“DUNAREA DE JOS”
UNIVERSITY OF GALATI
DOCTORAL SCHOOL OF MECHANICAL AND INDUSTRIAL ENGINEERING

BOOK of ABSTRACTS Scientific Conference of Doctoral Schools

SCDS-UDJG 2025

The Thirteenth Edition

GALAŢI, 12th-13th of June 2025

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I. ORAL PRESENTATIONS

SECTION 1
ADVANCED RESEARCH IN MECHANICAL AND INDUSTRIAL ENGINEERING

OP.1.1

Decay Analyses of Eight Floating Wind Turbines

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Abstract

This paper will analyze the decay response of eight floating wind turbines due to instantaneous concentrated forces applied on the turbine's tower or hub. The authors studied these floating wind turbines in previous work, but in terms of their response due to constant wind forces. The studied floating wind turbine types are Spar, Semi-Submersible, and TLP. In addition, drivetrain and mooring line analysis can be performed under the same input conditions. This research is ongoing, and many aspects will be added to the paper.

Keywords: Renewable Energy, Floating Wind, Decay Analysis.

OP.1.2

Comparative Assessment of LNG Bunkering Procedures in Romania, Spain, and Canada: Operational Approaches and Safety Considerations in Vessel Commissioning

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Abstract

This presentation provides a comparative evaluation of LNG bunkering procedures carried out in Romania, Spain, and Canada during the commissioning of a dual-fuel Ro-Ro vessel. The analysis focuses on operational methodologies, safety protocols, and environmental considerations across three distinct port environments: Damen Shipyard in 2 Mai (Romania), the Port of Cartagena (Spain), and the Port of Tilbury in Vancouver (Canada). Emphasis is placed on differences in system cooldown approaches, LNG transfer methods, and risk management strategies.

The Romanian operation, characterized by the use of vaporized and liquid nitrogen for gradual cooldown and LNG transfer via pressure differential, prioritized system integrity and procedural safety. In contrast, the Spanish operation employed terminal-based infrastructure and tanker-pump transfer, closely coordinated by the vessel's engineering crew. The Canadian case, conducted post-delivery under client supervision, revealed potential risks linked to bypassing gradual cooldown, resulting in suspected thermal stress on the LNG tank's loading valve.

By comparing these three scenarios, the study identifies best practices and highlights the importance of standardizing LNG commissioning protocols, particularly in emerging markets. The findings aim to support safer and more sustainable adoption of LNG as a marine fuel, while underlining the need for harmonized regulatory and logistical frameworks.

Keywords: LNG Bunkering, Cryogenic Fuel, Vessel Commissioning Safety, Comparative Maritime Practices, Alternative Marine Fuel Infrastructure.

OP.1.3

Sustainable Energy Integration: Evaluating Floating Solar Potential at Romania's Existing Hydropower Infrastructure

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Abstract

This study investigates the potential of integrating floating photovoltaic (FPV) systems with existing hydropower infrastructure across four major Romanian reservoirs (Vidraru, Vidra, Bicaz, and Siriu), evaluating multiple deployment scenarios with FPV coverage ranging from 10-50% of water surface area. The research examines the technical and operational synergies between these complementary renewable technologies, analyzing energy generation patterns, surface utilization efficiency, and system compatibility under different coverage ratios. By assessing these hybrid configurations, the study aims to identify optimal solutions that enhance renewable output while maintaining ecological balance, providing valuable insights for Romania's sustainable energy transition and efficient use of existing hydropower infrastructure.

Keywords: floating photovoltaic (FPV), hybrid energy, renewable energy, Romanian reservoirs.

OP.1.4

ACA to enhance the safety of the Black Sea ship operations

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Abstract

In the current era, with rising concerns regarding the ascending trend of greenhouse gas emissions and with the shipping industry continuously rising, the problem of ship time and emissions diminishing is on the spot.

The article proposes an investigation regarding the suitability of using an ant colony algorithm to furnish the bridge teams of ships with a decision-assisted tool to enhance the sustainability and safety of the voyage or mission in the naval field.

The sensitive Black Sea ecosystem needs to be protected against fossil fuel pollution and emissions, so the article, based on a close-to-reality scenario, investigates the possibility of downsizing the voyage cost, enhancing safety, and reducing emissions from ships.

The model consists of a Constanta—Batumi voyage based on oceanographic reanalyzed data, with high seas and a cargo ship chosen to conduct the voyage and avoid danger with the minimum possible fuel consumption.

The work draws some conclusions about the efficiency of the algorithm and its suitability for use on a ship's bridge in the said sea basin.

Keywords: Ant Colony Algorithm, safety, sustainability, Black Sea.

OP.1.5

Technologies for Processing Complex Surfaces on CNC Machines

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Abstract

This review paper delves into the evolution, capabilities, and practical applications of CNC machines, which have revolutionized the field of mechanical processing. The paper provides an in-depth analysis of various types of CNC machines, including milling, turning, and multi-axis systems, highlighting their adaptability and efficiency in performing complex machining tasks. It presents the fundamental principles of mechanical machining and it also explores key aspects of CNC machine programming, emphasizing the significant role of ESPRIT TNG software in optimizing processing workflows. This advanced software enables intuitive and flexible CNC programming, providing users with powerful tools for simulation and G-code generation. This software offers comprehensive capabilities for simulation, toolpath generation, and seamless integration into diverse manufacturing environments. By integrating technical information this paper aims to become a valuable resource for both specialists and beginners in this domain. The focus is placed on knowledge transfer and fostering innovation in computer-assisted mechanical processing.

Keywords: CNC machines, hybrid CNC machine, machining feeds and speeds, CAM, ESPRIT TNG.

OP.1.6

Numerical Study of Non-Linear Hydrodynamics Effects for a Full-Scale Ship in Regular Head Waves

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Abstract

The accurate prediction of ship performance in waves is a fundamental aspect of naval architecture, directly influencing operational efficiency. In real-world sea conditions, ships are often subjected to non-linear hydrodynamic effects, such as wave-induced slamming, green water on deck, and dynamic variations in resistance and propulsion loads, all of which can significantly impact overall performance and propulsion efficiency. As a result, understanding the occurrence and evolution of non-linear hydrodynamic effects is critical for achieving robust and reliable ship designs. This study investigates the hydrodynamic behavior of a full-scale ship advancing in regular head waves using Computational Fluid Dynamics (CFD) methods, with a particular focus on capturing non-linear effects. Numerical simulations were conducted using Fidelity Fine Marine, employing a viscous flow solver based on the Reynolds-Averaged Navier-Stokes (RANS) equations with finite volume discretization, the Volume of Fluid (VOF) method for free surface capturing, and the k-ω SST model for turbulence closure. Simulations were conducted at the ship's design speed, analyzing five different wavelengths across three wave heights. Detailed analyses were carried out for the wavelength and wave height combination where non-linear effects were most significant. The investigation included the distribution of the mass fraction over the ship hull and the relative position of the hull with respect to the wave surface at various time instances, which were correlated with the temporal variation of total resistance in waves. Key non-linear phenomena such as spray formation, slamming impacts, and green water on deck were successfully captured. Additionally, the axial velocity distribution in the propeller plane was analyzed at the same critical time instances to assess the impact of unsteady inflow conditions induced by wave-ship interactions.

Keywords: full-scale, CFD, regular head waves.

OP.1.7

A review on the evolution of marine structures and systems in the actual context of climate changes

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Abstract

The objective of this work concentrates on reviewing the evolutive aspect of the marine structures based on the reality of climate change and future global reconfiguration. From this perspective, this paper brings the attention to several types of marine structures and the challenges imposed by their design concepts, construction and operating conditions. These offshore structures represent a critical component to reaching the climate expectations posed by Intergovernmental Panel for Climate Change and contributing to a low carbon emission future. The rapid expansion of offshore wind and solar energy fields may possibly lead to the necessity of ocean energy development, thus becoming gradually more important in the global efforts to reduce the challenges posed by climate change. It is important to mention that desalinization systems could be integrated with marine energy farms, especially useful in areas lacking access to potable water or isolated lands, thus becoming greater assets than before. In this paper it has also been considered the impact of harsher weather conditions on the offshore platforms, altogether with the possible emergency procedures and operational requirements. It also emphasized the importance of promoting and setting safety standards in the marine industry, protecting the environment and researching new paths to enhance our future on Earth.

Keywords: offshore wind field, energy farms, climate changes, marine structures, safety.

OP.1.8

Potential and Variability of Offshore Wind Energy in the Black Sea Region

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Abstract

The increasing demand for sustainable energy solutions accentuates the strategic relevance of exploiting offshore wind potential in the Black Sea area. This paper emphasizes evaluating the wind patterns in representative coastal areas of the riparian countries chosen near major ports in Romania, Bulgaria, Turkey, Ukraine, Russia, and Georgia. Using a decade of ERA5 reanalysis data, the wind features at an altitude of 100 meters above sea level were estimated through the application of vertical extrapolation techniques. The key indicators of seasonal and monthly wind speed variation, wind power density, and prevailing wind directions were examined. The results reveal clear seasonal tendencies, with higher wind speeds during the cold months and significant decreases in summer, which influence the stability of power generation. Locations in Romania, Bulgaria, and Ukraine have appropriate wind regimes, while the Georgian location is one of poorer resources and greater variability. The study underscores the significance of pinpointing suitable sites for offshore development, while also highlighting the necessity for additional empirical verification and addressing operational issues like resource variability and marine logistics. The findings from this research advocate for the enhancement of future offshore wind farms in the Black Sea area.

Keywords: Black Sea are, sustainable energy, offshore wind.

OP.1.9

Possibilities of organizing road traffic through the use of traffic simulation programs

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Abstract

This paper aims to identify, organize and model traffic emissions with PTV Vissim and PTV Visum software at the "Cora Brătianu" intersection. Constanta is currently characterized by the construction of investment projects, which obviously has an impact on the transport infrastructure. In order to assess the impact of investment projects on the transport network in question, the methodology for determining the approximate percentage of vehicles that generate different types of facilities during the morning rush hour, the total number of parking spaces of that object and with it the data processors are obliged to transport was processed. The analysis of the transport capacity has shown that a demonstrable balance is achieved between the capacity of the road infrastructure and its expected congestion and the determination of the quality of life of the new investment in the studied area. The biggest deviation from the actual situation is in the calculation of the average length of the column or the average waiting time. In such cases, the simulation of the affected intersections is processed by the VISSIM software, and the results of an assessment are compared according to the technical conditions and by simulation. Evaluation by means of simulation programs often reflects real problems and possible solutions to the faulty state of the operative intervention in simulations and comparison of variants.

Keywords: traffic, congestion, intersection, emissions, motor vehicles, programs, simulation.

OP.1.10

Experimental Analysis of Ship Free Oscillations Using an IMU-Based Measurement System in Water and Air

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Abstract

Accurate evaluation of a ship's dynamic behavior is fundamental to understanding its stability characteristics, particularly in response to free oscillations such as roll decay. This research introduces the design and implementation of a compact, cost-efficient inertial measurement system utilizing the Bosch BMX160 IMU sensor, integrated with a Raspberry Pi 4 single-board computer, for recording ship free oscillations both in water and within a controlled air environment. The system supports remote data acquisition and real-time monitoring, providing flexibility for both laboratory-based and field experiments. Extensive calibration procedures were conducted for the gyroscope and accelerometer components of the BMX160 to ensure precise, drift-minimized measurements. Roll decay experiments were carried out on a scaled ship model in a towing tank, complemented by equivalent free oscillation tests in air, performed using a custom-engineered test rig simulating controlled roll motions. The collected data allowed for the evaluation of natural frequencies and damping coefficients in contrasting fluid environments. By comparing the roll decay behavior in water and air, the study examines the influence of added mass effects and hydrodynamic damping on the dynamic response of the ship model. The correlation of results across both testing scenarios emphasizes the reliability and sensitivity of IMU-based systems in capturing subtle dynamic behaviors, while also offering validation references for numerical and theoretical modeling in naval architecture. This integrated, scalable system presents a practical approach for experimental studies on ship motion and establishes a foundation for future investigations into more complex dynamic phenomena.

Keywords: roll decay test, motion data, added mass.

II. POSTERS

SECTION 1
ADVANCED RESEARCH IN MECHANICAL AND INDUSTRIAL ENGINEERING

PP.1.1

Energy improvement of a CO2 transcritical refrigeration system based on liquid injection method

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Abstract

Liquid injection is an effective method to improve CO2 trascritical refrigeration system. The main objective of this study is to further improve the energy performance of a refrigeration system already equipped with an ejector that can operate with two phases refrigerant (liquid and gas). The results indicated that there is an optimal value of superheated gas that enters the compressor which can further optimize the COP and reduce energy consumption. For a superheat value of maximum 15 K the new system has a COP increased with 4% overall and better energy consumption with 1,5% on the rack level compared with the same system without liquid injection.

Keywords: Energy consumption, Commercial refrigeration, Carbon Dioxide, Ejector, Liquid Injection.

PP.1.2

Operational Insights into Safety Procedures for LNG Tank Cooldown Prior to Initial Bunkering on a Dual-Fuel Vessel

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Abstract

This poster presents an operational overview of the safety procedures applied during the initial cooldown of an LNG storage tank on a dual-fuel Ro-Ro vessel prior to its first bunkering. The process, conducted at Damen Shipyard in 2 Mai, Romania, involved a carefully staged thermal transition using vaporized and liquid nitrogen (LIN) to reduce system temperature and mitigate material stress before introducing liquefied natural gas. Emphasis was placed on temperature monitoring, vapor containment, and hull protection to ensure structural integrity and compliance with IGF Code safety standards. Particular attention was given to the placement and insulation of cryogenic hoses to prevent contact with sensitive surfaces on the vessel and quay infrastructure. The poster highlights the key technical steps, environmental considerations, and safety measures implemented to support a successful and incident-free pre-bunkering operation. These insights contribute to the broader understanding of LNG-fueled vessel commissioning and inform best practices for shipyards operating without fixed LNG terminal facilities.

Keywords: LNG Bunkering, Cryogenic Safety, Dual-Fuel Vessel, Tank Cooldown, Environmental Protection.

PP.1.3

Impact Response of Epoxy-Based Glass Fiber Composites with and without Mat Reinforcement for Marine Use

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Abstract

This research presents a comparison between two composite materials, both made of quadriaxial glass fiber fabric (8 layers) and epoxy resin (SikaBiresin® CR82 with hardener CH80-2), one of which includes a Coremat Xi 3 mat layer positioned at the mid-thickness. The impact behavior was analyzed using force–displacement, absorbed energy–displacement, and velocity–displacement curves, at impact energies of 50 J and 200 J, with corresponding velocities of 4.32 m/s and 4.41 m/s. Parameters, such as maximum force, time to maximum force, displacement at maximum force, and absorbed energy were extracted.

Both materials showed partial penetration. At 50 J, the structural difference had limited influence, but at 200 J, the composite with the mat layer demonstrated superior performance. The maximum force decreased with approximately 760 N at 50 J and 9000 N at 200 J for the mat-reinforced composite, which also showed higher energy absorption due to extended impactor–composite interaction. The composite without the mat absorbed 76.84% of the impact energy at 50 J and 90.65% at 200 J, while the one with the mat absorbed 79.66% and 94.55%, respectively. These results confirm the improved impact response of the mat-reinforced composite and support its use in marine applications.

Keywords: quadriaxial glass fiber fabric, epoxy resin, mat layer, impact test, hemispherical impactor, maximum force, absorbed energy.

PP.1.4

Design Aspect of Airport Trailers

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Abstract

This study presents transfer systems using vehicles with trailers that can move a very large amount of material with each transport, an advantage that is sometimes seriously diminished if an operator is not available to load/unload the trailers when they have reached their destination. This disadvantage can be eliminated by automating the loading/unloading of trailers, which ensures that the load is transferred without the presence of an operator.

Airport trailers, despite their simple appearance, are pieces of equipment that require a wealth of knowledge gained through experience. On one hand, they have to provide more or less sophisticated functional solutions and, on the other hand, technical components which are often large, not only because of the loads to be transported but also because of the operating constraints. These constraints are often difficult to foresee or identify, even for operators.

Keywords: transfer system, airport trailer, components, design solution.

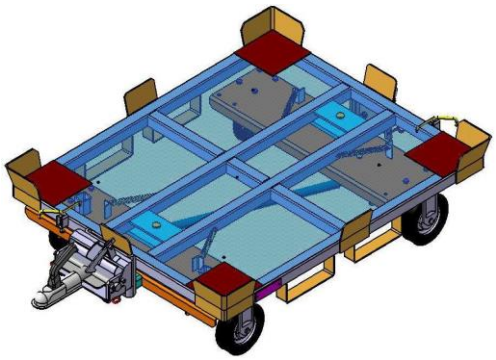

Figure 1. A design solution for the trailer vehicle

PP.1.5

Influence of Panel Thickness under Ballistic Impact with 9 mm Projectile

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Abstract

These tests were carried out on panels made of aramid fabrics Twaron T730, produced by Teijin Aramid VB. The panels were sewn on all four edges to maintain the integrity and order of the layers. After being hit with 3 projectiles of 9 mm FMJ, with impact velocities of 370-371 m/s, the panel made of 10 layers exhibit total penetration for all of three hits. The 15-layer panel exhibits partial penetration, with an average BFS (back face signature) of 35.66 mm, (impact velocity 370-376 m/s), accepted by NIJ 0101.06/2008.

Keywords: aramid fabric panel, impact, 9x19 mm FMJ projectile, Twaron T730, BFS.

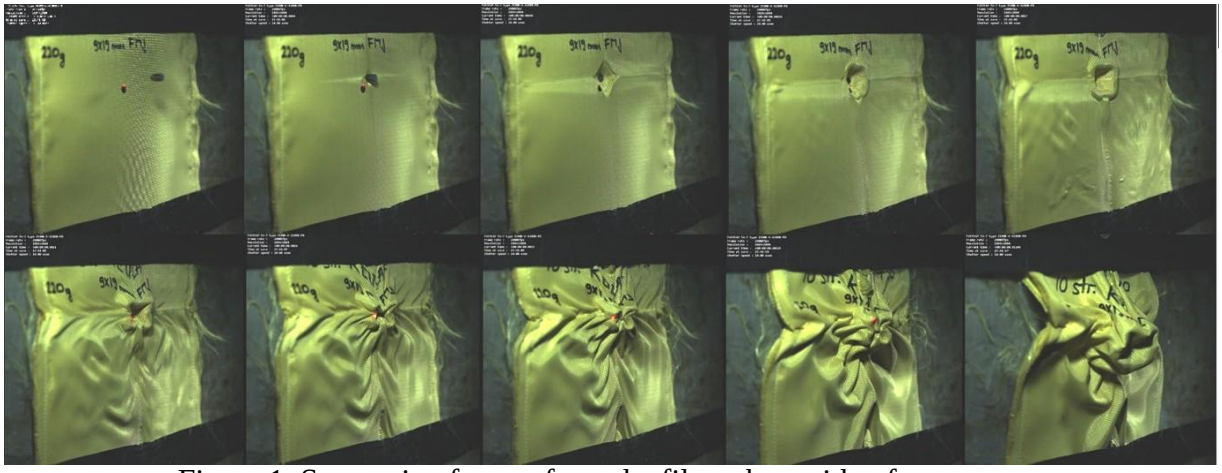

Figure 1. Successive frames from the film taken with a fast camera,
for the first hit on the 10-layer panel (Photron Fastcam SAZ camera, 20.000 fps)

PP.1.6

Assessment of gear design characteristics by image processing

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Abstract

Gear design and optimization are very important for obtaining efficient power transmission systems. The usual common approach for establishing gear characteristics typically relies on proper measurement or complex theoretical models. To identify the most important geometric features of gears, image analysis procedures were made to high-resolution pictures. To obtain a good estimation for the gear characteristics, the strategy presupposes different levels of processing, such as edge identification and contour analysis. Using this image processing technique, we can subsequently identify various geometric errors and defects that appear on the flanks of the teeth.

Keywords: gear characteristics, image processing, tooth profiles.

PP.1.7

Investigation of creep behavior of G-aenial restorative composite by nanoindentation

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Abstract

Successful restoration of teeth mainly depends on the mechanical and creep properties of the selected restorative biomaterial. Creep may result from occlusal stresses during clinical service, which can affect bond integrity at tooth-restoration interfaces. In the case of dental restorative composites, if direct transfer of stress to the bulk restorative material occurs, the resin-polymer phase of the composite will often respond in a time-dependent manner. Such a response can involve segmental movement of the polymer chains within the constraints of the network's connectivity.

In this study, the creep behavior of G-aenial restorative composite is investigated through nano-indentation using a Nano Indentation Tester (NHT, Anton Paar GmbH) wiht a Berkovich diamond tip indenter. The creep behavior (i.e., the change in depth of the indenter as a function of time) is measured at a maximum load of 100 mN for different holding times (10, 30, 60, and 120 seconds). Based on the experimental data, the creep response is modeled using the Maxwell and Kelvin two-element models. The influence of creep on the hardness and modulus is alsi analyzed.

Keywords: creep, nanoindentation, restorative material, G-aenial.

PP.1.8

Improving Mechanical Systems with Software-Based Sensing

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Abstract

The integration of software-based sensing into mechanical systems presents a transformative approach to system monitoring, diagnostics, and control. Unlike conventional hardware sensors, software program sensors—also known as virtual or soft sensors—use mathematical models, machine learning algorithms, or information fusion strategies to estimate critical system parameters that may be difficult or costly to measure directly. This article explores how software-based sensing complements the performance, reliability, and intelligence of mechanical systems by enabling real-time estimation, predictive maintenance, and adaptive control. Through selected case studies in manufacturing, automotive, and robotics applications, the article demonstrates how software sensors can supplement or replace physical sensors, reduce complexity, and improve system responsiveness. Challenges associated with version accuracy, data quality, and computational requirements are also discussed, along with future opportunities in digital twin development and AI-driven optimization.

Keywords: mechanical systems, software sensors, artificial inteligence.

SECTION 2
ADVANCED INVESTIGATION METHODS IN ENVIRONMENT AND BIOHEALTH

OP.2.1

Deep Learning for Breast Ultrasound Analysis: CNN-Based Tumor Segmentation and Classification for Improved Diagnosis

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Abstract

Breast ultrasound imaging is an essential tool in early breast cancer detection, yet its interpretation remains a challenging task due to image variability and noise. This study explores deep learning-based approaches for tumor segmentation and classification in breast ultrasound images, aiming to improve diagnostic accuracy and assist medical professionals in decision-making. An encoder-decoder architecture utilizing two pre-trained convolutional neural networks**,** DeepLabV3+ and U-Net, is proposed for the segmentation task**.** The segmentation performance was evaluated against a semi-automatic Local Graph Cut method using the Dice similarity coefficient. DeepLabV3+ achieved superior results compared to U-Net and Local Graph Cut. Further, a deep learning framework incorporating MobileNetV2, VGG16, and EfficientNetB7 is employed for classification**.** The proposed approach is novel in its ability to extract and analyze features from both the lesion and the surrounding tissue, leveraging morphological operations (erosion and dilation) to improve the model's interpretability. Transfer learning allows for the optimization of classification performance. The system was trained and validated using the BUS-BRA and BUSI datasets. High accuracy and AUC scores were achieved for the classification of both benign and malignant lesions. These results confirm the effectiveness of CNNs in segmentation and classification tasks, highlighting the potential of deep learning for automated breast cancer diagnosis. The proposed methodology paves the way for more robust, interpretable, and clinically relevant AI-driven diagnostic tools in breast imaging.

Keywords: breast lesion, US images, convolutional neural networks, tumor segmentation, tumor classification.

Acknowledgement. This research is part of the project 'MELCHIOR - MECHANICAL IMPEDANCE and MULTIPHYSICS CONCEALED AND HIDDEN OBJECTS INTERROGATION', MELCHIOR, NR. 82PHE/2024, PN-IV-P8-8.1-PRE-HE-ORG-2024-0209, PNCDI IV European and International Cooperation Program.

OP.2.2

Myocardial Infarction Detection from ECG Images Using Deep Learning and AutoML

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Abstract

Rapid and accurate detection of myocardial infarction is essential to reduce mortality from cardiovascular disease. This study proposes an analysis of electrocardiographic (ECG) images to identify early signs of myocardial infarction based on an approach of Deep Learning and AutoML. The proposed model uses convolutional neural networks (CNNs) and Transfer Learning strategies to improve the accuracy of detection while reducing the need for extensive data labeling. By integrating AutoML, the neural network architecture selection and optimization are automated, allowing the identification of the most efficient hyperparameters and network layers. ECG images preprocessing, optimal model selection by AutoML, and the performance evaluation using relevant metrics (accuracy, sensitivity, F1 score) are discussed. Experimental results indicate that this approach can go beyond traditional ECG analysis methods, providing a robust tool for AI-assisted diagnosis. In addition, we discuss the challenges related to the interpretability of Deep Learning models and possible future research directions for their integration into clinical practice.

Keywords: Deep Learning in Medicine, Myocardial Infarction Detection, AI-Assisted Cardiology Diagnosis ECG Classification,

Acknowledgement. This research is part of the project 'MELCHIOR - MECHANICAL IMPEDANCE and MULTIPHYSICS CONCEALED AND HIDDEN OBJECTS INTERROGATION', MELCHIOR, NR. 82PHE / 2024, PN-IV-P8-8.1-PRE-HE-ORG-2024-0209, PNCDI IV European and International Cooperation Program.

OP.2.3

Signal analysis based on recurrence plots for effective driver behavior detection

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Abstract

This paper employs recurrence plots (RPs) generated from both accelerometer and gyroscope data to analyze driver behavior. It integrates visualization with quantitative analysis by extracting key recurrence quantification measures, such as the Recurrence Rate (RR), Determinism (DET), and Laminarity (LAM), to effectively characterize the dynamics of the time-series signals. The accelerometer and gyroscope data are collected along three axes. These recurrence-based features facilitate the discrimination between stable, controlled driving dynamics and irregular, non-deterministic driving behavior. The RPs are generated using a sliding time window. The epoch length is set to 3000 samples with a window overlap of 80%. The results demonstrate that changes in driving conditions significantly altered the structure of the recurrence plots, with corresponding variations in the recurrence quantification RR, DET, and LAM metrics highlighting the sensitivity of these parameters to behavioral dynamics.

Keywords: Accelerometer, Gyroscope, Sliding Window, Recurrence Plots, Recurrence Matrix Recurrence Quantification Analysis, Recurrence Rate (RR), Determinism (DET), Laminarity (LAM)

Acknowledgement. This research is part of the project 'MELCHIOR - MECHANICAL IMPEDANCE and MULTIPHYSICS CONCEALED AND HIDDEN OBJECTS INTERROGATION', MELCHIOR, NR. 82PHE / 2024, PN-IV-P8-8.1-PRE-HE-ORG-2024-0209, PNCDI IV European and International Cooperation Program.

OP.2.4

Evaluation of Synthetic Water Quality Data and Its Limitations in Preserving Ecological Relationships

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Abstract

The scarcity of reliable biological datasets, particularly those incorporating biotic indices such as the Saprobic Index (SI), remains a key bottleneck in advancing machine learning applications for aquatic ecosystem assessment. Here, we evaluate the capacity of Conditional Tabular Generative Adversarial Networks (CTGAN) to produce synthetic datasets that integrate both physico-chemical parameters and biological information, based on real-world monitoring data from the lower Danube River.

We assessed the agreement between synthetic and real data sets through comparative analyses of box plots, Wilcoxon rank sum tests, and correlation matrices at different monitoring stations covering various sections of the Danube. Stable variables like pH, total dissolved solids (TDS), and chemical oxygen demand (COD-Cr) did not vary significantly ($p > 0.05$), which indicated a good replication of their distributional properties. In contrast, there were discrepancies for dynamic parameters such as dissolved oxygen, ammonium, and suspended solids ($p < 0.05$). Correlation analysis further underscored the limitations of the synthetic data: Correlation analyses further underscored the limitations of the synthetic data: strong relationships observed in the real datasets—such as between total nitrogen (TN) and nitrate ($r = 0.87$ in Gruia area) or electrical conductivity ($r = 0.98$ in Pristol area)—were either significantly weakened or nearly absent in the synthetic versions ($r \approx 0.03–0.17$).

These results suggest that although CTGAN models can precisely represent univariate distributions for many parameters, they often fail to preserve multivariate ecological structures. These findings have important implications for nutrient cycling processes and overall ecosystem functioning. While synthetic data offers valuable opportunities for exploratory modeling, scenario simulation, and machine learning focused on general distributional patterns, its use in studies involving biologically relevant physico-chemical variables, especially those shaped by seasonal dynamics such as aquatic life cycles, should be approached with caution.

Keywords: Synthetic data, Water quality monitoring, Saprobic, Index Ecological structure preservation

OP.2.5

Radiomic GLCM Texture Analysis for Classifying Retinal Conditions in OCTA Images

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Abstract
This study proposes a radiomics-based framework for the quantitative characterization of retinal microvasculature in Optical Coherence Tomography Angiography (OCTA) images, with a particular focus on distinguishing between normal, diabetic and myopic eyes. By using the publicly available FAZID dataset, we extracted a range of Gray Level Co-occurrence Matrix (GLCM) features, including both conventional and advanced second-order statistical descriptors. These features, such as autocorrelation, cluster prominence, inverse difference moment, joint entropy, maximal correlation coefficient (MCC) and informational measures of correlation (IMC1 and IMC2), were computed across multiple spatial distances and orientations to capture subtle variations in the foveal avascular zone (FAZ) and surrounding capillary network. The extracted radiomic GLCM features were used as input for four supervised Machine Learning (ML) classifiers: Random Forest (RF), Support Vector Machine (SVM), k-Nearest Neighbors (K-NN) and Decision Tree (DT). Model performance was evaluated using accuracy, precision, recall and F1-score. The results showed high discriminative performance across all MLs, distinguishing among the three retinal conditions. This study shows that radiomic features derived from GLCM analysis are valuable for accurate classification of retinal pathologies.

Keywords: Optical Coherence Tomography Angiography (OCTA), Machine Learning (ML), Gray Level Co-occurrence Matrix (GLCM), Foveal Avascular Zone (FAZ), Retinal Disease Classification, Feature Extraction.

Acknowledgement. This research is part of the project 'MELCHIOR - MECHANICAL IMPEDANCE and MULTIPHYSICS CONCEALED AND HIDDEN OBJECTS INTERROGATION', MELCHIOR, NR. 82PHE / 2024, PN-IV-P8-8.1-PRE-HE-ORG-2024-0209, PNCDI IV European and International Cooperation Program.

OP.2.6

Multimodal Deep Learning Approach for Alzheimer's Disease Diagnosis and Cognitive Decline Prediction

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Abstract
Accurate classification of Alzheimer's Disease stages and early prediction of cognitive decline are crucial for clinical decision-making. This paper explores a multimodal deep learning strategy, combining

baseline structural MRI data and clinical information to perform both disease stage classification and cognitive decline regression. MRI scans and associated clinical assessments were obtained from the Alzheimer's Disease Neuroimaging Initiative (ADNI) database. The proposed ensemble model integrates different three-dimensional convolutional architectures and clinical features to predict diagnostic categories and forecast future Mini-Mental State Examination (MMSE) scores. Initial findings indicate the potential of multimodal approaches to enhance predictive accuracy and support early intervention planning in Alzheimer's Disease.

Keywords:Alzheimer's Disease, Deep Learning, MRI, Cognitive Decline, Multimodal Learning

OP.2.7

Ear Tag Scanner: Mobile-Based System for Livestock Management and Ear Tag Classification Using Convolutional Neural Network

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Abstract
This paper introduces a mobile application that supports livestock management by automating the recognition and classification of animal ear tags using a Convolutional Neural Network (CNN). The system combines Optical Character Recognition (OCR) with a custom-trained model based on SSD MobileNet V2 FPN-Lite, optimized and quantized for on-device execution. The model was developed using a dedicated, annotated dataset of ear tags to ensure robust classification under real-world conditions. The application uses a local SQLite database to store animal data and includes functionalities for Excel import, dynamic search and filtering, and report generation in PDF and Excel formats. This lightweight, offline-capable solution enhances efficiency in agricultural workflows, supporting digitalization efforts through accessible, edge-deployable AI technology.

Keywords: CNN, SSD MobileNet V2, quantization, OCR, Android, SQLite, livestock management, edge AI, ear tag classification

OP.2.8

A Comparative Study on Fatigue Feature Classification Using IA Algorithms

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Abstract
Deep learning (DL) continues to have a growing impact across domains such as computer vision, healthcare, and automation. Convolutional Neural Networks (CNN), a foundational component of DL, have proven to be highly effective in image classification tasks due to their ability to learn hierarchical visual features. This project explores two main approaches: custom-trained CNN models using CSPDarknet53 architecture, part of the one-stage object detector family, and a pre-trained model—Roboflow 3.0 Object Detection (Fast). Both models were evaluated on a custom dataset consisting of labeled visual data. The CSPDarknet53 CNN was implemented and trained from scratch, while the Roboflow model leveraged transfer learning and a more complex, pre-trained backbone. Experimental results showed that while the Roboflow model achieved superior accuracy due to its architecture and exposure to large-scale datasets, the performance difference was relatively small—around 2–3%. These findings suggest that while custom CNNs can provide competitive results, leveraging pre-trained models such as Roboflow can be significantly more efficient in terms of deployment and accuracy for object detection and image classification tasks.

Keywords: Convolutional Neural Networks, transfer learning, performance, pre-trained

P.2.1

Using rational functions to improve the results of approximating a function

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Abstract
In this work, we use rational functions in order to improve the results obtained in the approximation of a function in an interval [a, b]. For this we will approximate the function chosen as an example in this study using a ratio of two polynomials. To determine the two polynomials, we use the Taylor series expansion about the point x = 0 of the function chosen and the Pade approximation. Also, to highlight the accuracy of the obtained approximation, we analyze the absolute error between the initial function and the Pade approximation respectively and the Taylor series in the considered interval. The analyzed data, in the chosen interval, highlights much better results obtained by the Pade approximation compared to the Taylor series.

Keywords: Rational function, Taylor series, Padé approximations, maximum error.

P.2.2

Evaluation of Water Temperature Evolution for Prut River, over 10 years

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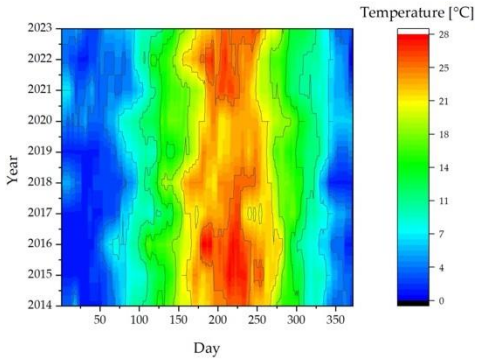
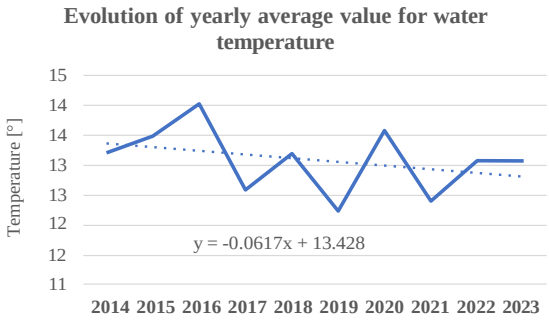
Abstract
This study presents an analysis of the water temperature of Prut River with the help of a detailed temperature map over 10 years (2014–2023). Figure 1a shows the daily temperatures across years, and the 2D map is colored by temperature value. The warm season (high temperatures) seems slightly extending (warming earlier and cooling later). Some years (e.g., 2015, 2022) show higher maximum temperatures than earlier ones in the analyzed period (like 2014-2016). It appears water temperatures of Prut River may be increasing slightly. Does this reflect climate change? Some rivers in Europe (like the Danube and the Rhine) show a general warming over 30–50 years. But for the Prut, over 2014–2023, the data does not yet clearly reflect warming, on the contrary, a linear regression of yearly average value has a negative slope (Figure 1b). This could be explained by the short observation window and its particular geographic position. Longer monitoring (extending the series to 30–50 years) would be needed to assess trends related to climate change robustly.





Keywords: Prut River, continental river, water temperature 10-year period.

P.2.3

Nutrient removal efficacy of two microalgae species, from wastewater

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Abstract
This study investigates the nutrient removal efficiency of two microalgae species, Chlorella pyrenoidosa and Chlorella sorokiniana, in treating urban wastewater. The objective was to evaluate reductions in total nitrogen (TN), total phosphorus (TP), and chemical oxygen demand (COD) after a 10-day cultivation period. Experiments were conducted in 5-liter photobioreactors under controlled conditions: 100 µmol photons/m²·s light intensity, 12:12 h light-dark photoperiod, 25°C temperature, and continuous aeration with 0.5 L/min air supplemented with 5% CO_2. The initial optical density was set at 0.2 (680 nm). Results showed that C. sorokiniana reduced TN from 53.39 mg/L to 2.40 mg/L and TP to 0.56 mg/L, while C. pyrenoidosa reduced TN to 5.26 mg/L and TP to 0.68 mg/L. COD was significantly decreased from 347.08 mg/L to 24.29 mg/L and 45.11 mg/L by C. pyrenoidosa and C. sorokiniana, respectively. These findings demonstrate the potential of both species - particularly C. sorokiniana - for effective bioremediation of municipal wastewater through nutrient and organic load reduction.

Keywords: water quality, waste water, microalgae.

P.2.4

The Development of Vegetation in Soil Contaminated with Petroleum Products Bioremedied with Sewage Sludge

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Abstract
Sewage sludge has a rich content of organic matter and water, which constitutes the support for the development of consortia of microorganisms with a decisive role in the bioremediation of soil contaminated with petroleum hydrocarbons. Previous experimental studies have shown that soil contaminated with petroleum products that has been bioremedied with sewage sludge can constitute the basis for the development of a vegetal layer. The concentrations of micro- and macroelements were determined, as well as the presence of microorganisms in the soil

bioremedied with sewage sludge, which contributed to the development of plants. For the analysis of heavy metals, ICP-MS methods (inductively coupled plasma spectrometry and mass spectrometry) were used, and the nutritional elements were evaluated by inductively coupled plasma optical emission spectrometry (ICP-OES). For the microbiological characterization, microbial strains were isolated and identified at the genus level by optical microscopy. The study had as its main aim the analysis of turf development in soil bioremedied with sewage sludge, highlighting the ecological benefits of this method.

Keywords: contaminated soil, petroleum, heavy metals, nutrients, microorganisms, bioremediation, sewage sludge.

P.2.5

Urban noise pollution in a medium-sized city from Romania

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Abstract

This research examines urban noise pollution in Galati, Romania, focusing on sound intensity measurements across six strategic locations. The study investigates noise levels during weekends at different moments (morning and afternoon), to assess varying patterns of anthropogenic activities. Measurements revealed that the Harbor area maintained the lowest noise pollution levels, while the Ring Road consistently showed extremely high sound levels, often exceeding acceptable limits. The research identified road traffic as the primary contributor to noise pollution, with construction activities significantly impacting local areas, where heavy machinery was used. Quantitative analysis demonstrated that most studied locations exceeded the 55 dB threshold considered acceptable for residential areas, with particularly concerning levels during peak traffic hours. The study encompassed 15 days of measurements, strategically selecting Friday, Saturday, and Sunday to capture the gradual decrease in anthropogenic activities throughout the weekend. Results indicate a clear correlation between traffic patterns, urban planning, and noise pollution levels, with the highest readings recorded during Friday evening rush hours. The findings suggest an urgent need for traffic management solutions and stricter enforcement of construction noise regulations to mitigate the growing urban noise pollution problem, which affects approximately over a hundred million people worldwide.

Keywords: noise pollution, urban environment, road traffic, construction impact.

P.2.6

Climate evolution in Romania in the 20th and 21st centuries and projections

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Abstract
Climate change is a hot topic these days in all countries around the world. Although Romania has taken important steps to combat climate change, continued efforts are needed to implement existing policies for monitoring and forecasting climate parameters, as well as to raise population awareness. In this paper, several climatic parameters are analyzed, such as mean annual air temperature, average minimum and maximum temperatures per month, mean temperature during the vegetation season, annual amount of precipitation, amount of precipitation per month and amount of precipitation during the vegetation season. Climatic parameters were studied over three periods: 1901-1991, 1991-2020 and 2020-2023. Temperatures were also estimated until the year 2100. The Projected Future Temperatures were calculated by combining data found in the current databases and Representative Concentration Pathways (RCP) projection data. Some ecoclimatic indices were calculated, such as De Martonne aridity index, the Lang rainfall index and the Ellenberg coefficient. To achieve the objectives of this study, the following databases were used: World Bank Climate Knowledge Portal, European Environment Agency (EEA), World in Data, European Drought Observatory (EDO), European Climate Assessment & Dataset, Romania's National Air Quality Monitoring Network (RNMCA).

Keywords: climate change, climatic parameters, ecoclimatic indices, projections.

P.2.7

Methods for optimizing household waste collection using Dijkstra-type algorithms

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Abstract
The Waste Management (WM) activity has recently gained major importance in the European space. According to EU requirements, this activity is approached operationally, being integrated into circular economies, being linked to significant revenues from selective waste collection services. Since the current economic situation requires an increase in the efficiency and profitability of municipal services, the collection activity requires streamlining. A number of 275 ecological selective collection islands have been built in the municipality of Galaţi. Under these conditions, a problem is daily related to dynamic optimizations of the visiting maps of these islands. In this sense, the designed algorithm and the construction of the application developed within our laboratory are based on the specific use of Dijkstra-type algorithms that allow the traversal of points on a directed graph of the map type that includes restrictions on the direction of traversal or gauge. The method considered within this project is based primarily on a detailed map of the municipality of Galaţi. The map used is imported into the ArcGis / QGIS system and the set of streets and intersection points that will be used are defined, using the tools in this environment. A database with the locations of the location points is also introduced into this environment. All these geometric aspects are then imported into a mathematical graph object. Depending on the points to be visited by the collection vehicles, the algorithm that offers the most economical route is run.

Keywords: Waste Management, Dijkstra-type algorithms, ANOVA.

P.2.8

Studying the diurnal dynamics of nitrogen oxide concentrations in the South-Eastern part of Romania, using long-term data series

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Abstract
The study of air quality parameters is currently a desideratum. Given that climate change is viewed through the prism of the effects it generates, such a subject is certainly of interest. Considering the level of pollution due primarily to traffic, this paper proposes to present the study of the diurnal dynamics of nitrogen oxide concentrations - NO, NO2 and NOx in the South-Eastern area of Romania. Data from the national monitoring network - Romania's National Air Quality Monitoring Network (RNMCA) and the World Bank Climate Knowledge Portal, European Environment Agency (EEA) were used. Statistical analysis methods such as ANOVA and PCA were considered. Significant differences were identified between the seasonal, monthly and diurnal variations between the data sets, which allowed the

identification of important changes in the pollution regime recorded in this area. The study interval was 2017 -2025.

Keywords: NO concentration, NO2 concentration and NOx concentration, ANOVA.

P.2.9

Assessment of Heavy Metal Soil Pollution Adjacent to the Streets of Galaţi City

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Abstract
The objective of this study was to assess the level of soil pollution in the vicinity of streets from Galati city. Samples were collected from the surface (0–10 cm), at a distance of 2–5 m from the edge of the streets. The immediate roadside area was avoided to eliminate the risk of accidental contamination. The sampling locations were selected and grouped based on the age of the streets, the density of present traffic, and the maximum allowed vehicle speed on the road segments. After determining the heavy metal concentrations, the degree of soil contamination was assessed using the following indices: the contamination factor (Cf), the pollution load index (PLI), the geoaccumulation index (Igeo), the enrichment factor (EF) and the metal pollution index (MPI).

Keywords: traffic, heavy metals, soil.

P.2.10

The Influence of Agricultural Practices on Soil Quality. Case Study: Fundeni Commune, Galaţi County

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Abstract
The present study aims to assess the influence of agricultural practices on soil quality in Fundeni commune, Galați County, and to determine whether the soil is polluted with heavy metals resulting from

such practices. All these aspects are analyzed using the X-ray fluorescence (XRF) method to evaluate heavy metal content. To assess the degree of soil pollution, simple evaluation indices were used. These include the enrichment factor (EF), the integrated pollution index (IPI), the migration index (MI), and the ecological potential risk (Ei and RI).

Keywords: agriculture, heavy metals, soil.

P.2.11

Assessment of Lanthanum and Cerium Pollution in the Shatt al-Arab River

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Abstract
This study aims to analyze the concentrations and bioaccumulation factors (BAFs) of 10 metal elements (Ce, La, Fe, Ca, Mg, Na, K, Ti, Mn and P) in water and fish tissue samples from the Shatt al-Arab River in Iraq. The samples were collected in May 2018 at four stations along the river using appropriate methods and equipment. The concentrations of the metals were determined using X-Ray Fluorescence (XRF) with a standard calibration method and quality control procedures. The BAFs were calculated as the ratio of the concentration of a metal in fish tissue to the concentration of the same metal in water. The study also performed descriptive statistics and correlation analysis on the data to examine the abundance, variability, distribution, shape, confidence level, and associations of the metals. The study focused on the spatial and temporal variability and the interactions of lanthanum (La) and cerium (Ce) with other metals in river sediments. The results showed that La and Ce had different sources, effects, and mechanisms of interaction with other metals, depending on various factors. The results also showed that some metals had higher average BAF values than others, indicating that they were more readily taken up by fish from water and accumulated in their tissues. La had a higher average BAF value than Ce. The study suggested that further analysis and monitoring of these metals were needed to evaluate their environmental impacts and potential health risks for humans who consume fish from contaminated water sources. The concentrations of Ce and La in the water and fish tissue samples vary widely across the four stations along the Shatt Al-Arab river. The translocation factor (TF) of Ce and La indicates that the fish have a low ability to accumulate these elements from the water. The results of the one-way ANOVA and Tukey HSD test show that there are significant differences in the concentrations of Ce and La among the stations, suggesting that there are different sources of pollution or environmental factors affecting the distribution of these elements. The Pearson correlation analysis reveals that there are positive associations between Ce and La, as well as between some other elements, indicating that they may have similar origins or behaviors in the water and fish tissue samples.

Keyword: oil pollution,Lanthanum and Cerium, pollution in the rive