilebilmektedir. Bu mimarilerin bazıları; tekerlek başına bir motor, bir motor ile mekanik diferansiyel veya aynı aks üzerinde iki bağımsız motor gibi farklı yöntemler içermektedir. Geleneksel mekanik diferansiyellerin ağırlık ve sürtünme dezavantajlarını ortadan kaldıran bağımsız tekerlek tahrikli sistemler, özellikle araç dinamiği kontrolünde büyük avantaj sağlamaktadır. Bu çalışmada, arka aksında iki bağımsız sürekli mıknatıslı senkron motor (PMSM) bulunan arkadan itişli bir elektrikli taşıt için Elektronik Diferansiyel Sisteminin (EDS) modellenmesi ve benzetimi sunulmaktadır.

EDS için gerekli olan dönüş manevrası sırasında iç ve dış arka tekerleklerin referans açısal hızları, taşıt hızı ve direksiyon açısı girdilerinden Ackermann–Jeantand kinematiği kullanılarak elde edilmiştir. Motorların yük torku ise 3 serbestlik dereceli (3-DOF) boylamsal, yanal ve savrulma hareketlerini kapsayan taşıt dinamiği üzerinden; yuvarlanma direnci, aerodinamik sürüklenme, ivmelenme direnci ve manevra sırasında oluşan dinamik yük transferinin tekerlek kuvvet kapasitesine etkisi dikkate alınarak hesaplanmıştır.

Her bir PMSM, uzay vektör darbe genişlik modülasyonu (SVPWM) tabanlı alan yönlendirmeli kontrol (FOC) tekniği ile sürülmüştür. Böylece, sağ ve sol motorların hız–tork gereksinimlerine karşılık oluşan elektromanyetik tork ve tork üretimi için gerekli i_d ve i_q akım bileşenlerinin talepleri ayrıntılı olarak incelenmiştir.

MATLAB/Simulink ortamında gerçekleştirilen benzetimlerde, aynı taşıt hızında farklı dümenleme açıları için dönüş senaryosu uygulanmıştır. Manevra şiddeti arttıkça sağ-sol teker hız gereksinimi ile birlikte sağ-sol motor yük torklarının belirgin biçimde ayrıştığı gösterilmiştir.

Anahtar Kelimeler – Elektronik Diferansiyel Sistemi (EDS), Sürekli Mıknatıslı Senkron Motor (PMSM), Alan Yönlendirmeli Kontrol (FOC), Uzay Vektör Darbe Genişlikli Modülasyon (SVPWM), Elektrikli Taşıtlarda Tahrik Sistemleri



The Postdramatic Function of Violence in Einar Schleef's Play *Götz von Berlichingen*

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Abstract – Einar Schleef's play *Götz von Berlichingen* provides a powerful example for examining how the phenomenon of violence is experienced in post-dramatic theater. Johann Wolfgang von Goethe's early text *Sturm und Drang*, through Schleef's direction and interpretation, transforms into a structure where dramatic narrative, character construction, and plot are systematically and consciously suspended. The phenomenon of violence is produced not through individual actions and scenes of conflict, but as a continuous pressure through chorus, sound intensity, repetition, and physical exposure. Schleef removes the individual subject from the center and turns the stage into an arena where collective subjects collide. The study examines how the staging of violence in post-dramatic theater functions as an ethical-political mechanism through the performance of *Götz von Berlichingen*.

Keywords: Postdramatic Theatre, Einar Schleef, Götz von Berlichingen



Settlement Analysis of Barrette Foundation in Soft Clayey Soil

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Abstract – In this study, the settlement behavior of barrette foundations in soft clay soil was investigated using numerical analysis. The main objective of the study is to evaluate the effects of barrette pile cross-sectional geometry, plan layout arrangement, barrette depth, and spacing between barrettes on settlement values under a constant vertical load. Within this scope, rectangular, L-shaped, and T-shaped barrette piles were modeled using the Plaxis 2D finite element software in vertical, horizontal, and staggered layout configurations. For each layout arrangement, two separate analyses were conducted with barrette depths of 10 m and 15 m, while the spacing between barrettes was taken as 3 m. In addition, the analyses were repeated by increasing the spacing between barrettes to 6 m. In all analyses, a constant vertical load of 120 kN/m² was applied, and the resulting settlement values for each case were evaluated in detail. The numerical analysis results indicated that the settlement behavior of barrette foundations in soft clayey soils varies significantly depending on barrette geometry, layout arrangement, depth, and spacing between barrettes. In particular, it was determined that the cross-sectional geometry of the barrettes plays a decisive role in the overall system stiffness, and that barrette types with higher stiffness lead to more favorable soil–foundation interaction. With increasing stiffness, the applied loads are distributed more uniformly to the soil, resulting in a noticeable reduction in total settlement values. Overall, increasing the barrette depth contributed to a reduction in settlement by enhancing the foundation stiffness. The findings demonstrate that increasing stiffness in barrette foundations is a critical design parameter for settlement control and that the selection of appropriate cross-sectional geometry, layout arrangement, and barrette dimensions is of great importance for engineering design decisions.

Keywords – Barrette foundation, Settlement behavior, Plaxis 2D, Clayey soil, Stiffness



Yapay Zekâ Tarafından Üretilen Sahte Görsellerin Tespitinde EfficientNet Mimarilerinin Karşılaştırılması

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Özet – Yapay zekâ ile üretilen görüntülerin gerçekçilik düzeyinin artması, görsel içeriklerin güvenilirliğini tehdit eden ciddi bir sorun hâline gelmiştir. Bu çalışmada, sahte görsellerin tespiti amacıyla farklı EfficientNet mimarileri (B0, B3, B6) ile çeşitli kayıp fonksiyonu kombinasyonlarının (CE, Attn+CE, Attn+Composite) performansları karşılaştırılmıştır. Deneyler, 60.000 gerçek ve 60.000 yapay görüntü içeren dengeli bir veri seti olan CIFAKE üzerinde gerçekleştirilmiştir. Modeller, doğruluk, çoklu rastgele tohumla elde edilen tutarlılık ve kalibrasyon hatası (ECE) bakımından değerlendirilmiştir. Sonuçlar, EfficientNet-B3 mimarisinin Attn+CE kayıp fonksiyonu ile birlikte kullanıldığında doğruluk ve kararlılık açısından en dengeli performansı sunduğunu göstermektedir. Ayrıca McNemar testi ile yapılan istatistiksel analizler, model konfigürasyonları arasındaki performans farklarının anlamlı olduğunu ortaya koymuştur. Bu bulgular, yapay zekâ tarafından üretilen görsellerin otomatik olarak tespit edilmesine yönelik güvenilir sistemlerin geliştirilmesi için önemli katkılar sağlamaktadır.

Anahtar Kelimeler – Sahte görsel tespiti, EfficientNet, derin öğrenme, kayıp fonksiyonları, görüntü sınıflandırma



Psycho-Social Differentiation in Crimes Against Property: An Empirical Analysis of Georgian Judicial Practice

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Abstract - This paper presents an interdisciplinary empirical study aimed at the psycho-social differentiation of offenders committed for crimes against property (Articles 177, 178, and 179 of the Criminal Code of Georgia) within the context of Georgian judicial practice. The study design is based on a Mixed Methods framework, involving a quantitative content analysis of 180 publicly available convictions issued between 2015 and 2020. By synthesizing theoretical frameworks with empirical data, the study identifies a specific "Legal DNA" for each type of crime. The research reveals a significant correlation between crime categories and variables such as instrumental aggression, self-control deficits, levels of intoxication, and subcultural identity. Specifically, the aggravated robbery (Art. 179) group exhibited high levels of instrumental aggression and psychopathological markers, whereas theft (Art. 177) cases were dominated by social deprivation and rational choice strategies. The findings highlight the ineffectiveness of conditional sentences (probation) for individuals with high self-control deficits and emphasize the urgent need for individualized penitentiary interventions. This work fills an existing scientific vacuum in Georgian forensic psychology and offers practical, evidence-based recommendations for the development of criminal justice policy.

Keywords: Legal DNA, Recidivism, Forensic Psychology, Georgia, Property Crimes.



Deep Learning-Based SoC Estimation of Lithium-Ion Batteries Using CNN–LSTM

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Abstract: Accurate estimation of the State of Charge (SoC) is essential for effective battery management in electric vehicles using lithium-ion batteries. Due to the nonlinear and time-dependent behavior of battery dynamics, traditional estimation methods face limitations in accuracy and adaptability. This paper proposes a hybrid deep learning approach that combines Convolutional Neural Networks (CNNs) and Long Short-Term Memory (LSTM) networks for SoC estimation. The model uses battery voltage, current, and temperature as input signals to capture both spatial features and temporal dependencies within the battery data. By integrating CNN-based feature extraction with LSTM-based sequence modeling, the proposed framework provides an efficient data-driven solution for SoC estimation suitable for electric vehicle applications.

Keywords: Defect Detection, Artificial Intelligence, Industrial Machines, Predictive Maintenance, Machine Learning, Deep Learning.



A Hybrid Deep Learning and EKF Approach for Accurate State of Charge Estimation of Lithium-Ion Batteries in Electric Vehicles

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Abstract: Accurate estimation of the State of Charge (SoC) is a key requirement for reliable battery management in electric vehicles employing lithium-ion batteries. The nonlinear characteristics of battery behavior and the presence of measurement noise pose significant challenges to conventional estimation methods. This paper presents a hybrid SoC estimation framework that combines a deep learning model based on Convolutional Neural Networks (CNNs) and Long Short-Term Memory (LSTM) networks with an Extended Kalman Filter (EKF).

The CNN-LSTM model is employed to capture complex nonlinear relationships and temporal dependencies from measurable battery signals, including voltage, current, and temperature. The EKF is then integrated to enhance estimation robustness by filtering noise and incorporating recursive state correction. By leveraging the learning capability of deep neural networks and the estimation stability of model-based filtering, the proposed hybrid approach provides an effective and reliable solution for SoC estimation in lithium-ion batteries for electric vehicle applications.

Keywords: Short-Term Memory, Artificial Intelligence, Extended Kalman Filter, Predictive Maintenance, lithium-ion batteries, Deep Learning.



Immunotoxic Effects of a Household Pesticide: A Murine Experimental Study

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Abstract – Pesticides used in agriculture, public green spaces, and domestic environments pose increasing risks to environmental and human health. Numerous studies have linked pesticide exposure to various adverse effects, including carcinogenic, neurotoxic, and endocrine-disrupting outcomes. Growing evidence also indicates that pesticides may induce long-lasting or irreversible damage to the immune system.

In this context, the present study aims to evaluate the immunotoxic potential of “Powder Fly Killing Bait,” a household insecticide widely used in Algeria. To assess its effects on the murine immune system, three doses (40, 80, and 160 mg/kg body weight) were administered to mice under controlled experimental conditions.

Immunological investigations revealed marked alterations following exposure. These changes included a significant increase in peritoneal macrophages and splenocyte counts, as well as an increase in the relative weight of the spleen. Hematological analysis showed elevated total white blood cell and monocyte counts, accompanied by a decrease in lymphocyte and granulocyte levels. In parallel, a reduction in relative liver weight was observed in treated animals.

Furthermore, signs of hepatic inflammation were detected, prompting a histopathological examination of liver tissue. Microscopic analysis confirmed inflammatory lesions and structural alterations, providing insight into the observed immunological and hematological disturbances.

Overall, the findings demonstrate that exposure to this household pesticide induces significant immunotoxic and hepatotoxic effects in mice. These results highlight potential health risks associated with the widespread and uncontrolled use of domestic pesticides and emphasize the need for stricter regulation and increased public awareness regarding their safe use.

Keywords – Immunotoxicology; Household pesticide; Murine model; Immune system; Hepatotoxicity.



CLIMATE CHANGE: GLOBAL CONCEPTS, HUMAN ADAPTATION, AND REGIONAL PERSPECTIVES

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Abstract - Global climate change is one of the most important challenges facing today's world and directly affects both natural systems and human life. It is mainly caused by increased greenhouse gas emissions resulting from human activities such as fossil fuel use, deforestation, and industrial development. Climate change leads to rising temperatures, changing rainfall patterns, more frequent extreme weather events, and environmental degradation. Albania, as part of the Mediterranean region, is particularly sensitive to these changes. In recent decades, the country has experienced warmer summers, irregular precipitation, longer drought periods, and an increased risk of floods and heatwaves. These impacts affect everyday life, especially agriculture, water availability, ecosystems, and human health. This topic introduces students to the global causes and consequences of climate change while using Albania as a practical and familiar example. The educational approach aims to raise awareness, encourage critical thinking, and promote responsible environmental behavior among young people. Understanding climate change at both global and local levels is essential for building an informed and environmentally conscious generation.

Keywords: Climate Change, Human Adaptation, Regional Perspectives, Albania



Integrating Mathematical Sciences into Food Chemistry Research: An Interdisciplinary Approach

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Abstract - The complexity of modern production systems, nutritional demands, and safety requirements increasingly challenges food sciences and chemistry. This paper presents an interdisciplinary approach that integrates mathematical sciences with food chemistry research to enhance analysis, modeling, and prediction. Mathematical tools such as kinetic modeling, statistical inference, optimization, and computational simulations are applied to investigate chemical reactions in food processing, nutrient stability, and quality control. These methods enable quantification of uncertainty, the development of predictive models for shelf-life and safety, and the optimization of processes to improve efficiency and sustainability. By merging food science expertise with mathematical rigor, the study demonstrates how interdisciplinary frameworks can yield deeper insights into molecular interactions, drive innovation in food technology, and support evidence-based decision-making across industry and policy.