The 24th International Conference on Informatics in Economy (IE 2025)

Recent Results in Education, Research, and Applications in the AI Era

Conference Program

Bucharest, Romania
May 15-16, 2025

Conference Organizers

Bucharest University of
Economic Studies

Department of Economic Informatics
and Cybernetics

INFOREC Association

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Preface

This year, the ***24th International Conference on INFORMATICS in ECONOMY (IE 2025)***, Recent Results in Education, Research, and Applications in the AI Era, has been held in a hybrid format in Bucharest, Romania, on 15 – 16 May 2025. The Conference promotes research results in Business Informatics and related Computer Science topics:

- *Artificial Intelligence: Theory and Applications*
- *Big Data Management, Processing and Analytics*
- *Smart Cities and Sustainable Communities*
- *IoT, Mobile and Multimedia Solutions*
- *Cloud, Distributed and Parallel Computing*
- *Cybersecurity and Critical Infrastructures*
- *Cybernetic Approaches in Quantitative Economics*
- *Digital Business and e-Transformation*
- *IT Deployment in Cultural Institutions*

The Conference has represented a meeting point for participants from all over the world, both from academia and from industry.

The conference was first organized in 1993 in collaboration with researchers from Institut National des Sciences Appliquées de Lyon (INSA de Lion), France. From 1993 to 2011, the conference has been organized once every two years, publishing in ten editions high quality papers and bringing together specialists from around the world. Starting with 2012, the conference takes place annually, the 11th, 12th, 14th, 15th, and 16th edition volumes have been indexed by ISI Thomson Reuters in its ISI Proceedings directory. Also, the 20th, 21st, 22nd, and 23rd editions have been indexed in Scopus and published in Springer.

The International Conference on Informatics in Economy is one of the first scientific events on this subject in Romania and during the last ten years has gained an international scientific recognition. At national level, remains one of the most important scientific events that gather the entire Romanian Economic Informatics community.

The conference has made partnerships with international journals like *Economic Computation and Economic Cybernetics Studies and Research, Informatica Economică, Database Systems Journal, Journal of Logistics, Informatics and Service Science, Journal of System and Management Sciences* to publish an extended format of the conference best papers.

In an era of accelerated technological change, IE 2025 addresses emerging challenges and opportunities at the intersection of education, research, and business innovation, encouraging interdisciplinary exchange and collaboration. This year's edition also highlights the growing role of cybernetic approaches and machine learning in addressing complex economic, societal, and technological challenges.

A Conference such as this can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Conference Team

Conference Important Events

Thursday, May 15, 2025		
Time	**Event**	**Hall name**
09:00 – 09:30	**Registration & Coffee break**	**Room 2104 (CSIE building)**
09:30 – 10:00	**IE 2025 Opening Ceremony** Prof. Nicolae **ISTUDOR**, PhD Rector of the Bucharest University of Economic Studies Prof. Claudiu **HERȚELIU,** PhD Dean of the Faculty of Economic Cybernetics, Statistics and Informatics, Bucharest University of Economic Studies Prof. Cristian **CIUREA**, PhD Head of the Department of Economic Informatics and Cybernetics, Bucharest University of Economic Studies	**Room 2104 (CSIE building)**
10:00 – 10:45	Acad. Florin-Gheorghe **FILIP**, Romanian Academy, Romania *"Enlightenment, Humanism, Collaboration, and Dataism in the Artificial Intelligence Era"*	**Room 2104 (CSIE building)**
10:45 – 11:30	Prof. Luis M. **CAMARINHA-MATOS**, NOVA University of Lisbon, Portugal *"Sustainable Collaborative Business Ecosystems"*	**Room 2104 (CSIE building)**
11:30 – 12:15	Assoc. Prof. Valerio **FICCADENTI**, London South Bank University Business School, United Kingdom *"One method, many systems. Rank-size approach to socio-economic modelling"*	**Room 2104 (CSIE building)**
12:30 – 13:30	**Lunch break**	**Cantina ASE Cihoski**
13:30 – 18:00	**Paper presentations**	**Rooms available on each section**
18:00 – 21:00	**IE 2025 Conference Dinner**	**Sheraton Bucharest Hotel, Calea Dorobanti 5-7**

CONFERENCE PROGRAM

– SECTION 1 –

Big Data, Cloud Computing, and IT Innovation in Cultural Institutions

In response to the increasing convergence between data-intensive technologies and digital transformation efforts, this section integrates research across three key thematic areas: *„**Big Data Management, Processing and Analytics**”*, *„**Cloud, Distributed and Parallel Computing**”*, and *„**IT Deployment in Cultural Institutions**”*. The papers included in this section explore a wide range of topics, from big data analytics performance and distributed consensus mechanisms to advances in visual analytics, machine learning applications in environmental prediction, and emerging trends in quantum computing sustainability.

Thursday, 15 May, 13:30 – 18:00, Room: B101, Piața Romană 7
Chairman: Mihaela Muntean, Secretary: Andreea-Mihaela Niculae

1. **THE SECOND AXELROD TOURNAMENT: EXPLORING ROUND UNCERTAINTY IN THE ITERATED PRISONER'S DILEMMA USING MONTE CARLO SIMULATIONS** – Gabriel Pop, Mircea Milencianu, Alexandra Pop

2. **A SURVEY OF OLAP PERFORMANCE FOR BIG DATA SYSTEMS** – Cătălina Badea

3. **A FEW CONSIDERATIONS ON DISTRIBUTED CONSENSUS TIME** – Alexandru Stan, Cristian-Sorin Bologa, Gheorghe-Cosmin Silaghi

4. **CHARACTERISTICS OF LAKEHOUSE IMPLEMENTATIONS** – Sorin Nicu Petrescu

5. **IMPROVING AIR QUALITY PREDICTIONS WITH MACHINE LEARNING: THE IMPACT OF STATE-LEVEL DATA IN US AQI PREDICTION** – Andreea-Mihaela Niculae, Ioana-Diana Petre

6. **ADVANCING LEARNING ENVIRONMENTS WITH AI AGENTS** – Vlad Diaconița, Laurențiu-Gabriel Dincă

7. **VISUAL ANALYTICS – EXPLORING AND UNDERSTANDING ECONOMIC TRENDS IN BUSINESS** – Muntean Mihaela

8. **GREEN QUBITS: EXPLORING THE SUSTAINABILITY OF QUANTUM COMPUTING** – Teodor Cervinski, Cristian Toma, Mihai Doinea, Marius Popa

– SECTION 2 –

Digital Innovation for Business Transformation and Sustainable Communities

In the context of accelerated technological advancements and growing societal challenges, this section integrates research addressing two key areas: *„**Digital Business and e-Transformation**” and „**Smart Cities and Sustainable Communities**”*. The selected papers explore the latest advancements in large-scale data processing, distributed architectures, and innovative IT solutions for enhancing cultural and societal development through technology.

Thursday, 15 May, 13:30 – 18:00, Room: B301, Piața Romană 7
Chairman: Stelian Stancu, Secretary: Andreea Pernici

1. **THE EUROPEAN DIGITAL INNOVATION HUBS – A DIGITAL TRANSFORMATION BROKERS** – Evelina Parashkevova-Velikova, Margarita Bogdanova

2. **IMPACT OF DESIGN THINKING IMPLEMENTATION ON DYNAMIC MANAGERIAL CAPABILITIES. EVIDENCE FROM ROMANIAN COURIER INDUSTRY** – Alina Matei

3. **DIGITAL AND NON-DIGITAL TOOLS FOR CITIZENS' PARTICIPATION IN IMPLEMENTING OPEN INNOVATION IN THE BULGARIAN PUBLIC SECTOR: AN EMPIRICAL VIEW** – Mariela Stoyanova, Elitsa Lazarova, Asen Bozhikov

4. **AN OPTIMIZATION MODEL FOR ENERGY AWARE SERVER PROCUREMENT IN DATA CENTERS** – Marius Radulescu, Constanta Zoie Radulescu, Delia Mihaela Neacsu, Radu Boncea

5. **ASSOCIATING PAID DIGITAL ADVERTISING WITH AI USAGE IN MARKETING AND SALES AMONG EUROPEAN SMES** – Marian Pompiliu Cristescu, Lia-Cornelia Culda, Raluca Andreea Nerisanu, Dumitru Alexandru Mara, Ana Maria Constantinescu

6. **ANALYSIS OF ADVERTISING RESULTS ON FACEBOOK (META) AND GOOGLE PLATFORMS ON GENERATED SALES FOR AN E-COMMERCE COSMETICS STORE** – Claudia Cristina Stan

– SECTION 3 –

IoT Innovations and Cybersecurity Challenges in the Digital Era

Reflecting the increasing interconnection between IoT ecosystems, mobile technologies, and critical cybersecurity needs, this section combines two key thematic areas: *„**IoT, Mobile and Multimedia Solutions**” and „**Cybersecurity and Critical Infrastructures**”*. The contributions address cutting-edge topics such as IoT vulnerability assessment, cybersecurity for healthcare systems, edge computing optimization, blockchain-based trust services, and privacy-enhancing technologies, highlighting the evolving complexity of securing digital infrastructures in an interconnected world.

Thursday, 15 May, 13:30 – 18:00, Room: 2317
Chairman: Cristian Eugen Ciurea, Secretary: Robert Ticu-Jianu

1. **AUTOMATING VULNERABILITY DISCOVERY IN IoT DEVICES: A COMPARATIVE STUDY OF FUZZING TECHNIQUES** – Robert Ticu-Jianu and Cătălin Boja

2. **SUPPORTING HYBRID AND REMOTE LEARNING THROUGH VIRTUAL INFRASTRUCTURES INTEGRATED WITH CYBERQUEST AND RASPBERRY PI** – Andrei Cătălin Nica, Cristina Radu and Pavel Cristian Crăciun

3. **RELEVANT ARTIFACTS IN CYBER INVESTIGATIONS FOR HEALTHCARE INFRASTRUCTURES** – Denis Alexandru Andrei Grigore and Dana-Mihaela Vîlcu

4. **ANALYZING GDPR COMPLIANCE IN IoT ECOSYSTEM WITH KEY DATA PROTECTION STRATEGIES AND INDUSTRY IMPACT**– Alisa Harkai and Cristian Eugen Ciurea

5. **UAV-BASED SYSTEM FOR METHANE MEASUREMENT, ADVANCED MAPPING AND ANALYSIS OF POTENTIAL EMISSION SOURCE** – Ionuț Gabriel Stoica, Richárd Kovács, Bogdan Cristian Ciulinaru and Mihail Stoica

6. **OPTIMIZING PERFORMANCE IN MODERN PROGRAMMING LANGUAGES THROUGH COMPILED LAMBDA EXPRESSIONS** – Alexandru Bărbulescu, Marian Dârdală, Felix Furtună and Andrei-Razvan Siminica

7. **OPTIMIZING EDGE COMPUTATION: A LIGHTWEIGHT FRAMEWORK FOR LOW-POWER IOT DEVICES** – Andrei Robert Cazacu

8. **DIGITAL SIGNATURE: LEGAL RECOGNITION, SECURITY CHALLENGES, AND OPTIMIZATION TECHNIQUES** – Loredana Mocean and Miranda-Petronella Vlad

9. **BLOCKCHAIN INTEGRATION IN TRUST SERVICE PROVIDERS: TRENDS, CHALLENGES, AND FUTURE DIRECTIONS** – Andrei Brînzea and Emil Bureacă

10. **ZKFLAG: A PRIVACY-FIRST, OPEN-SOURCE PLATFORM FOR FEATURE FLAGS USING ZERO-KNOWLEDGE PROOFS** – Bianca-Renata Mircea and Iulian Aciobăniței

– SECTION 4 –

Cybernetic Approaches in Quantitative Economics

This section presents advanced quantitative approaches rooted in cybernetic thinking, addressing complex dynamics in economics, finance, and decision-making. The contributions explore autoregressive models, fuzzy real options, quantum-inspired optimization, time series prediction using synthetic data, bibliometric analyses, and multi-criteria decision methods, reflecting the interdisciplinary nature of **modern economic cybernetics**. The studies highlight modeling uncertainty, non-linearity, systemic risk, and sustainable development, offering novel insights into both theoretical and applied aspects of quantitative economics.

Thursday, 15 May, 13:30 – 18:00, Room: 2316
Chairman: Nora Chiriță, Secretary: Ionuț Nica

1. **ARDL INSIGHTS INTO FINANCIAL CONTAGION: ASSESSING THE IMPACT OF CRUDE OIL AND BITCOIN ON EUROPEAN BANKS** - Ștefan Ionescu, Ionuț Nica, Daniel Magueta and Camelia Delcea

2. **MAPPING THE EVOLUTION OF FUZZY REAL OPTIONS AND DECISION-MAKING: A BIBLIOMETRIC ANALYSIS** – Zahra Hosseni, Virginia Mărăcine and Irina Georgescu

3. **EXPLORING THE INNOVATION CLAUDIA CURVE AND LOAD CAPACITY UTILIZATION IN FINLAND: AN AUTOREGRESSIVE DISTRIBUTED LAG APPROACH** – Nora Chiriță, Jani Kinnunen, Nicolae-Marius Jula and Ștefan-Alexandru Ionescu

4. **A BIBLIOMETRIC ANALYSIS OF EVACUATION SIMULATION RESEARCH: TRENDS, COLLABORATION, AND THEMATIC EVOLUTION (2002–2024)** – Livia Diana Iancu, Corina Ioanas and Paul-Adrian Drăgoi

5. **PRE-TRAINED NEURAL NETWORKS USING SYNTHETIC DATA FROM GENERALIZED HERMITE PROCESSES FOR TIME SERIES PREDICTION** – Erik-Robert Kovacs, Liviu-Adrian Cotfas and Ioan Roxin

6. **RANKING UE HAPPINESS: TOPSIS AND VIKOR CLASSIFICATION –** Adina Jigani, Alexandra-Nicoleta Ciucu, Kosyo Stoychev, Vanesa Vargas and Andra Sandu

7. **ASYMMETRY OF OIL MARKET VOLATILITY INFLUENCE ON ECONOMIES OF OIL EXPORTING COUNTRIES –** Costin Boldea, Ion Buligiu and Eduard Matei

8. **CIRCULAR ECONOMY AND THE IMPLEMENTATION OF THE GREEN SUPPLY CHAIN. AN ANALYSIS OF THE IMPLICATIONS ON THE ACTUAL ECONOMY –** Andreea Radu, Andreea Dima and Mihai Roman

9. **QUANTUM-INSPIRED OPTIMIZATION AND PROBABILISTIC APPROACHES FOR PREDICTING FINANCIAL MARKET CRASHES: A COMPARATIVE STUDY** – Sorin Muraru

10. **A BIBLIOMETRIC ANALYSIS OF THE BIBLIOMETRIC PAPERS IN TRANSPORTATION SECTOR** – Adrian Domenteanu, Georgiana-Alina Crisan, Bianca-Raluca Cibu, Ioana Ioanas, Anca Vlad and Xiaolei Wang

11. **ENHANCING FINANCIAL AUDITING WITH MACHINE LEARNING: SVM-BASED ANOMALY DETECTION IN GENERAL LEDGER DATA** – Florina Livia Covaci

12. **LSTM DEEP LEARNING NETWORK APPLIED TO STOCK MARKET** – Nicușor Andrei

13. **ROMANIAN NEWS ARTICLE CLASSIFICATION: A MULTI-MODEL COMPARISON WITH CLASS BALANCING** – Adrian Vintila and Constanta Nicoleta Bodea

14. **GENERATIVE AI IN DIGITAL BUSINESS: TRENDS AND CHALLENGES** – Olga Darii, Maria Beldiga and Tudor Bragaru

15. **MARKET VOLATILITY PREDICTION UNDER POWERFUL GEOPOLITICAL EVENTS. A CASE STUDY ON THE LATEST EUROPEAN CONFLICT** – Lavinia Roxana Toma

– SECTION 5 –

Artificial Intelligence: Theory and Applications

This section explores recent advancements in **Artificial Intelligence** (AI) theory and applications across diverse domains, including education, finance, cybersecurity, business process optimization, and social media analysis. Contributions address both foundational AI techniques, such as deep learning, natural language processing, and genetic algorithms, and their practical deployment for solving real-world challenges. Special attention is given to ethical aspects, model trustworthiness, and responsible innovation in AI-driven environments.

Thursday, 15 May, 13:30 – 18:00, Room: B607, Piața Romană 7
Chairman: Cătălina Lucia Cocianu, Secretary: Alin-Gabriel Văduva

1. **A SOLUTION TO UNIVERSITY COURSE TIMETABLING PROBLEM USING GENETIC ALGORITHMS** – Ionuț Bălan and Sorin Vlad

2. **UNVEILING IT JOB MARKET SENTIMENT AND TRENDS: A REDDIT-BASED STUDY USING SENTIMENT ANALYSIS AND NAMED ENTITY RECOGNITION** – Denisa-Maria Iordache and Cristina Iancu

3. **APPROACHES TO OPTIMIZING TRAFFIC MANAGEMENT** – Florin Andreescu and Dorin Simionescu

4. **DEALING WITH IMBALANCED DATA FOR LOAN DEFAULT PREDICTION: A COMPARATIVE STUDY ACROSS BALANCING TECHNIQUES FOR CNN, LSTM, RF, AND SVM MODELS** – Konstantinos Kofidis, Cătălina Lucia Cocianu and Cristian Răzvan Uscatu

5. **ASSESSING THE STATIC MALWARE ANALYSIS CAPABILITIES OF LARGE LANGUAGE MODELS** – Alexandru-Cristian Bardaș

6. **EMPLOYEE SATISFACTION IN AI-DRIVEN WORKPLACES: A SENTIMENT ANALYSIS OF GLASSDOOR REVIEWS** – Claudiu Brândaș, Otniel Didraga, Andrei Albu and Gabriela Mariuțac

7. **ASSESSING THE TRUSTWORTHINESS OF LARGE LANGUAGE MODELS: A TWO-STAGE FRAMEWORK USING RAGAS AND LLAMAINDEX** – Alin-Gabriel Văduva, Anca-Ioana Andreescu and Simona-Vasilica Oprea

8. **BERTWEETRO: NLP EXPERIMENTS ON ROMANIAN SOCIAL MEDIA TEXTS** – Dan Claudiu Neagu

9. **AI-DRIVEN DOCUMENT MAPPING: FROM XSLT TO DML VIA SEMANTIC BUSINESS ENTITY EQUIVALENCE** – Iulian Ilie-Nemedi, Filip Brenciu and Valentin Prutu

10. **ARTIFICIAL INTELLIGENCE IN ERP SYSTEMS: A SYSTEMATIC LITERATURE REVIEW** – Iulia-Maria Stepan and Luminita Hurbean

11. **ETHICS OF ARTIFICIAL INTELLIGENCE IN BUSINESS: CHALLENGES, APPLICATIONS AND PATHWAYS FOR RESPONSIBLE INNOVATION** – Cătălin Raul Halic, Marcela Florea, Dominic Bucerzan and Crina Anina Bejan

12. **AUTOMATING STUDENT ATTENDANCE USING FACIAL RECOGNITION THROUGH ARTIFICIAL INTELLIGENCE** – Franceska Balint, Alin Zamfiroiu, Costinela-Beatrice Păștinică and Daniel Savu

13. **AI AND THE FUTURE OF EDUCATION TESTING** – Felician Alecu, Paul Pocatilu, Sergiu Capisizu

14. **GENERATIVE AI IN DIGITAL BUSINESS: TRENDS AND CHALLENGES** –Mihai Dulgheru

15. **ARTIFICIAL INTELLIGENCE: A NECESSITY FOR SUSTAINABLE DEVELOPMENT** – Lorena Bătăgan, Aura Grigorescu, Răzvan Bologa

ABSTRACTS

Big Data, Cloud Computing, and IT Innovation in Cultural Institutions

THE SECOND AXELROD TOURNAMENT: EXPLORING ROUND UNCERTAINTY IN THE ITERATED PRISONER'S DILEMMA USING MONTE CARLO SIMULATIONS

Gabriel **POP**
Babeș-Bolyai University, Cluj-Napoca, Romania
Mircea **MILENCIANU**
Babeș-Bolyai University, Cluj-Napoca, Romania
Alexandra **POP**
Babeș-Bolyai University, Cluj-Napoca, Romania

Abstract: *This paper uses Monte Carlo simulations to investigate strategic decision-making in multi-agent interactions inside the Iterated Prisoner's Dilemma (IPD). Building on Axelrod's work, we propose a second-generation tournament with stochastic components including unpredictable game lengths for evaluating strategy adaptability and resilience. By establishing a comparison between cases with fixed and uncertain intervals, we investigate how uncertainty influences strategic performance. We find, via a descriptive approach, strategies showing significant behavioral variations between deterministic and uncertain environments. The findings help explain adaptive learning, response dynamics, and strategic flexibility, so strengthening the cooperative tactics for artificial intelligence and decision-making systems. Our findings highlight the limits of only deterministic solutions and suggest the need of adaptive strategies to increase long-term cooperative success.*

Keywords: Prisoner's Dilemma; Monte Carlo simulations; uncertainty; finite and infinite games.

A SURVEY OF OLAP PERFORMANCE FOR BIG DATA SYSTEMS

Cătălina **BADEA**
Alexandru Ioan Cuza University of Iasi, Romania

Abstract: *The vast quantities of data generated today, referred to as Big Data, offer significant opportunities and applications for researchers across various fields. Even so, managing Big Data requires addressing significant demands on time and computational resources, making the optimization of database management system (DBMS) performance essential. Numerous studies have employed online analytical processing (OLAP) to compare the efficiency of relational and non-relational DBMS, aiming to identify the most effective systems for handling extensive data workloads. By covering a decade of research, this survey captures*

the variety of benchmarks used for performance comparison. The main comparative articles were selected from three primary academic platforms: Springer Nature Link, Scopus, and Web of Science, filtering studies published between 2013 and 2024. Out of a total of 3,285 papers, 41 relevant studies were identified using full-text examination and backward snowballing technique. This survey investigates (1) the databases examined across diverse architectures, (2) the methodologies employed, and (3) synthesizes the performance results to provide a comprehensive understanding of database efficiency.

Keywords: Big Data*;* SQL; NoSQL; NewSQL.

A FEW CONSIDERATIONS ON DISTRIBUTED CONSENSUS TIME

Alexandru **STAN**
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Cristian-Sorin **BOLOGA**
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Gheorghe-Cosmin **SILAGHI**
Babeș-Bolyai University, Cluj-Napoca, Romania

Abstract: *Consensus algorithms are essential to distributed systems, enabling agreement amid failures and delays. This study examines Paxos and Raft consensus algorithms across six network topologies (Ring, Mesh, Tree, Small World, Erdos-Renyi, and Barabasi-Albert) under both correlated and uncorrelated errors. In this context, we extend the results of \cite{Howard2020} by showing that the network structure significantly impacts the performance of the two algorithms, with regular topologies experiencing increased message complexity under correlated errors. Raft generally outperforms Paxos in medium-sized networks with low to moderate stress levels. However, Paxos demonstrates greater resilience in high-stress environments on all network topologies. Our findings allow to optimize the selection of consensus algorithms based on network structure and error conditions.*

Keywords: Distribution Systems; *Consensus Time; Network Topology*

CHARACTERISTICS OF LAKEHOUSE IMPLEMENTATIONS

Sorin Nicu **PETRESCU**
Alexandru Ioan Cuza University of Iasi, Romania

Abstract: *Organizations face challenges in managing large, diverse datasets while ensuring efficient analytics and real-time decision-making. Traditional data warehouses and lakes offer benefits but struggle with integrating structured and unstructured data seamlessly. The Lakehouse architecture combines the reliability of warehouses with the flexibility of lakes, enabling advanced analytics. This study analyzes 38 papers from IEEE, ACM, Scopus, and*

Web of Science to examine Lakehouse implementations, focusing on functional zones, technologies, objectives, data sources, publication trends, and industry adoption. Using ATLAS.ti for qualitative coding and R for statistical analysis, findings show that data processing speed, cost efficiency, and scalability are key priorities. Apache Spark, Delta Lake, and Parquet dominate the ecosystem, supporting efficient data transformation and querying. Adoption is growing, especially in healthcare, energy, and telecommunications, but security, compliance, and data resiliency remain underexplored. As Lakehouse technologies evolve, this study highlights key trends, challenges, and future research opportunities in modern data management and large-scale data integration.

Keywords: Lakehouse Architecture; Implementation Trends; Industry Adoption.

IMPROVING AIR QUALITY PREDICTIONS WITH MACHINE LEARNING: THE IMPACT OF STATE-LEVEL DATA IN US AQI PREDICTION

Andreea-Mihaela **NICULAE**
Bucharest University of Economic Studies, Romania
Ioana-Diana **PETRE**
Bucharest University of Economic Studies, Romania

Abstract: *This paper investigates the impact of incorporating US state-level information into machine learning models for Air Quality Index (AQI) prediction, an important task for protecting public health. Utilizing data from the US EPA, the performance of Linear Regression, Random Forest, and XGBoost models were compared, both with and without state-level data, to determine if state-specific factors improve prediction accuracy. Our findings demonstrate that incorporating state-level information significantly enhances model performance, particularly for XGBoost, which achieved the highest R2 (0.883) and lowest RMSE (28.84). These results suggest that state-specific factors play a key role in influencing air quality, and that incorporating these factors into predictive models can lead to more accurate and reliable AQI forecasts, enabling more effective air quality management strategies. This research highlights the importance of considering state-level information when developing machine learning models for AQI prediction.*

Keywords: Air Quality Index; Machine Learning; Linear Regression; Random Forest; XGBoost.

ADVANCING LEARNING ENVIRONMENTS WITH AI AGENTS

Vlad **DIACONITA**
Bucharest University of Economic Studies, Romania
Laurentiu-Gabriel **DINCA**
Bucharest University of Economic Studies, Romania

Abstract: *Artificial Intelligence (AI) agents have become increasingly central to the evolution of educational technology, offering new approaches to personalization and learning engagement. Although prior research has shown that AI-driven personalization can significantly enhance academic performance and motivation, gaps persist in how these systems can be integrated responsibly and on a scale. In an attempt to address these gaps, our review synthesizes recent empirical studies and field reports on the effectiveness, challenges, and opportunities of AI agents in education and professional training. We adopt an integrated architectural perspective, illustrating how AI-driven components, such as student modeling, adaptive content delivery, and early warning systems, can be combined to form robust educational platforms. Despite concerns about data privacy, bias, and infrastructure disparities, AI agents can improve learning outcomes and engagement when carefully deployed. Ultimately, we argue that these agents, guided by ethical and pedagogical best practices, have the potential to transform teaching and learning into more equitable and individualized experiences.*

Keywords: Artificial Intelligence; Educational Technology; Intelligent Tutoring Systems; Language Learning; Virtual Learning Environments; Adaptive Learning

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VISUAL ANALYTICS – EXPLORING AND UNDERSTANDING ECONOMIC TRENDS IN BUSINESS

Mihaela **MUNTEAN**
West University of Timisoara, Romania

Abstract: *The paper is a debate on visual analytics from a theoretical and applied point of view. The visual analytics process is introduced, and the main visual analytics techniques are approached according to their purpose. The visual analytics framework was applied for the study of the electricity market in Romania. The consumption and production of electricity from various sources in the last three years, daily measured, were taken into account. Integrating visualizations and machine learning algorithms we identified patterns, detect-ed seasonality aspects and anomalies, developed forecast trends analysis regarding electrical energy production and consumption.*

Keywords: Visual Analytics; Trend Analysis; Visualization; Model.

GREEN QUBITS: EXPLORING THE SUSTAINABILITY OF QUANTUM COMPUTING

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Abstract: *As new scientific breakthroughs emerge in the quantum physics field, quantum computing evolves from theoretical concepts and constructs to practical innovations. However, the questions surrounding its impact on environment and sustainability remain largely unanswered. The object of the current paper is to assess the carbon footprint of quantum computing technologies and to analyze their impact on the environment. More than this, the study aims to explore the alignment of such technologies with global sustainability goals. Specifically, the research paper will aim to identify key sources of energy consumption and emissions across the quantum computing lifecycle, including hardware manufacturing, cryogenic cooling systems, operational energy usage, and quantum circuit simulation. The research methodology adopted in this study is a qualitative approach based on extensive review of peer-reviewed scientific literature, environmental assessments, and benchmarking frameworks tailored to carbon emissions measurement. A comparative analysis between quantum computing and classical high-performance computing is conducted to evaluate energy efficiency and environmental impact in different realistic scenarios. This paper provides original perspectives into the often-overlooked environmental dimension of quantum computing, contributing a comprehensive view on sustainability challenges and opportunities. By highlighting the importance of environmental impact assessments, this study supports the development of greener, more responsible quantum innovation.*

Keywords: Quantum Computing; Environmental Impact; Energy Consumption.

Digital Innovation for Business Transformation and Sustainable Communities

THE EUROPEAN DIGITAL INNOVATION HUBS - A DIGITAL TRANSFORMATION BROKERS

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Abstract: *The purpose of the study is to investigate a relatively under-researched area, namely the activities of European Digital Innovation Hubs (EDIH) and their expected impact on economic entities and public authorities. The opportunities the European Digital Innovation Hubs network provides to the public sector and companies are examined. Technological specialization and the creation of an innovation ecosystem are key to the development of each region. Through implementing interventions in support of digital transformation, European policy creates EDIHs. Through them, the aim is to increase competitiveness based on knowledge, technology transfer and capacity building in the context of the digital transition. Data are presented on the hubs' geographical coverage, financing, and technological specialization, with references to future challenges related to the functioning of the EDIHs.*

Keywords: European Digital Innovation Hubs; Digital Transformation; Innovation Ecosystem,

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IMPACT OF DESIGN THINKING IMPLEMENTATION ON DYNAMIC MANAGERIAL CAPABILITIES. EVIDENCE FROM ROMANIAN COURIER INDUSTRY

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Abstract: *Design thinking as a problem-solving framework has garnered significant attention for its reliance on retroduction and human centered design (HCD). The present study focuses on team dynamics and examine the effects of retroduction and HCD on team innovation quality in Romanian courier industry. We conduct an empirical analysis involving seven teams, each undertaking multiple innovation decisions. Our results suggest that teams that relied more on retroduction in time-constrained tasks tended to make lower-quality decisions, while teams that were highly human-centered produced decisions of higher quality. Importantly, team size emerged as a key moderating variable.*

Keywords: Design thinking; Retroduction; Human Centered Design; Team Dynamics.

DIGITAL AND NON-DIGITAL TOOLS FOR CITIZENS' PARTICIPATION IN IMPLEMENTING OPEN INNOVATION IN THE BULGARIAN PUBLIC SECTOR: AN EMPIRICAL VIEW

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Abstract: *The following article analyzes the role of digital technologies in the process of creating open innovation in the public sector in Bulgaria, focusing on the interaction between civil society and public institutions. The aim of the study is to examine how technologies support the creation and implementation of open innovation by including citizens in the different phases of the innovation process. To be more complete, traditional non-digital communication tools are also mentioned and discussed. The study is based on an empirical analysis of data from a survey among representatives of different levels of the public sector in Bulgaria. A mixed methodological approach was applied, combining quantitative and qualitative methods for assessing and analyzing citizen participation in innovative practices. The results achieved show that digital participatory platforms play an important role in increasing transparency, trust and citizen participation in open innovation processes. At the same time the administration in Bulgaria still relies on traditional communication tools, which are the offline public discussions with stakeholders. The main challenges that are highlighted are the low level of citizens' engagement, limited digital literacy among some social groups and the lack of a sustainable strategic framework for integrating technologies into governance. The study's conclusion emphasizes the need for more active policies to promote the use of digital communication tools in the public sector which are useful mechanisms for closer cooperation between state institutions and civil society in the innovation process*

Keywords: Open Innovation; Public Sector; Citizen Engagement; Digital Communication Tools; Digital Transformation.

AN OPTIMIZATION MODEL FOR ENERGY AWARE SERVER PROCUREMENT IN DATA CENTERS

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Abstract: *Efficient procurement planning is important for building an energy-efficient data center. However, with rapid technological advancements and con-strained IT budgets, acquiring data center equipment remains a challenging and costly endeavor. Data center managers must consider that server operating costs are directly linked to energy consumption. Sustainable equipment procurement requires evaluating costs from different suppliers, assessing performance based on multiple criteria, and aligning purchases with available budgets. Striking a balance between cost and performance remains an active research area. This paper presents an optimization model for server processors procurement in cloud data centers. The model incorporates different types of data center server processors, considering both power consumption and cost factors. A power consumption minimization model is then developed, incorporating budget constraints. Finally, a numerical example is analyzed to illustrate the model's application.*

Keywords: Data Center; Server Processor; Power Consumption; Procurement; Binary Programming Model.

ASSOCIATING PAID DIGITAL ADVERTISING WITH AI USAGE IN MARKETING AND SALES AMONG EUROPEAN SMES

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Abstract: *Digital transformation reshapes business models and processes through technology, and our research examines how companies' investments in digital advertising can lead to technological innovation, especially in small and medium-sized enterprises. We aim to examine whether investments in paid internet advertising are associated with higher adoption of AI in marketing and sales. Specifically, the study seeks to determine if SMEs that allocate more resources to digital advertising also show increased levels of AI integration, while exploring the potential moderating effects of firm size and time. Using Eurostat data from 21 countries for 2023 and 2024, we analyzed the percentage of firms using paid internet advertising and those using AI in marketing and sales. Our approach combined descriptive statistics, correlation, and multiple regression analysis with diagnostic checks. Results reveal a significant positive association: each percentage point increase above the mean in paid advertising corresponds to a 0.101 percentage point increase in AI adoption, with the model explaining 55.2% of the variance. These findings provide empirical evidence that strategic investments in paid digital advertising drive AI adoption in marketing and sales, accelerating digital transformation in SMEs.*

Keywords: Digital Transformation; Paid Advertisement; Artificial Intelligence.

ANALYSIS OF ADVERTISING RESULTS ON FACEBOOK (META) AND GOOGLE PLATFORMS ON GENERATED SALES FOR AN E-COMMERCE COSMETICS STORE

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Abstract: *Advertising on digital channels is an important tool for businesses to drive sales, especially on e-commerce platforms. Using a quantitative matrix mod-el, the paper wants to discover which of META and Google channels are the best advertising option for an online*

mono-brand cosmetics store, taking into consideration KPIs such as: Conversion Rate, Cost per Conversion and Re-turn on Ad Spent. The matrix's conclusion is that Google scored better on 2 out of the 3 KPIs and should further on be considered as an important channel for e-commerce purchases growth. The practical contribution of the paper encourages businesses and marketers to use the findings and adjust their media advertising budgets towards the most effective channel for selling objectives, especially if the advertising budgets are rather limited. As social media is also a key communication channel nowadays, marketers and businesses should have a more complex advertising model, including this channel (social media) in their marketing mix in order to target consumers in every step of the Consumer's Decision Journey.

Keywords: Advertising on Social Networks; Social Networks; Meta Advertising; Google Advertising; E-commerce.

THE EVOLUTION OF BUSINESS PROCESS AUTOMATION FROM INDUSTRY 1.0 TO HYPERAUTOMATION: A LITERATURE REVIEW

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Abstract: *Hyperautomation is a digital transformation strategy that involves the use of advanced technologies such as Artificial Intelligence (AI), Machine Learning (ML), or Robotic Process Automation (RPA) to intelligently optimize and automate complex processes within an organization. This paper analyzes the evolution of business process automation, starting from the early forms of mechanization during the Industrial Revolution to the innovative technologies of Industry 4.0 that have led to the conceptualization of hyperautomation. Through a literature review, the study highlights the impact of emerging technologies on operational efficiency, process optimization, and the digital transformation of organizations. The paper furthermore aims to provide a comprehensive framework for explaining the evolution of automation, presenting the key technologies involved, such as AI, ML, RPA, or IoT (Internet of Things). Moreover, this study explores the practical applications of hyperautomation across various industries, emphasizing its role in accelerating execution time, reducing errors, and improving overall productivity.*

Keywords: Automation; Hyperautomation; Artificial Intelligence; Machine Learning; Robotic Process Automation; Digitalization; Business Process Management.

ADDRESSING TECHNICAL DEBT THROUGH SCENARIO-BASED DEVELOPMENT: A COST-DRIVEN APPROACH

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Abstract: *The paper addresses a critical challenge in software development: the persistent gap between identifying technical debt (TD) and effectively managing it. Despite growing awareness of TD's impact, many organizations struggle to implement systematic approaches for its resolution. We believe this gap stems primarily from communication barriers and misaligned priorities among different roles within development teams. Through observations of over 30 software development teams across multiple organizations and a comprehensive literature review, we identified key organizational and communication barriers preventing effective TD management. Our research introduces a scenario-based development framework that creates a common language around technical debt by defining quantifiable cost-related metrics, including baseline development costs, TD resolution costs, and interest accumulation. These metrics establish a shared context that aligns business priorities with development realities. We validated the framework through a case study in a fintech organization, where partial TD resolution during database integration resulted in a 50% reduction in effort for subsequent integration work. Our approach demonstrates that effective TD management requires technical solutions, organizational alignment, and improved cross-functional communication. This framework helps reconcile diverse team perspectives and enables more informed decision-making around technical debt prioritization and resolution by providing concrete, measurable ways to evaluate TD's impact on specific functionalities.*

Keywords: Technical Debt Management; Cross-functional Communication; Scenario-Based Development.

A DUAL PERSPECTIVE ON THE 2023 ENERGY MIX ACROSS EU-27. K-MEANS VERSUS GMM CLUSTERING

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Abstract: *The energy mix agenda has always integrated a dynamic characteristic, being subject to existent resources, international trade, political programs, and regional priorities. Therefore, the energy production has changed significantly in the European space, especially in the context of the transition towards more environmentally friendly alternatives. Considering these aspects, a clear appraisal of the main energy resources used by the EU27 member states could prove to be useful in designing future priorities, as well as dedicated regional strategies. In order to construct an analytical framework for this scope, we have selected the most recent data series from Eurostat, namely the gross available energy in 2023. Regarding resource categorization, we have focused on the three types of fossil fuels: natural gas, oil, and solid fossils, completed by nuclear and renewable sources. From a methodological point of view, we have used two clustering algorithms, the K-Means and Gaussian Mixture Model, considering their potential to profile both the similarities, as well as discrepancies when it comes to the overall energy mix. As for the results, we have classified the 27 members into 7 and 6 clusters, identifying both outlier allocations, as well as several agglomerations of states. As a general insight, although fossil-fuel dependence (and especially petroleum) remains high, the share of renewables is gaining some dominance in the overall energy equation, an encouraging conclusion in the continental context of the green transition.*

Keywords: Energy Mix; Gaussian Mixture Model; K-means; Clustering; European Union.

URBANIZATION STRATEGIES IN THE 21ST CENTURY: EVOLUTION, COMPARISON AND ARGUMENTS FOR SATELLITE CITIES

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Abstract: *The increase in global population, the accelerated expansion and urbanization processes, along with the complex challenges that accompany these transformations, require the adoption of integrated urban development models that combine advanced digital technologies with principles of sustainability and resilience. The present research outlines the major recent strategic approaches (the intensification of urbanization in existing cities and the construction of smart cities from scratch) by synthesizing the advantages and disadvantages of these urbanization models. It proposes the hybrid model of satellite cities as a balanced solution that integrates urban modernization with sustainability, resilience, and socio-economic integration. This solution is based on the application of complexity theory in urban planning, supported by emerging technologies, while emphasizing the importance of interdisciplinary collaboration, smart mobility, technological innovation, and digital governance. Through flexible spatial planning and effective connectivity to large urban centers, satellite cities provide an ideal framework for piloting and adopting emerging technologies ranging from digital infrastructure and intelligent mobility to participatory governance and AI-assisted sustainability. This capacity to innovate without the constraints of traditional urban environments transforms satellite cities into transition hubs toward cognitive, adaptive, and regenerative cities, supported by multi-stakeholder decision support systems that incorporate Complex Adaptive Systems (CAS), emergent technologies and citizen-participation platforms. The article explores the evolution of these models, offers a strategic comparison, and argues why satellite cities may represent a more viable solution for a sustainable, resilient, and community-centered urban future—highlighting both vulnerabilities and opportunities in a world undergoing constant change.*

Keywords: Satellite cities; Sustainable Communities; Digital Governance; Smart Mobility.

TASK LOAD BALANCING IN THE VEHICULAR EDGE COMPUTING LAYER USING TRAFFIC PREDICTION

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Abstract: *Vehicular Edge Computing (VEC) enhances traditional edge computing by integrating computational resources within the vehicular environment, allowing vehicles to offload tasks to nearby Roadside Units (RSUs). However, as urban traffic grows, the distribution of workload across RSUs can become imbalanced, with high-congestion areas facing heavy computational demands while other regions remain underused. This paper addresses the task load balancing problem by implementing a future-aware resource orchestration strategy that employs the Seasonal AutoRegressive Integrated Moving Average with eXogenous regressors (SARIMAX) model to forecast traffic conditions. We determine the SARIMAX hyperparameters using an automated "auto-ARIMA" procedure. We assess the performance of SARIMAX predictions in both Monte Carlo and Rolling Forecasting scenarios using real vehicular traffic data from Bucharest, Romania, obtained through the HERE Traffic API. Furthermore, we present a new traffic dataset containing over 120 hours of street-level traffic data from Bucharest, which is publicly available on the Kaggle platform. The simulation results demonstrate the effectiveness of the proposed strategy in reducing task processing delays through proactive workload balancing, achieving a reduction of overloaded RSUs by over 60\% and a 20-25\% improvement in the Gini coefficient.*

Keywords: Vehicular Edge Computing (VEC); SARIMAX; Traffic Flow dataset; Task Offloading

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ECONOMIC EFFICIENCY AND SAFETY FOR ELECTRIC DELIVERY MONITORING SYSTEMS BY INTELLIGENT MODELS

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Abstract: *Continuity for an electric delivery network involves the electrical networks diagnosis of the technical condition for the electric equipment done by monitoring certain parameters, chosen in such a way as to provide concrete information about their technical condition. The difficulty consists in the fact that the data monitoring system of the network, the operating regimes, their geometric characteristics, and the buses power consumption are uncertain. Intelligent models take in account the uncertainty and the difficulties can be overcome using the fuzzy logic, implemented for the discrete failure events which often exists in the electric networks. The dependency of the electric devices is taken in account, and the system availability evolution is computed, leading to the economic efficiency measurable results evaluation. For a delivery power system case study, the model is implemented with the help of the power production/consumption data base. The eco-nomic damages due to the undelivered energy to the consumers, because of the operational discontinuity, are evaluated, for one year monitoring.*

Keywords: Delivery power networks; Safety monitoring; Intelligent models; Economic efficiency

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AUTOMATING VULNERABILITY DISCOVERY IN IOT DEVICES: A COMPARATIVE STUDY OF FUZZING TECHNIQUES

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Abstract: *With the explosive growth of the Internet of Things (IoT), security challenges have become more pressing than ever, which pushed automated vulnerability detection towards being a necessity more than a nice to have. Out of the large and diverse pool of security assessment techniques, fuzzing has proven to be a highly effective method for identifying vulnerabilities through injecting unexpected or malformed inputs into target systems. This approach has proven to be particularly useful for uncovering security flaws such as buffer overflows, memory corruption, authentication weaknesses, and protocol inconsistencies, all of which are issues that if left unchecked, could lead to serious exploits. However, IoT systems come with unique constraints, including limited resources and distinct attack surfaces, which affect the effectiveness of different fuzzing techniques. Traditional methods that rely on large, complex and expensive testbeds may not be well-suited for IoT devices with restricted processing power and memory or in projects with limited budget. This paper explores various fuzzing technologies and compares their attributes for identifying the right solution when it comes to securing IoT systems. Specifically, it examines coverage-based fuzzing, metamorphic fuzzing, concolic fuzzing, fingerprinting and machine learning-assisted fuzzing in detecting software vulnerabilities and protocol flaws. Additionally, this research considers the trade-offs between scalability, automation, and efficiency when applying these techniques to IoT firmware.*

Keywords: IoT Security; Fuzzing; Cybersecurity; Testing.

SUPPORTING HYBRID AND REMOTE LEARNING THROUGH VIRTUAL INFRASTRUCTURES INTEGRATED WITH CYBERQUEST AND RASPBERRY PI

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Abstract: *This article explores a VM-based architecture integrated with the CyberQuest security platform and Raspberry Pi devices. This solution supports hybrid and remote learning in educational institutions by offering flexibility and scalability. The study compares this approach with cloud services like AWS, Azure, and Google Cloud, focusing on advantages such as cost reduction, security, and demand management. The article also examines ongoing improvements like automated resource scaling and enhanced CyberQuest integration to future-proof educational IT infrastructures.*

Keywords: Cloud-based Learning; Virtualization; Virtual Machines; Scalable Infrastructure.

RELEVANT ARTIFACTS IN CYBER INVESTIGATIONS FOR HEALTHCARE INFRASTRUCTURES

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Abstract: *The increasing frequency of cyber threats has underscored the need for robust security measures in IT infrastructures, particularly within the healthcare sector. This paper explores the role of penetration testing in identifying vulnerabilities and assessing the impact of various security testing techniques—automated, hybrid, and manual—on a virtualized healthcare network. Through simulated attack scenarios, we analyze network behavior under vulnerability conditions, evaluating factors such as performance, resource consumption, and anomaly detection. Additionally, we investigate the broader landscape of cybersecurity threats targeting healthcare, referencing ENISA reports that rank healthcare among the top sectors affected by cyberattacks, particularly ransomware, DDoS attacks, and data leaks. By correlating these threats with security vulnerabilities in eHealth applications, we aim to provide insights into the need for robust cybersecurity measures. Finally, our study examines digital artifacts essential for cybersecurity investigations and their role in identifying attack vectors and system weaknesses. The conclusions drawn from*

our research emphasize the necessity of proactive security strategies, incident response measures, and regulatory compliance to protect healthcare infrastructures against evolving cyber threats.

Keywords: Cybersecurity; Healthcare; Public; Artifacts; Vulnerabilities.

ANALYZING GDPR COMPLIANCE IN IOT ECOSYSTEM WITH KEY DATA PROTECTION STRATEGIES AND INDUSTRY IMPACT

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Abstract: *The proliferation of Internet of Things (IoT) devices has revolutionized various industries by enabling unprecedented connectivity and automation. However, this surge in connected devices has also exposed vast amounts of personal data to potential security breaches, posing significant privacy risks. The General Data Protection Regulation (GDPR) has emerged as a crucial regulatory framework designed to address these concerns, ensuring the protection of personal data across the IoT ecosystem. This article provides an in-depth analysis of how GDPR principles, such as data minimization, user consent, and transparency, are integral to securing IoT devices and networks. It further explores effective data protection strategies, including encryption, anonymization, and the implementation of privacy by design and by default, to help organizations comply with GDPR requirements. Through case studies and examples, the article highlights the challenges faced by businesses in achieving compliance, particularly in sectors like e-commerce, healthcare, finance, and smart cities, each of which encounters unique privacy and security challenges. By exploring these complexities, organizations can not only mitigate legal and financial risks but also foster trust and safeguard user privacy in an increasingly interconnected world. Ultimately, this article emphasizes the critical role of GDPR in shaping the future of IoT security and the sustainable development of privacy-centric IoT solutions.*

Keywords: IoT; GDPR; Data Protection; User Consent; Data Security.

UAV-BASED SYSTEM FOR METHANE MEASUREMENT, ADVANCED MAPPING AND ANALYSIS OF POTENTIAL EMISSION SOURCE

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Abstract: *Methane (CH_4) is a potent greenhouse gas (GHG) with a significantly higher global warming potential than carbon dioxide (CO_2) over a 20-year period. Accu-rate detection and quantification of methane emissions are crucial for mitigating climate change and ensuring compliance with international regulations, such as the EU Methane Strategy and OGMP 2.0. Conventional methane monitoring methods, including ground-based sensors and satellite observations, often face limitations in spatial resolution, response time, and cost-effectiveness. This paper presents CH4SCOUT, a UAV-based system designed for real-time methane de-tection, quantification, and mapping. The system integrates high-sensitivity gas sensors, AI-driven emission source localization algorithms, and cloud-based ana-lytics to enhance monitoring capabilities. The UAV is equipped with autonomous flight navigation, obstacle avoidance mechanisms, and a controlled airflow sys-tem to improve measurement accuracy. Additionally, CH4SCOUT employs vari-ous modeling techniques to optimize emission detection and provide precise spa-tial analysis. This research underscores the technological advancements and poli-cy implications of CH4SCOUT while highlighting future directions in autono-mous methane monitoring, AI-driven predictive modeling, and multi-sensor UAV integration. The findings indicate that UAV-based solutions have the po-tential to transform methane monitoring, supporting global climate initiatives and industry sustainability efforts.*

Keywords: Methane Detection; Environmental Monitoring UAV; 3D Mapping.

OPTIMIZING PERFORMANCE IN MODERN PROGRAMMING LANGUAGES THROUGH COMPILED LAMBDA EXPRESSIONS

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Abstract: *Dynamic object instantiation is a common requirement in modern software systems, especially in environments where flexibility and runtime decisions are paramount. In the .NET, developers have traditionally relied on reflection-based techniques such as standard reflection and the methods from the System.Activator static class to create objects at runtime. More recently, the advent of lambda expressions and their ability to be compiled into efficient delegates has opened new avenues for optimization. This paper investigates the performance impact of using compiled lambda expressions compared to standard reflection, Activator.CreateInstance, and Reflection.Emit. Through a series of experiments—including warm-up versus steady-state tests, parameterized constructor instantiation, and multi-threaded executions—we demonstrate that compiled lambda expressions consistently deliver superior performance in many contexts. Our results show that while traditional reflection methods incur significant overhead (with average execution times of ap-proximately 135–140 ms for one million instantiations), compiled lambda expressions and Reflection. Emit offer near-instantaneous instantiation (around 6–8 ms in single threaded environment, and 2.5ms in multi-threaded environment). The implications of these findings are critical for developing high-performance, scalable applications in .NET*

Keywords: Lambda expressions; Reflection; Intermediate Language.

OPTIMIZING EDGE COMPUTATION: A LIGHTWEIGHT FRAMEWORK FOR LOW-POWER IOT DEVICES

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Abstract: *Even though Moore's law relevance in today's world is a highly debated topic, we can't deny the significant increase in computational power observed in affordable low-powered devices. Commodity hardware such as the Broadcom BCM2712 System-on-a-Chip which is powering the Raspberry Pi 5 is outperforming 15-year-old desktop class CPUs while only using a fraction of the power. This prompted a paradigm shift in the Internet of Things (IoT) world, moving away from relying entirely on cloud computing to performing*

as much of the computations on-device and on devices that are close by, thus marking the start of the edge-fog-cloud topology. Most edge computing platforms in the market have converged to using a containerization approach for scheduling workloads on edge devices which offers a great deal of flexibility by abstracting away the underlying platform but introduces CPU and memory overhead in an already resource-constrained environment. This paper aims to build on top of prior art introduced by the novel OpenEdgeCompute Framework [1] which is leveraging a simple orchestrator-worker pattern. We will perform a deep dive into the inner workings of the worker and its interactions with the orchestrator; additionally, we will analyze different design decisions that were made during the implementation phase such as the choice of a message passing interface or key abstractions needed to hide the implementation details from the outer world. To measure its effectiveness, we will benchmark the proposed solution using a simple echo application against a control edge computing framework that's using containerization and capture key metrics such as cold boot times of the worker, end-to-end time for a cold-booted worker to process a request, CPU utilization and memory consumption.

Keywords: Edge computing; Internet of Things; Low powered devices; Cloud computing; Fog computing.

DIGITAL SIGNATURE: LEGAL RECOGNITION, SECURITY CHALLENGES, AND OPTIMIZATION TECHNIQUES

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Abstract: *The electronic signature is an advanced technology used for the authentication of digital documents, providing guarantees of authenticity, integrity, and non-repudiation. In the European Union, the eIDAS regulations define three types of signatures: simple, advanced, and qualified, each with distinct applicability and legal value [1]. In Romania, national legislation, such as Law 455/2001 and Emergency Ordinance 38/2020, ensures compliance with the use of digital signatures. This technology employs cryptographic techniques based on public and private key pairs, serving as an essential tool for digital efficiency in interactions with public and private institutions. However, there are cybersecurity risks, such as the theft of cryptographic keys or phishing attacks. These risks can be mitigated through advanced security measures, education, and the continuous updating of technological infrastructure.*

Keywords: Digital Signature; Encryption; Legislation; Cybernetic Attacks.

BLOCKCHAIN INTEGRATION IN TRUST SERVICE PROVIDERS: TRENDS, CHALLENGES, AND FUTURE DIRECTIONS

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Abstract: *The services provided by Public Key Infrastructure (PKI) have become indispensable mechanisms for information security and supporting the widespread adoption of digitalization, through secure authentication of entities and digital signatures. These mechanisms provide essential security properties such as the integrity, confidentiality, and authenticity of data. As digitalization continues to evolve, PKI plays a crucial role in facilitating the adoption of a safer and more efficient digital system, where identity validation and electronic signatures are fundamental processes. Nevertheless, traditional systems currently in use also come with disadvantages and potential vulnerabilities that can be exploited by attackers. The main drawbacks include the presence of a single point of failure represented by the Certificate Authority (CA) or a Qualified Time Stamping Authority (QTSA), as well as the lack of transparency in the processes of managing digital certificates and issuing qualified timestamps. Integrating an emerging technology such as blockchain within traditional PKI provides additional layers of security, such as transparency, immutability, and decentralization, thereby eliminating the existence of a single point of failure. In this paper, we analyze the integration of blockchain technology within the services provided by a Trust Service Provider (TSP) from the perspectives of security, availability, and interoperability. Starting from the current security mechanisms within the PKI and the potential vulnerabilities, we conducted a study highlighting the need for blockchain integration to address these shortcomings. In our analysis of blockchain-based PKI solutions, we also identified challenges regarding blockchain integration into traditional PKI, such as lack of interoperability and challenges in aligning with existing cryptographic standards and legislation.*

Keywords: Blockchain; Trust Service Providers; Trust services; PKI.

ZKFLAG: A PRIVACY-FIRST, OPEN-SOURCE PLATFORM FOR FEATURE FLAGS USING ZERO-KNOWLEDGE PROOFS

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Abstract: *Feature flags are essential for agile and robust modern application development, enabling rapid experimentation and controlled feature rollouts. However, conventional feature flag management platforms can pose privacy risks by exposing sensitive user data. In this paper, we introduce ZKFlag, an open-source platform that delivers feature flags management as a service while preserving user privacy. At the core of ZKFlag is the use of zero-knowledge proofs, which ensure that sensitive data remains confidential without compromising functionality. We detail the platform's architecture, key functionalities, and security properties. We demonstrate that ZKFlag offers equivalent integration ease to popular solutions while outsourcing platform management while providing a high level of security. By leveraging advanced cryptographic techniques, ZKFlag creates an agile and secure environment for modern software development.*

Keywords: Toggle Flags; Feature Flags; Zero-Knowledge Proofs; Cloud Services.

ARDL INSIGHTS INTO FINANCIAL CONTAGION: ASSESSING THE IMPACT OF CRUDE OIL AND BITCOIN ON EUROPEAN BANKS

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Abstract: *This study investigates the dynamics of financial contagion within the European banking sector, focusing on Erste Bank International (EBS) and its interactions with Raiffeisen Bank International (RBI), OTP Bank (OTP), crude oil prices (CL) and Bitcoin (BTC) over the period 2015-2023, using daily price data collected from Yahoo Finance. Utilizing the Autoregressive Distributed Lag (ARDL) model and error correction mechanisms, we explore both short-term impacts and long-term relationships among these variables. Data were extracted from Yahoo Finance, ensuring a comprehensive over-view of market coverage. The results show strong interdependencies, while CL, RBI, and OTP significantly influencing EBS stock in the short term. BTC's impact, while present, is more complex, reflecting the evolving role of digital assets. The error correction model confirms a solid adjustment toward long-term equilibrium. Residuals are centered around zero, with Jarque-Bera test indicating normality, supporting the model's robustness. The low standard deviation further reflects consistency. This research contributes to under-standing financial contagion mechanisms, highlighting how traditional market indicators and emerging digital assets influence stock performance within the banking sector. It offers valuable insights for investors, policymakers, and regulators aiming to better understand and manage the complexity of today's interconnected financial systems.*

Keywords: Financial Contagion; ARDL; Financial Market; Bitcoin; Crude Oil; EU's core-periphery model

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MAPPING THE EVOLUTION OF FUZZY REAL OPTIONS AND DECISION-MAKING: A BIBLIOMETRIC ANALYSIS

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Abstract: *This study provides a comprehensive bibliometric analysis of scientific literature on fuzzy real options and decision-making under uncertainty. The dataset was extracted from the Scopus database, covering publications between 1982 and 2024. A total of 185 documents from 117 sources were analyzed using the bibliometrix package and the biblioshiny interface in RStudio, al-lowing for both quantitative and qualitative insights. The annual scientific production shows a growing trend, especially after 2010, with a significant increase in recent years. The co-occurrence network and keyword analysis revealed that the dominant research themes are "fuzzy decision making", "real options", and "fuzzy pay-off methods". Key contributors include authors such as Collan M., Yüksel S., and Dinçer H., with relevant outputs concentrated in journals like "Journal of Intelligent and Fuzzy Systems" and "Fuzzy Sets and Systems". Factorial analysis identified clusters focused on fuzzy set theory, decision models, and optimization strategies. International collaboration is significant, with 26.49% of publications involving cross-country authorship. This analysis contributes to a deeper understanding of the evolution, structure, and interdisciplinary relevance of fuzzy real options research in complex decision environments.*

Keywords: Fuzzy real options; Decision-making under uncertainty; Fuzzy decision-making; Bibliometric analysis.

EXPLORING THE INNOVATION CLAUDIA CURVE AND LOAD CAPACITY UTILIZATION IN FINLAND: AN AUTOREGRESSIVE DISTRIBUTED LAG APPROACH

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Abstract: *This study investigates the existence of the Innovation Claudia Curve (ICC) in Finland by examining the nonlinear relationship between foreign direct in-vestment (FDI), GDP per capita, renewable energy consumption (REN), and natural resource rents (NRR) on the load capacity factor (LCF) during the period 1990 – 2022. Using the Autoregressive Distributed Lag (ARDL) approach, the analysis confirms the ICC hypothesis, highlighting a U-shaped nonlinear impact of FDI on environmental efficiency. The results suggest that innovation and renewable energy act as stabilizing forces in the economic, ecological system, while excessive FDI and economic expansion can initially disrupt load capacity utilization. These dynamics reflect the behavior of a complex adaptive system, aligning with the principles of economic cybernetics, were feedback loops and delayed effects shape long-term sustainability outcomes.*

Keywords: Innovation Claudia Curve; Load Capacity Factor; Economic Cybernetics; Environmental Efficiency.

A BIBLIOMETRIC ANALYSIS OF EVACUATION SIMULATION RESEARCH: TRENDS, COLLABORATION, AND THEMATIC EVOLUTION (2002–2024)

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Abstract: *Evacuation simulation has emerged as a crucial research area intersecting disaster management, safety science, and computational modeling. This study conducts a bibliometric analysis of 166 scientific articles retrieved from the Web of Science Core*

Collection, selected based on the presence of the phrase "evacuation simulation" in their titles. The analysis spans publications from 2002 to 2024, capturing two decades of scholarly output. Using bibliometric tools such as Bibliometrix (R), the study investigates publication trends, prolific authors, dominant sources and international collaboration patterns. Network visualizations and thematic maps provide insight into the intellectual, social, and conceptual structure of the field. The findings highlight a growing interdisciplinary interest in evacuation simulations, with increased integration of agent-based modeling, artificial intelligence, and GIS applications in recent years. This work offers a comprehensive overview of how the field has developed and outlines emerging themes. It is intended to serve as a valuable reference for researchers, practitioners, and policymakers involved in emergency planning and simulation modeling.

Keywords: Evacuation Simulation; Bibliometric Analysis; Trend Analysis.

PRE-TRAINED NEURAL NETWORKS USING SYNTHETIC DATA FROM GENERALIZED HERMITE PROCESSES FOR TIME SERIES PREDICTION

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Abstract: *Generalized Hermite Processes (GHP) have been used to model financial systems analytically. Nevertheless, their potential uses in machine learning applications have been less studied. By varying the parameters of the GHP, mainly the Hurst exponent and the degree of the Hermite polynomial, different realization paths can be simulated using software exhibiting different roughness and memory patterns. We sample these paths and pre-train an LSTM neural network on them for different numbers of epochs. Then, the model is presented with domain data in three contexts: zero-shot, one-shot and fine-tuned on the domain data for 10 epochs, and the fit is assessed using sequential 5-fold cross-validation for three different financial time series data sets with different provenance and characteristics. The approach is promising as the pretrained models show surprisingly good fit even for the zero-shot context. For two of the datasets, the approach outperforms the baseline model trained directly on the domain data by a significant margin, and further fine-tuning improves fit up to a point, while on the third dataset the reference model outperforms the proposed approach by a small margin, with further fine-tuning unable to close the error gap. The experiments show the applicability of using synthetic data obtained from GHP to pre-train neural networks for time series regression problems.*

Keywords: Generalized Hermite Process; Transfer Learning; Time Series Regression; Pre-training; Fine-tuning; LSTM.

RANKING UE HAPPINESS: TOPSIS AND VIKOR CLASSIFICATION

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Abstract: *This study ranks EU member states based on indicators designed to assess happiness, leveraging six key variables from the 2023 World Happiness Report: GDP per capita, social support, healthy life expectancy, freedom to make life choices, generosity, and perceptions of corruption. Using two multi-criteria decision-making methods, TOPSIS and VIKOR, the research highlights significant geographical disparities, with northern and western EU countries reporting higher happiness levels compared to southern and eastern regions. Notably, Finland, Romania, and Lithuania exhibited discrepancies between self-reported happiness and the results derived from the six variables. The findings emphasize that happiness is a dynamic metric, influenced by evolving life circumstances, technological advancements, and societal shifts toward emotional awareness and life prioritization. The VIKOR meth-+od demonstrated greater alignment with self-reported happiness rankings, validated by error analysis using RMSE and MAE. This research underscores the complexity of measuring happiness and provides valuable insights for policymakers and academics aiming to enhance well-being across diverse contexts.*

Keywords: Happiness; Sustainable Development; TOPSIS; VIKOR

ASYMMETRY OF OIL MARKET VOLATILITY INFLUENCE ON ECONOMIES OF OIL EXPORTING COUNTRIES

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Abstract: *In this research paper we investigated whether economies that have a high degree of crude oil dependence due to using it as their main source of income can remain stable in the long run even after facing global crises and economic changes. We attempted to quantify the impact of Oil Market on the variation of GSP/Capita and Current Account Balance for five selected countries, using generalized regression models. Different non-linear regression models are proposed for the GDP per capita for Oman, Qatar, United Arab Emirates, Kuwait, and Saudi Arabia. The models were tested using the values of economic indicators (Brent Spot Oil Price, Word Oil Demand and Supply, Exports of services and goods, Oil rents and Inflation) from 2000 to 2021, by mean of generalized regression analysis. Precedent studies focused on linear regression or vector autoregressive approaches for testing the dependence of an economic indicator to a volatile variable. Our approach centered on non-linear models with a high accurateness of prediction.*

Keywords: Oil market volatility; GDP per Capita; Non-linear regression; Current Account Balance.

CIRCULAR ECONOMY AND THE IMPLEMENTATION OF THE GREEN SUPPLY CHAIN. AN ANALYSIS OF THE IMPLICATIONS ON THE ACTUAL ECONOMY

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Abstract: *This paper explores the impact of circular economy and the implementation on large scale of the green supply chain concept, highlighting the implications over sustainability, durable development and economic performance. In the actual context of a sustainability-oriented market, integrating green supply chains solutions is no longer a choice but a constraint supported by directives and standards that are adopted internationally. Using a*

quantitative approach, the research underlines the correlation between the implementation of circular economy and the performance upgrade of the supply chain, demonstrating the impact of these factors on economic and ecologic sustainability and it is developed on two pillars: the first, company-based, applying a neuronal network prediction model and regressions in order to assess the effects of blockchain implementation, while the second uses time series to observe the elements of green supply chain using the VAR analysis. The results suggest that the adoption of the green supply chain significantly contributes to the reduction of the negative environmental impact, while offering competitive advantages for the enterprises and assuring their adheration to the energetic performance standards. As can be expected, the research is not exhaustive, and it depends on the availability of data and the constant informational update of the interest elements on the chosen subject.

Keywords: Sustainability; Green Supply Chain; Circular Economy.

QUANTUM-INSPIRED OPTIMIZATION AND PROBABILISTIC APPROACHES FOR PREDICTING FINANCIAL MARKET CRASHES: A COMPARATIVE STUDY

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Abstract: *In recent years, the accurate prediction of financial market crashes has attracted considerable research interest due to its critical implications for economic stability and portfolio management. This paper presents an advanced methodology for predicting market crashes identified as dips in the S&P 500 Index, utilizing logistic regression optimized through two sophisticated algorithms: the Classical Bat Algorithm (CBA) and its quantum-inspired counterpart, the Quantum Bat Algorithm (QBA). The study uses economic indicators—Gold, the US 10-Year Treasury Yield, and the Volatility Index (VIX)—due to their established correlation with market volatility. While the CBA provides a robust framework by emulating echolocation behavior for solution optimization, the QBA integrates quantum computing principles such as superposition and quantum interference to enhance its exploratory efficiency and convergence capabilities. Furthermore, theoretical advancements from recent research on quantum-inspired optimization methods, including quantum annealing and quantum neural networks, suggest significant potential for these models to improve predictive performance by efficiently navigating complex optimization landscapes. Probabilistic modeling techniques, such as Bayesian neural networks, are also theoretically explored to address uncertainty and reduce false positives in crash predictions. Additionally, logical structures inspired by classical and quantum computational frameworks are considered to enhance interpretability and transparency of decision-making processes within the models. The results illustrate that quantum-inspired algorithms like QBA not only modestly outperform classical approaches but, when integrated with advanced theoretical perspectives, promise substantial improvements in the precision, interpretability, and reliability of market crash predictions.*

Keywords: Bat Algorithm; Market Crash; Quantum-inspired.

A BIBLIOMETRIC ANALYSIS OF THE BIBLIOMETRIC PAPERS IN TRANSPORTATION SECTOR

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Abstract: *The transportation sector stands as one of the most representative industries of each country's economy, companies and government focusing on facilitating the flow of goods, services and people in an efficient and effective manner. In Europe, the transport sector represents approximately 5% of gross domestic product (GDP), with over ten million employees. In recent years, the domain promoted sustainable development, in order to minimize the greenhouse gas emissions, focusing on alternative transportation methods or fuels. The scope of the research is to investigate the bibliometric papers on the transportation sector, that have been extracted from the ISI Web of Science database. The research points out the main trends and developments that have been discussed by the academic community, identifying the most representative authors, journals, affiliations, countries and keywords. A re-view of the top five most cited papers will be performed, in order to under-stand the main themes and methods discussed by researchers, together with the presentation of the most representative thematic and unigrams used in abstract. The outcome of the paper stands as a starting point for a future search for policymakers, researchers or stakeholders.*

Keywords: Transportation; Industry; Bibliometric.

ENHANCING FINANCIAL AUDITING WITH MACHINE LEARNING: SVM-BASED ANOMALY DETECTION IN GENERAL LEDGER DATA

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Abstract: *A key aspect of transparent company operations is accurate bookkeeping data. To assure the accuracy of financial statements, new technologies and algorithms must be developed to handle the extremely complicated and time-consuming work of financial auditors. The detection of financial misstatements regarded unusual in general ledger (GL)*

data is a ongoing issue in accounting. Due to growing data volumes, commonly utilized approaches like random sampling and human inspection of bookkeeping rules are currently difficult and unreliable, hence machine learning (ML) algorithms must be used for identifying data anomalies. In standard audits, most proposed methods are used to analyze a relatively stable population of journal entries over a financial quarter or year. The current paper explores a system architecture based on support vector machine (SVM) for implementing real-time anomaly detection in accounting journal entries.

Keywords: Anomaly Detection; SVM; Machine Learning; Accounting

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LSTM DEEP LEARNING NETWORK APPLIED TO STOCK MARKET

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Abstract: *This study explores the use case of Long Short-Term Memory (LSTM) deep learning network architecture applied to stock market price forecasting. Long Short-Term Memory models, known for their ability to capture long-term dependencies in sequential data, are particularly suited for handling the non-linear and dynamic relations present in financial time series. For this case study, a model has been trained using Apple's historical data of daily transactional prices and volumes, two technical indicators used in trading strategies, and macroeconomic data for the United States of America. After testing several architectures using the Bayesian-based search method, the results indicate that LSTM models can effectively model complex market behavior using the right architecture for each use case. This work contributes to the evolving field of financial analytics using modern data science methods by highlighting the potential of deep learning approaches in the volatile context of stock markets.*

Keywords: LSTM; Deep Learning; Stock Market; Price Prediction.

ROMANIAN NEWS ARTICLE CLASSIFICATION: A MULTI-MODEL COMPARISON WITH CLASS BALANCING

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Abstract: *This paper presents a comprehensive analysis of text classification techniques for automating news categorization in a Romanian television station. We constructed an original dataset of approximately 24,000 labeled news stories collected from the station's media asset management system over a 15-month period. Our research evaluates the*

performance of seven supervised machine learning classification algorithms: Multinomial Naive Bayes, Support Vector Machine, Logistic Regression, Random Forest, XGBoost, k-Nearest Neighbors, and Multi-Layer Perceptron, combined with three feature extraction methods: TF-IDF, CountVectorizer, and HashingVectorizer. We tested these combinations on both the original imbalanced dataset and a balanced version created using random oversampling. Results demonstrate that balancing the dataset significantly improves classification performance across all models. On the balanced dataset, Random Forest and Multi-Layer Perceptron achieve near-perfect performance regardless of the feature extraction technique employed. The study reveals that while feature extraction choice notably impacts performance on imbalanced data, these differences become minimal after balancing. Our findings offer valuable insights for building automated news categorization systems for Romanian content, demonstrating that established NLP techniques can be effectively applied to this less-resourced language with appropriate preprocessing and balancing methods. This approach could allow news organizations to save time and resources while improving categorization consistency.

Keywords: Supervised Machine Learning; Text Classification; Class Imbalance; Oversampling; Romanian Language Processing

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AI-BASED AUTOMATED WEB APPLICATION TESTING

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Abstract: *The evolution of web technologies and the increasing complexity of digital systems have transformed web application testing into an indispensable component of software quality assurance. Although traditional automated testing frameworks – based on scripting and static data – are effective in many scenarios, they face difficulties in terms of scalability, adaptability and maintainability of dynamic interfaces and complex interactions. In recent years, Artificial Intelligence (AI), especially through the use of large-scale linguistic models (LLMs) and reinforcement learning, has opened up new opportunities for improving test coverage, efficiency and autonomy in functional testing. AI-assisted tools can automatically generate relevant test data, simulate realistic user behaviors and detect anomalies without extensive human intervention. This paper provides a comparative analysis between traditional and AI-assisted methods for functional testing of web applications, providing a synthesis of recent academic and industrial research. Key benefits of AI-based testing include rapid test generation, increased functional coverage, and increased adaptability. However, there are challenges related to transparency, integration into CI/CD processes, and validation in industrial environments. The paper aims to support QA professionals and*

researchers in understanding the current circumstances of web application testing and making informed decisions regarding the adoption of intelligent automation tools.

Keywords: Web applications; Functional and non-functional testing; Test automation; Artificial Intelligence; Machine Learning; AI-assisted testing; Open-source tools.

MARKET VOLATILITY PREDICTION UNDER POWERFUL GEOPOLITICAL EVENTS. A CASE STUDY ON THE LATEST EUROPEAN CONFLICT

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Abstract: *This study investigates the impact of geopolitical events on the volatility dynamics of Ukrainian financial markets amid the Russia-Ukraine conflict. It analyzes historical price data of key indices and companies, including the PFTS Index, Kernel Holding S.A., MHP SE, and Ukrnafta by computing volatility using rolling window measures and technical indicators such as ATR, PSO, and Bollinger Bands. A bidirectional LSTM model is employed to integrate these indicators, enabling the capture of temporal dependencies in both directions and yielding high predictive accuracy. The findings reveal distinct, asset-specific volatility patterns, providing valuable insights for risk assessment and strategic investment decisions in times of geopolitical uncertainty.*

Keywords: Geopolitical Instability; Volatility; Moving Time Periods; ATR; PTO; Bollinger Bands; Bi-LSTM.

A SOLUTION TO UNIVERSITY COURSE TIMETABLING PROBLEM USING GENETIC ALGORITHMS

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Abstract: *This paper presents the use of genetic algorithms to solve the problem of scheduling university courses in the Romanian institutions, problem named shortly University Timetabling. This timetabling involves the allocation of courses, seminars, and laboratories to specific classrooms, with the objective of minimizing students' idle time. At the university, activities are divided in two semesters, each semester having a certain number of subjects. For each subject we have a theoretical activity (a course) and a practical activity (seminar or laboratory). The courses are held with students from an entire year of study, the seminars with a group of students (each year of study being divided in groups), and the laboratories at the semi-group level. The algorithm uses a set of rules for room allocation so, larger classrooms are used for lectures, smaller ones for seminars, and certain rooms with special equipment for laboratories. If it is necessary, the classrooms can be interchanged depending on the teacher's or students' needs. The presented algorithm is implemented in Java programming language, it uses a MySQL database, and for the data display we have chosen a web interface.*

Keywords: Genetic Algorithms; Timetabling; Metaheuristics; Optimization; Constraints.

UNVEILING IT JOB MARKET SENTIMENT AND TRENDS: A REDDIT-BASED STUDY USING SENTIMENT ANALYSIS AND NAMED ENTITY RECOGNITION

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Abstract: *Characterized by a constantly evolving landscape, the IT industry has encountered numerous challenges over the years. From the profound disruptions caused by the COVID-19 pandemic to the pressures exerted by the rapid evolution of artificial intelligence, this*

sector has undergone substantial trans-formations, many of which have directly impacted the professionals within it. These shifts have not only redefined operational paradigms but also reshaped the workforce, needing continuous adaptation and resilience among those involved. This study conducts a complex investigation of IT job postings on Reddit to identify labor market trends, evaluate employee sentiment, and examine how job titles correlate with sentiment scores. Through web scraping with Python's PRAW library, approximately 7,000 IT-related job posts from 2024 were collected, for which VADER was applied for sentiment assessment, complemented by a Named Entity Recognition (NER) model enhanced with cosine similarity to extract relevant IT job titles. Additionally, Latent Dirichlet Allocation (LDA) topic modelling uncovered five key thematic clusters within these discussions: Interview and Hiring Logistics, Application Mechanics and Follow-Up, Technical Skill Development, Compensation and Career Growth, and Team Dynamics. The findings reveal significant sentiment variations across job roles, with software engineering positions being the most frequently discussed but receiving mixed reactions. Managerial roles exhibited lower sentiment scores, reflecting workplace challenges, while technical specialist roles generally held positive perceptions. The study provides valuable insights for HR professionals, job seekers, and industry analysts by highlighting sentiment patterns and key discussion topics shaping the IT job market.

Keywords: Reddit data mining; Job Satisfaction; IT labor market.

APPROACHES TO OPTIMIZING TRAFFIC MANAGEMENT

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Abstract: *Traffic management is an essential dimension of the Smart City concept. The paper proposes a method to integrate AI to support efforts related to optimizing traffic management. It is a phase of a complex research project whose general objective is to define a general AI-based system for urban traffic management. A key component in this direction is the simulation of reality, which can be used to train, experiment, and evaluate the results of various AI models over the simulation. The Research Methodology consisted of consulting and studying specialized scientific and technical literature regarding the area of interest, formulating work directions following each current research stage of the proposed topic, determining and analyzing experimental data, and interpreting and assessing the results. Using the type of simulation proposed, various scenarios can be analyzed for each type of intersection. The decisions made by the trained model in multiple situations that in the real world can be disruptive or lead to congestion can be studied. At the same time, the information needed for each model can be evaluated to achieve higher levels of efficiency both at the level of a single intersection and the effects on the entire intersection network. That also improves the feature engineering optimization and permits the study of the behavior when used in addition to any other possible relevant quantities like meteorology information and historical data about city behavior. Another scenario that can be studied is*

the green wave needed for emergencies, authorities, and disaster scenarios. This approach has the significant advantage of being used for research purposes even when very few real data sources are available. It also allows the definition and study of complex networks of AI agents with decision-making or execution roles, significantly helping the implementation of advanced traffic management systems in the real world.

Keywords: Optimization; Traffic Management; Machine Learning; Artificial Intelligence.

DEALING WITH IMBALANCED DATA FOR LOAN DEFAULT PREDICTION: A COMPARATIVE STUDY ACROSS BALANCING TECHNIQUES FOR CNN, LSTM, RF, AND SVM MODELS

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Abstract: *Loan default prediction is a critical challenge for financial institutions. On one hand, misclassifying high-risk borrowers can severely impact liquidity and solvency, and on the other hand, it may negatively impact the connection with good clients and ultimately lead to bad results. This study proposes a complete preprocessing framework that combines bootstrapping and random under-sampling to address the inherent class imbalance in credit datasets. Minority-class instances are replicated through bootstrapping, and the over-representation of non-default cases is reduced via under-sampling. The resulting training set be-comes more balanced, which enables models to better capture rare default patterns. We evaluate this approach using various machine learning models, including deep learning architectures (CNN and LSTM), support vector machines (SVM), and Random Forest (RF). The results are assessed through key evaluation metrics for imbalanced data classification, such as the F1 score and ROC AUC, which demonstrate that our sampling techniques significantly enhance the performance of the models. The findings underscore the ability of the proposed preprocessing strategy to mitigate class imbalance in training sets and open promising directions for future research, including the integration of swarm intelligence optimization techniques for further model enhancement.*

Keywords: Loan Default Prediction; Imbalanced Data; Bootstrapping; Under-sampling; SVM; RF; CNN; LSTM.

ASSESSING THE STATIC MALWARE ANALYSIS CAPABILITIES OF LARGE LANGUAGE MODELS

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Abstract: *Recent advancements in artificial intelligence, particularly large language models, have demonstrated exceptional growth trajectories, exceeding all prior expectations and benchmarks across a variety of domains, including humanities, mathematics, computer science and others. Their rapid evolution has facilitated widespread adoption for usage in both mundane applications and complex problem-solving scenarios. Within computer science, these systems have been hailed as the next evolutionary step, demonstrating efficiency in low to moderate difficulty tasks, and sometimes even advanced ones. Thanks to these results, it led to workforce displacements in certain sectors. However, their capabilities remain inadequately evaluated in high-complexity context, specifically within the cybersecurity ecosystem. This study aims to examine the performance of three prominent large language models in malware analysis. The methodology focuses solely on static malware analysis, employing a custom file parser designed to extract comprehensive metadata in conjunction with industry standard tools. All the data is then fed into the selected systems to evaluate their performance and efficacy in this context.*

Keywords: Malware Analysis; Artificial Intelligence; Large Language Model; Parser.

EMPLOYEE SATISFACTION IN AI-DRIVEN WORKPLACES: A SENTIMENT ANALYSIS OF GLASSDOOR REVIEWS

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Abstract: *The rapid integration of artificial intelligence (AI) has transformed workplace dynamics and employee experiences, yet its impact on employee satisfaction remains underexplored. This study investigates satisfaction levels among AI professionals by analyzing 1,500 Glassdoor reviews using a mixed-methods approach. While prior research has emphasized AI's economic and technological effects, the nuanced relationship between quantitative ratings and narrative sentiment has not been fully examined. To address this gap, we explore three central questions: (1) How do key satisfaction dimensions-such as work/life balance, culture & values, diversity & inclusion, career opportunities, and*

compensation & benefits-contribute to overall employee perceptions? (2) What is the relationship between free-text sentiment and numerical ratings? (3) How do these sentiments evolve over time? Quantitative analysis using R revealed high overall satisfaction (average stars rating of 4.24), with all dimensions scoring favorably except for senior management, which lagged at 3.94. Complementary sentiment analysis using Python's TextBlob showed that 80.7% of reviews exhibited positive sentiment, reinforcing the numerical findings. These results highlight the need for balanced organizational improvements, particularly in leadership practices, to sustain employee satisfaction. The study contributes to the literature by providing comprehensive insights into employee sentiment in AI-driven environments, offering practical implications for both researchers and industry practitioners.

Keywords: Artificial Intelligence; Employee Sentiment; Glassdoor Job Reviews

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ASSESSING THE TRUSTWORTHINESS OF LARGE LANGUAGE MODELS: A TWO-STAGE FRAMEWORK USING RAGAS AND LLAMAINDEX

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Abstract: *Large Language Models (LLMs) have rapidly advanced the field of natural language processing, enabling applications ranging from chatbots and virtual assistants to scientific research and education. Despite their impressive generative capabilities, a pressing concern remains: how trustworthy are these models when it comes to delivering accurate, contextually grounded information? This paper addresses this challenge by evaluating the trustworthiness of LLMs through a dual approach that leverages LlamaIndex for retrieval-augmented generation (RAG) and RAGAS for systematic performance evaluation. We investigate three LLMs - LLaMA 3 (Groq), Mistral-7B-Instruct (Together.ai), and GPT-4o-mini (OpenAI) - and compare their ability to retrieve, interpret, and generate accurate answers grounded in external data. Using a subset of the neural-bridge/rag-dataset-12000, we conduct a detailed, metric-driven evaluation. The results demonstrate that while GPT-4o-mini leads in most trustworthiness dimensions, LLaMA 3 exhibits strong competitiveness as an open-weight alternative. Mistral, though promising, falls short in certain key areas of contextual grounding and correctness.*

Keywords: Retrieval Augmented Generation; LlamaIndex; Trustworthiness

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BERTWEETRO: NLP EXPERIMENTS ON ROMANIAN SOCIAL MEDIA TEXTS

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Abstract: *The introduction of Transformers has revolutionized NLP due to their ability to better "understand" the meaning of texts. These models are created (pre-trained) in a self-supervised manner on large scale data to predict words in a sentence but can be adjusted (fine-tuned) for other applications. Initially, these models were created using literary texts but very quick the need to process social media texts appeared. These texts have some problematic characteristics (they are short, informal, filled with typos, etc.) which means that a standard BERT model will have issues on this type of input. Thus, dedicated models need to be pre-trained on microblogging content and many have been developed in international languages. For under-represented languages, like Romanian, this is more difficult to achieve due to the lack of open-source resources. In this paper we present our efforts in pre-training from scratch 8 BERTweetRO models, based on RoBERTa architecture, with the help of a Romanian tweets corpus. To evaluate our models we fine-tune for Sentiment Analysis (with 3 classes) and compare them against Multilingual BERT plus several other popular classic and deep learning models. We couldn't find any useful Romanian datasets labeled with sentiments, so we use an automatic translation service to translate an English one to Romanian and confirm the validity of this approach by testing our models on real life tweets. We include a commercial solution in this comparison and show that some BERTweetRO variants and almost all models trained on the translated data have a better accuracy than the commercial solution. Our best BERTweetRO variants place second after Multilingual BERT in most experiments, which is a good result considering that our Romanian corpus used for pre-training is relatively small, containing around 51,000 texts.*

Keywords: Machine Learning; Language Models; Sentiment Analysis; Under-resourced language; Microblogging texts.

AI-DRIVEN DOCUMENT MAPPING: FROM XSLT TO DML VIA SEMANTIC BUSINESS ENTITY EQUIVALENCE

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Abstract: *In modern business environments, seamless data transformation between heterogeneous document formats is critical for interoperability. This paper presents an AI-driven approach to automating document mapping by leveraging semantic equivalence between business entities. Our methodology begins by extracting XML Schema Definitions (XSDs) from both input and output document formats, which may include XML, EDI (EDIFACT, X12, TRADACOMS), JSON, SWIFT, and other structured message types. We then employ ChatGPT to generate an XSLT-based transformation that maps data between these formats. A key contribution of our work is the development of a novel conversion mechanism that translates XSLT, which operates in an input-driven manner, into a proprietary mapping language, DML, which follows an output-driven paradigm. This transformation ensures compatibility with systems that require explicit output-centric mapping definitions, overcoming limitations of traditional XSLT-based approaches. Our implementation significantly reduces manual effort in cross-format data mapping, enhances accuracy through AI-assisted semantic interpretation, and enables rapid adaptation to new business document standards. We vali-date our approach through a series of case studies, demonstrating its applicability across diverse industries and data exchange scenarios.*

Keywords: AI-Assisted Code Generation; Enterprise Data Integration; Automated Document Conversion

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ARTIFICIAL INTELLIGENCE IN ERP SYSTEMS: A SYSTEMATIC LITERATURE REVIEW

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Abstract: *Enterprise Resource Planning (ERP) systems have long been the backbone of business operations, integrating various functions across organizations. During the 2010s, academic interest in ERP systems as a research topic experienced a decline as the field matured and many foundational challenges had already been extensively studied. Researchers have shifted their focus toward emerging technologies, reducing attention on ERP-related studies.*

Since 2020, the integration of artificial intelligence (AI) into ERP systems has sparked renewed interest. This study conducts a systematic literature review to examine the current state of research at the intersection of AI and ERP. Utilizing the Scopus database, we identified 56 relevant studies published between 2010 and 2025 based on predefined inclusion and exclusion criteria. Our findings highlight key trends in AI applications within ERP, such as predictive analytics, process automation, and intelligent decision support. This review offers valuable insights for researchers, outlining future research directions and practical implications for AI-driven ERP systems.

Keywords: Systematic Literature Review; Artificial Intelligence; ERP systems; Bibliometric Analysis.

ETHICS OF ARTIFICIAL INTELLIGENCE IN BUSINESS: CHALLENGES, APPLICATIONS AND PATHWAYS FOR RESPONSIBLE INNOVATION

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Abstract: *Artificial Intelligence (AI) is transforming business operations by driving automation, optimizing decision-making, and enhancing customer experiences. While AI offers benefits such as increased efficiency, cost reduction, and improved accuracy, it also raises significant ethical concerns, including data privacy, algorithmic bias, transparency, and employment displacement. This paper examines the ethical implications of AI in business through a sector-specific case study analysis. It explores real-world applications of AI, highlighting how companies navigate ethical challenges while leveraging AI for strategic advantage. The study also outlines best practices for re-sponsible AI adoption, including ethical governance mechanisms such as AI ethics committees, fairness audits, and explainable AI (XAI) models to enhance transparency and accountability. As AI continues to evolve, this research discusses future directions, including explainable AI, regulatory developments, and human-AI collaboration. The findings underscore the importance of balancing innovation with strong ethical oversight to ensure equitable and sustainable AI adoption. By embedding ethical governance mechanisms into AI development, businesses can mitigate risks while fostering long-term trust, accountability, and fairness in AI applications.*

Keywords: Artificial Intelligence; Business; Ethics; Transparency; Algorithmic Bias; Data Privacy.

AUTOMATING STUDENT ATTENDANCE USING FACIAL RECOGNITION THROUGH ARTIFICIAL INTELLIGENCE

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Abstract: *New learning perspectives are opened by using technology in education, which allows quick access to resources, content customization and increased interactivity. Technological advances shape all aspects of our lives, redefining the way we relate to the environment. Thus, technology fundamentally changes the educational process, helping to develop digital skills and collaborate and assess in real time. The emergence of Artificial Intelligence, as a factor of progress and as a tool for optimizing the educational process, manifests itself as a social catalyst. Facial recognition appears in this context as part of the digitalization of educational processes, with the ability to automate activities such as attendance tracking, access control and personalization of the educational experience. The purpose of this paper is to examine how facial recognition can be used in educational systems to help digitize and streamline administrative procedures. The development of a digital attendance system based on facial recognition is the practical part of the paper. This system will allow for automatic student identification, data centralization, and interactive attendance visualization.*

Keywords: Artificial Intelligence; Machine Learning; Education.

AI AND THE FUTURE OF EDUCATION

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Abstract: *Jobs with a high potential for automation are the most exposed to replacement by artificial intelligence, but all other jobs will be affected by these substantial changes implied by automation. Related to the education sector, we foresee teachers employing consistent changes linked to the widespread use of augmentation, real-time in-depth student performance analysis, worldwide availability of customized resources and a personalized learning path for students. This paper underlines the reasons why we consider the education sector vulnerability to AI is quite low, such as the high adoption costs, complexity and difficulty.*

Keywords: AI; Automation; Education; Adoption; Vulnerability.

GENERATIVE AI IN DIGITAL BUSINESS: TRENDS AND CHALLENGES

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Abstract: *This article provides an overview of generative artificial intelligence along with the main types of generative models, including Generative Adversarial Networks, Variational Autoencoders, Autoregressive Models, and others. Additionally, the article discusses how generative AI is applied across various industries, such as Healthcare, Finance, Retail, Education, Media and Entertainment, Hospitality and Tourism, Architecture, Engineering, and Construction. The third chapter presents a study on the impact of GenAI on business operations, along with recent trends and statistics regarding the adoption of generative AI by companies. Toward the end of this article, the challenges and risks associated with these technologies are reviewed.*

Keywords: Generative AI; ChatGPT; Variational Autoencoders; Autoregressive Models; Risks of GenAI

ARTIFICIAL INTELLIGENCE: A NECESSITY FOR SUSTAINABLE DEVELOPMENT

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Abstract: *Artificial Intelligence (AI) already benefits from quite an extensive attention in the world. From international institutions and organizations to academic area, the topic, along with its uses and potential vulnerabilities, is widely debated. Beyond its commercial utility, a lot of researchers are exploring the role of AI in advancing sustainable development. This paper aims to examine specific domains in which AI technologies can contribute to the achievement of sustainability goals. AI is increasingly seen as an essential tool for advancing sustainable development.*

Keywords: Artificial Intelligence; Sustainable Development; Social Equity; Economy Development.

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