Lucian Blaga University of Sibiu, Romania

Faculty of Sciences

Research Center in Informatics and Information Technology

ICDD 2025

9th International Conference on Applied Informatics

Imagination, Creativity, Design, Development

Volume of Abstracts and Program

May 29-31, 2025

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Imagination, Creativity, Design, Development

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Motto:

"There are no limits, only your imagination"

TOPICS

- Algorithms and data structures
- Graph theory and applications
- Formal languages and compilers
- Cryptography
- Modeling and simulation
- Computer programming
- Computer vision
- Computer graphics
- Game design
- Data mining
- Distributed computing
- Artificial Intelligence
- Service oriented applications
- Networking
- Grid computing
- Mobile operating systems
- Scientific computing
- Software engineering
- Bioinformatics

- Robotics
- Computer Architecture
- Evolutionary Computing
- Multimedia Systems
- Internet Communication and Technologies
- Web Applications
- Machine learning

OBJECTIVES

The conference is mainly addressed to young researchers from all over the world. The conference gives the participants the opportunity to discuss and present their research on informatics and related fields (like computational algebra, numerical calculus, bioinformatics etc.). The conference welcomes submissions of original papers on all aspects of informatics and related fields ranging from new concepts and theoretical developments to advanced technologies and innovative applications. All submitted papers will undergo a rigorous single-blind peer review process, with each paper being assessed by a minimum of two independent experts in the relevant field. Paper acceptance and publication will be judged on the basis of their relevance to the conference topics, clarity of presentation, originality and accuracy of the results and proposed solutions. The presentation (article) has also to include a computer application. The conference will include regular presentations (15min.) and short IT Companies presentations.

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Department of Mathematics and Informatics

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Lucian Blaga University of Sibiu

UNIVERSITATEA LUCIAN BLAGA DIN SIBIU

Organized with support of Romanian Ministry of National Education

MINISTERUL EDUCAȚIEI ȘI CERCETĂRII

OFFICIAL LANGUAGE

The official language of the conference is English.

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PROGRAM

International Conference on Applied Informatics – ICDD 2025
organized by
Faculty of Sciences, Research Center in Informatics and Information Technology
Lucian Blaga University of Sibiu, Romania

THURSDAY, May 29th, 2025

NTT DATA Romania, 6th Floor, 1A Șerbota str., Sibiu

08:45-09:30 **Registration**

09:40-10:00 **Opening ceremony**

10:00-11:15 **Papers presentation - Chair Prof. Dr. Dana Simian**

1. *WebXR-Previz: Low-Cost System for Real-Time Previsualization and Broadcast Graphics,* **Felix Husac**, Lucian Blaga University of Sibiu, Romania
2. *Assessing Visual Tracking in Children with Special Needs: A Tool for Ergotherapists,* **Gokul Perumbayil Vijayakrishnan, Anagha Manikathuparambil Baby, Blesson Manjakunnel,** Technical University of Applied Sciences Würzburg-Schweinfurt, Germany
3. *Web-based Intelligent System for Dynamic Text Rendering and Interactive Content Management in Full-screen Environments in the Music Industry,* **Kristian Spasov, Martin Dzhurov, Serkan Sadulov,** University of Ruse "Angel Kanchev", Bulgaria
4. *SmartGarden: An Economical IoT-Enabled System for Indoor Plant Surveillance and Irrigation*, **Alexandra Onose,** Transilvania University of Brasov, Romania
5. *Rated Voting System and the future of voting in Romania*, **Giorgiana-Maria Marangoci, Alex-Andrei Rîpan, Ștefan-Ioan Istina,** Vasile Alecsandri University of Bacău, Romania

11:15-11:55 **Coffee break**

11:55-13:10 **Papers presentation - Chair Prof. Dr. Peter Braun**

1. *Converting different CV formats into a standardized format*, **Cantemir Mihu**, NTT Data Romania
2. *TransitAI: An AI-Powered Conversational Assistant for Public Transportation Information Access*, **Eduard-Alexandru Oprea, Elena-Luiza Buzatu, Ioana-Valeria Turcin**, National University of Science and Technology Politehnica Bucharest, Pitești University Center, Romania
3. *Evaluating Log Messages Using a Big Data Approach*, **Tobias Schneider**, Hochschule Landshut, Germany
4. *ArchiMind Academy: A Hybrid Model for Digital Innovation in STEM Education*, **Ioan Flavius Dancasiu,** Lucian Blaga University of Sibiu, Romania
5. *Discovery STEM – EduLab360*, **Andrei-Zian Gavrilă, Andrei-Marius Țiplic, Paul-Ioan Țiplic,** Gheorghe Lazăr National College Sibiu, Romania

13:10-15:00 **Pizza break**

15:00-16:30 **Papers presentation - Chair Assoc. Prof. Dr. Florin Stoica**

1. *Simulations of Vertical Farming Spaces*, **Roberto-Alessandro Sociu, Codrin-Petruț Toma**, Vasile Alecsandri University of Bacau, Romania
2. *Personalized Medical Service Matching Platform*, **Elena-Iuliana Trifan**, Lucian Blaga University of Sibiu, Romania
3. *POLARIS - Path Optimization & LAN Analysis Routing Intelligence System*, **Victor - Ioan Călbureanu**, Samuel von Brukenthal National College Sibiu, Romania
4. *AI Platform for Real-Time Cyber Threat Detection*, **Vlad-Matei Poienariu, Rares Muntean, Vlad-StefanAlexandrescu**, Spiru Haret University, Romania
5. *CityVibe*, **Diana Săvoiu, Luca Todoran,** Lucian Blaga University of Sibiu, Romania
6. *Rubik's Cube - an interactive solution for optimizing your training*, **Andrei Dăian, Marian-Daniel Drăghici,** Lucian Blaga University of Sibiu, Romania

18:00-20:00 **Official Dinner – Restaurant Sonne Sibiu**

International Conference on Applied Informatics – ICDD 2025
organized by
Faculty of Sciences, Research Center in Informatics and Information Technology
Lucian Blaga University of Sibiu, Romania

FRIDAY, May 30th, 2025

NTT DATA Romania, 6th Floor, 1A Șerbota str., Sibiu

09:30-10:45 **Papers presentation - Chair Prof. Dr. Peter Braun**

1. *Comparative Analysis of Transfer Learning vs. Individual LSTM Models for Stock Price Prediction,* **Andrei Priboi,** Transilvania University of Brasov, Romania
2. *User-Centered AI: Improving Workflows through intelligent Chatbots,* **Sophie Geisler, Peter Möhle, Marcel Wernisch, Felix Zorn,** Technical University of Applied Sciences Würzburg-Schweinfurt, Germany
3. *Game Engine Development: Research, optimization, and performance enhancement,* **Serkan Sadulov, Mustafa Mustafov,** University of Ruse "Angel Kanchev", Bulgaria
4. *Hello Code! - A Gamified Approach to Learning Programming*, **Luana Lăcrămioara Hususan, Beatrice-Elena Câlb,** Lucian Blaga University of Sibiu, Romania
5. *Autonomous Navigation using interconnected embedded devices with external AI Accelerator,* **Marian-Daniel Drăghici, Andrei Dăian,** Lucian Blaga University of Sibiu, Romania

10:45-11:30 **Coffee break**

11:30-13:00 **Papers presentation - Chair Prof. Dr. Dana Simian**

1. *Predictive Maintenance using On-Board Diagnostics (OBD-II) Data: An Analysis***, Tanya Teresse, Jarin J. V., Deepthi Das,** Christ (Deemed to be) University, Bangalore, India-online
2. *Hybrid Steganography-Cryptography Solution for Password Management*, **Iulia-Georgiana Muntean**, Lucian Blaga University of Sibiu, Romania
3. *Organ 3D Model Reconstruction using Point Clouds and Delaunay Triangulation,* **Matei-Cristian Steavu,** Transilvania University of Brasov, Romania
4. *EmiNet: A first step towards health*, **Ștefan Eminovici,** Samuel von Brukenthal National College Sibiu, Romania

5. *Tecky: Multimodal Local Agents for Intelligent macOS Automation,* **Alexandru – Emil Sofonea,** Samuel von Brukenthal National College Sibiu, Romania
6. *Using Supervised Machine Learning Models for the Management of Quality Indices*, **Marin-Eusebiu Șerban,** Lucian Blaga University of Sibiu, Romania

13:00-14:00 **Coffee break**

14:00-14:30 **Closing ceremony – NTT Data, 6th floor**

14:45 **Lunch break – Restaurant Sonne Sibiu**

SATURDAY, May 31th, 2025

International Conference on Applied Informatics – ICDD 2025
organized by
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Lucian Blaga University of Sibiu, Romania

09:00-19:00 **Trip on the route**
Sibiu - Biertan - Sighișoara - Daneș – Sibiu

ABSTRACTS

POLARIS - Path Optimization & LAN Analysis Routing Intelligence System

Victor - Ioan CĂLBUREANU

POLARIS is a comprehensive network simulation and analysis platform developed in C# using the .NET Framework, designed to assist IT administrators and network engineers in designing, evaluating, and optimizing computer network infrastructures. POLARIS is also meant for students and people interested in learning computer networking. Its design and implementation is meant to help better understand computer network protocols and visualize it for a student that might need help, like I, the author did, when I was learning networking in a class full of students with more advanced understanding of such concepts. The application name reflects its core purpose: like the North Star that has guided navigators for centuries toward their optimal destinations, POLARIS guides network professionals toward optimal network paths and configurations through intelligent analysis and routing optimization.

Rubik's Cube - an interactive solution for optimizing your training

Andrei DĂIAN, Marian-Daniel DRĂGHICI

The Rubik's Cube has been a fascinating puzzle and Math's problem. Although, since it was used and solved in many ways, there are good use cases of interactive applications, that can enhance a human solver's experience. Hence, this article presents a combined solution for an interactive learning approach based on a game and an image processing interface. The Unity Game is designed to let the user visualize a configuration, via a 3D representation of the puzzle. Once a desired solution has been found, an interactive approach to the solved position can be easily achieved. The image processing interface, a Python application, allows solvers to scan their current cube configuration, making the whole process faster. Both applications communicate via an integrated API, which exposes endpoints and serializes a certain configuration into JSON text.

ArchiMind Academy: A Hybrid Model for Digital Innovation in STEM Education

Ioan Flavius DANCĂȘIU

In the context of accelerated digital transformation and the growing need for learner-centered pedagogical approaches, ArchiMind Academy introduces an innovative educational model focused on performance, interdisciplinarity, and generational proximity. Designed as a hybrid

tutoring school—offering both online and in-person sessions—the project aims to deepen students' understanding of mathematics, physics, and computer science, three foundational subjects for the development of logical and scientific thinking. Special emphasis is placed on physics and computer science, which are often inadequately addressed in traditional curricula, despite their critical role in shaping STEM competencies. A distinctive feature of the project is the inclusion of university students as peer tutors, leveraging the principles of peer learning to enhance engagement and cognitive empathy in the learning process. The accompanying digital platform integrates tools for educational management, course delivery, and scheduling, all tailored to the expectations of today's learners. ArchiMind Academy aligns with global trends in educational digitalization, promoting a sustainable and scalable model of personalized learning.

Autonomous Navigation using interconnected embedded devices with external AI Accelerator

Marian-Daniel DRĂGHICI, Andrei DĂIAN

This project presents an embedded autonomous navigation system based on Raspberry Pi with external Hailo AI Accelerator HAT, designed for real-time traffic sign and object recognition. GStreamer pipelines are used both to display detection results locally and to stream live video to a remote dashboard, which can securely access the system via SSH port forwarding and send precise control commands to the vehicle through Flask socket communication.

EmiNet: A first step towards health

Ștefan EMINOVICI

EmiNet is a software application employing a Multi-Layer Perceptron (MLP) neural network to provide preliminary diagnoses based on user-inputted symptoms. The model, trained on a dataset covering approximately 80 common illnesses, utilizes SMOTE (Synthetic Minority Over-sampling Technique) to address class imbalance, and its development involved k-fold cross-validation to ensure robust generalization and almost perfect predictions. It can request additional information (further symptoms) when the confidence level of the initial prediction is low. Natural language symptom processing is performed using advanced techniques, including the NLTK and spaCy libraries. The artificial intelligence component is implemented using TensorFlow and Keras, alongside NumPy for numerical operations. The user interface is developed in Flutter, communicating via a Flask API with the Python-implemented backend. Multilingual support (English/Romanian) ensures broader accessibility.

Discovery STEM – EduLab360

Andrei-Zian GAVRILĂ, Andrei-Marius ȚIPLIC, Paul-Ioan ȚIPLIC

This paper introduces an interactive educational application developed in Python, designed to support the learning of fundamental concepts in mathematics, physics, and chemistry. The application combines theoretical

modules with virtual laboratories that enable users to experiment with core scientific principles through interactive simulations. Within the mathematics and physics modules, the platform integrates graphical tools and numerical algorithms for plotting functions, solving algebraic equations of degrees one to three, and modeling classical mechanics, geometric optics, and thermodynamic phenomena. Users can manipulate key parameters to explore system behavior dynamically, promoting conceptual understanding through visual representation.

In addition, the application includes discipline-specific calculators capable of solving standard textbook problems and generating customized simulations based on user input. To further enhance the learning experience, an integrated educational chatbot employs natural language processing (NLP) to interpret queries and provide contextual explanations and problem-solving guidance across all three scientific domains. The user interface is designed with accessibility and engagement in mind, featuring intuitive controls and structured navigation. Overall, the application offers a modern, interdisciplinary approach to STEM education, combining interactivity, visualization, and intelligent assistance to support deeper learning.

User-Centered AI: Improving Workflows through intelligent Chatbots

Sophie GEISLER, Peter MÖHLE, Marcel WERNISCH, Felix ZORN

The manual procedure of requesting and scheduling rooms for university classes often causes considerable administrative effort and delays. This paper presents an AI-driven chatbot integrated into a university room booking system to handle first-level support queries (such as room availability checks and booking requests) through natural language. The proposed chatbot leverages a Large Language Model (LLM) to understand user inquiries and generate context-aware responses, thereby automat ing routine booking interactions. We outline the system's architecture, highlighting the chatbot's central role as an interface between users and the scheduling backend. The chatbot's design incor porates an LLM component for language understanding and generation, guided by system-defined prompts and safeguarded by validation layers to ensure reliable and secure operation. We discuss how user interaction is facilitated via a web frontend and a chat platform integration, and how the AI-driven decision-making enables flexible, context-sensitive dialogue management. In this context, a self-developed backend service was introduced to interface with the existing booking system, ensuring accurate retrieval and synchronization of room availability and booking details. An initial workflow based chatbot design is described as a conceptual alternative, though our implementation focuses on the User-Centered approach. Preliminary results from the prototype indicate improved efficiency (reduced response times and automated task

completion) and high intent-recognition accuracy, while also revealing important considerations regarding system safety and governance. We conclude with insights on the practical implications of deploying LLM-powered chatbots for scheduling support and directions for future work to enhance robustness and scalability.

WebXR-Previz: Low-Cost System for Real-Time Previsualization and Broadcast Graphics

Felix HUSAC

Cinematographic previsualization (previz) and real-time extended reality (XR) graphics are powerful tools in filmmaking and television broadcasting. These technologies enable the integration of virtual 3D objects into the real world in real time, and in relation to the viewer's perspective. In filmmaking, they are used to explore virtual production sets and plan visual effects sequences. In live broadcasts, they are used to enhance the production value and engagement of a show. Professional video XR systems rely on expensive tracking hardware, dedicated cameras, real time rendering servers and complex software pipelines. Our approach uses readily available consumer hardware: an Android smartphone for spatial input and a desktop PC for rendering. This paper presents the architecture and implementation of a flexible, web-based system for real-time 3D visualization applicable to both cinematographic previsualization and live interactive television graphics. The smartphone camera's pose data (position and orientation) is transmitted in real time via WebSockets to a computer. A Three.js

application on the PC receives this data, translating the phone's physical movements into virtual camera control for previz or real-time 3D graphics for live XR applications. This approach, based on standard web technologies, aims to lower the barrier to entry by offering powerful real-time visualization in a cost effective manner, without the need for industry standard equipment.

Hello Code! - A Gamified Approach to Learning Programming

Luana Lăcrămioara HUSUSAN, Beatrice-Elena CÂLB

In an era where digital literacy is increasingly essential, Hello Code! introduces an innovative and interactive approach to programming education. Designed as a gamified learning platform, the application provides structured lessons, hands-on coding exercises, and real-time feedback to enhance skill acquisition. By integrating gamification elements such as points, badges, daily challenges, and leaderboards, Hello Code! fosters user motivation and encourages consistent learning. The platform offers courses in multiple programming languages, including HTML, C++, and SQL, making it accessible to students, aspiring developers, and professionals looking to strengthen their technical expertise. Through practical projects, quizzes, and coding challenges, learners engage with real-world programming scenarios, bridging the gap between theoretical knowledge and practical application. By transforming coding education into

an engaging and rewarding experience, Hello Code! provides an accessible and effective solution for individuals at different skill levels. Future developments aim to enhance adaptive learning experiences, expand language support, and integrate AI-driven personalized recommendations to further optimize the learning journey.

Rated Voting System and the future of voting in Romania

Giorgiana-Maria MARANGOCI, Alex-Andrei RÎPAN, Ștefan-Ioan ISTINA

In modern democracy, the voting systems play an essential role, influencing both the confidence of citizens in the electoral process and in the representation of candidates. However, traditional methods may have restrictions that lead to biased voter participation and fairness in the electoral process. This paper explores the Rated Voting System, another model where voters assign scores to candidates, which provides a more refined selection when compared to the classical voting system used in Romania and in other countries. We have chosen to highlight the challenges of both systems, by presenting their characteristics and differences. In order to approach the discussed issues, we have created an application that ranks the candidates using the traditional voting system and also the rated voting system, hoping to bring technological innovation to the electoral process.

Converting different CV formats into a standardized format

Cantemir MIHU

Presentation of an example application of GenAI whereby unstructured documents, such as CVs, can be interpreted and converted into a structured format. The presented example converts CVs of any format into a standard format.

Hybrid Steganography-Cryptography Solution for Password Management

Iulia-Georgiana MUNTEAN

In an era where password breaches are increasingly common, traditional password managers, while encrypted, still present an obvious target due to their predictable data storage formats. This project proposes a hybrid steganography-cryptography solution that enhances password security by hiding encrypted credentials within seemingly ordinary images. Using encryption in combination with image steganography, the system ensures that sensitive data is not only protected, but also obscured from detection.

SmartGarden: An Economical IoT-Enabled System for Indoor Plant Surveillance and Irrigation

Alexandra ONOSE

This paper presents SmartGarden, an economical and adaptable IoT-based technology intended for real-time monitoring and automated irrigation of indoor plants. The system integrates open-source microcontrollers, ambient sensors, and a locally managed Flutter-based mobile application. In contrast to current commercial solutions that frequently depend on cloud infrastructure and proprietary ecosystems, SmartGarden prioritizes user autonomy, offline functionality, and straightforward customization. The system's novelty is in its open, scalable architecture, enabling both novice and experienced users to customize and enhance it based on particular plant care needs. The prototype was evaluated in real-world situations and shown dependable performance, affirming its potential for practical and instructional applications.

TransitAI: An AI-Powered Conversational Assistant for Public Transportation Information Access

Eduard-Alexandru OPREA, Elena-Luiza BUZATU, Ioana-Valeria TURCIN

Public transportation systems generate vast amounts of structured data through GTFS (General Transit Feed Specification) feeds, yet accessing this information through conventional interfaces often presents significant usability challenges. This paper introduces TransitAI, an AI-driven

conversational assistant that bridges the gap between complex transit data and intuitive user interaction. By integrating large language models with domain-specific transit knowledge, the system enables users to query transportation information using natural language. The architecture combines a Flask-based backend with specialized services, including a natural language understanding component (Ollama), real-time data processing (GTFS Realtime), journey planning (OpenTripPlanner), and data retrieval (Elasticsearch). Through a modular design, the system accommodates various query types, from stop information and route details to complex journey planning. Technical evaluations demonstrate the system's ability to handle complex transit queries with high accuracy while maintaining responsive performance. This research demonstrates how AI can transform public service information access, providing insights for future smart city applications.

Assessing Visual Tracking in Children with Special Needs: A Tool for Ergotherapists

Gokul PERUMBAYIL VIJAYAKRISHNAN,
Anagha MANIKATHUPARAMBIL BABY, Blesson **MANJAKUNNEL**

Assessing visual tracking ability in children with special needs is challenging due to the limitations of traditional observational methods, which are often time-consuming, costly, and imprecise, while also struggling to maintain the engagement of the child. Additionally, these methods can be difficult for therapists to interpret. This study proposes a

cost-effective eye-tracking tool that enables therapists to evaluate and enhance visual tracking abilities without the need for specialised hardware. The tool integrates an interactive game to sustain engagement while using a standard webcam to capture gaze data. A deep learning model then processes this data, mapping gaze direction to screen coordinates to generate an interpretable representation of visual tracking performance. Our analysis quantifies the correlation between predicted gaze points and the actual trajectory of a moving object along the x and y axes, providing therapists with a visual representation of gaze behaviour. By enabling remote assessments and minimizing logistical barriers, this tool enhances accessibility, precision, and efficiency in therapeutic evaluations. It provides an affordable, open-source alternative to conventional eye-tracking systems, usable on any standard computer with a webcam, and supports data-driven intervention strategies to enhance therapeutic outcomes.

AI Platform for Real-Time Cyber Threat Detection

Vlad-Matei POIENARIU, Rares MUNTEAN, Vlad-STEFANALEXANDRESCU

This paper introduces an AI-powered application platform model for cyber threat detection in real-time. The System uses machine learning that is constantly adapting to new threat patterns. By efficiently monitoring the network traffic, the application's security is enhanced. The purpose of the application is to be able to handle many types of threats and attacks by adapting to malicious threats in various shapes and forms. After each

interaction with malware, the AI is capable of learning new tactics, ensuring the application is constantly up to date with the new threats available. Implementing the AI in the program results in regularly fortifying the network's safety, reliability, and the User's experience. These advantages are provided by a properly trained machine learning model capable of smoothly receiving data from the System. The User is able to view everything and is notified when a new thread is being discovered by using a modern User-Interface dashboard. Automating security duties for the System, such as keeping track of the logs, alerts, or common incidents, helps minimize human errors and concentrates the team on more complex security threats, making it more efficient when it comes to traditional cybersecurity. Additionally, AI can predict future attacks, allowing organizations to prepare for them.

Comparative Analysis of Transfer Learning vs. Individual LSTM Models for Stock Price Prediction

Andrei PRIBOI

This paper analyzes the application of a multi-task transfer learning-like methodology for financial time series forecasting, particularly stock price prediction. We will compare and analyze two prediction models, one trained on individual company data, and one trained on data ranging from different stocks and domains which leverages cross-stock knowledge transfer. The empirical foundation is his torical closing price data for 50 major stocks, from 2020 to 2023, and the model architecture was optimized via a random

search for best hyperparameter values. Results demonstrate a +70% increase in prediction accuracy when exploiting transfer learning compared to the individual models. Evidence is revealed that major trends in stock price movements can be transferred effectively between firms and market sectors. Furthermore, this study identifies market capitalization, volatility and sector classification as significant factors influencing the benefits of transfer learning. The benefits can also be extended to time series analysis in other domains, such as healthcare patient monitoring systems or in energy consumption forecasting.

Game Engine Development: Research, optimization, and performance enhancement

Serkan SADULOV, Mustafa MUSTAFOV

This paper reviews the process of developing a game engine and explores the methodologies of development, best practices, and challenges involved in creating such software. This study provides an in-depth analysis of the tools, frameworks, and design patterns used for development, along with real-world examples of code and assets utilized throughout the process. Special attention is given to performance considerations, rendering techniques, physics simulations, and scripting integration to ensure a comprehensive understanding of the development workflow. Furthermore, this research presents a hands-on demonstration of the final product,

showcasing the engine's capabilities and potential applications for game developers.

CityVibe

Diana SĂVOIU, Luca TODORAN

Public sentiment is a critical factor in shaping urban policies, infrastructure planning, and community development. CityVibe is a data-driven sentiment analysis platform that extracts, processes, and visualizes social media data to provide real-time insights into public opinion across different city areas. By leveraging natural language processing (NLP) and geospatial analysis, the platform enables authorities, urban planners, and decision-makers to assess citizen satisfaction, detect emerging concerns, and monitor sentiment trends with high granularity. The system integrates data analytics and visualization tools to map sentiment variations across neighborhoods, offering a structured approach to evaluating policy impact, improving public services, and addressing urban challenges. It provides an interactive interface where users can track fluctuations in public opinion, analyze patterns over time, and correlate sentiment data with key urban indicators such as traffic conditions, environmental factors, and socio-economic variables. By transforming unstructured digital discourse into actionable intelligence, CityVibe enhances datadriven decision-making in smart city management. Future extensions may incorporate historical sentiment analysis, predictive modeling, and integration with additional urban datasets

to further support evidence-based governance and sustainable urban development.

Evaluating Log Messages Using a Big Data Approach

Tobias SCHNEIDER

Large log files, with hundreds of thousands of entries, can get hard to monitor. Due to the sheer size of the file, detecting if a system is to be considered in an error-state and finding the underlying root-cause gets increasingly challenging. This paper addresses the issues by calculating the error-success ratio, using the exponential moving average algorithm and providing a pattern-based proposal of the root-cause by employing a suffix array. The introduced log analyzing system is able to query the log file in various manners, speeding up analysis. Measurements, using log messages of a simulated microservice environment, showed that the approach introduced in this paper enhances user-driven analysis significantly. In numbers, for a log file with over 400,000 entries, it enables the operator of the log analyzing system to be 34 times faster in finding meaningful patterns, such as the most repeated message.

Simulations of Vertical Farming Spaces

Roberto-Alessandro SOCIU, Codrin-Petruț TOMA

This paper is in direct connection to a research we performed during a theory-based project about the use of AI in Vertical Farming. We developed

the initial results in an original work, aiming to describe the costs and materials which are needed for someone to be able to put into action such an endeavour.

This study presents a simulation-based analysis of vertical farming systems, aiming to optimize plant growth, spatial efficiency and nutrient management, ignoring initial and external costs (such as the cost of building the facility, etc.), focusing solely on plant and nutrient costs.

Key variables include: vertical space allocation, lighting schedules, nutrient concentrations, and temperature regulation.

Vertical farming is a modern method of growing crops in vertically stacked or vertically sloping beds, often integrated into controlled indoor environments. Unlike traditional agriculture, which is based on large horizontal plots of land, vertical farming utilizes vertical space, allowing efficient use of smaller areas. This innovative farming technique can take place in buildings, greenhouses, shipping containers or other urban spaces. It incorporates various technologies to create an optimal growing environment for crops, including hydroponics, aquaponics and aeroponics. Each of the three methods offers different advantages, but our approach considers only the hydroponics method to facilitate the understanding of the data used and the results obtained. The reason we decided to analyze vertical farming is so that we could compare how important and complementary such a “futuristic” farming technique can be to classical agriculture.

The application we propose used: C# (in Visual Studio IDE) to perform the various calculations and simulations, MySQL (using WampServer and PhPMyAdmin) to develop the database where all the data about plants and

nutrients are stored, and the Windows Forms open-source GUI class library for building the desktop application, as part of Microsoft .NET. The code calls the procedures stored in the database to get the needed data, based on the user input of the specifications of the building, it calculates the necessary amounts of light, temperature, humidity and water, while also calculating the number of plants that fit inside a predetermined space, ultimately showing a simulation of the yield of the crops.

Regarding the future of this app, there are a variety of niches it could fit in, becoming both a governmental app or/and one for individuals, to be developed and customized on demand. In addition, simulation capabilities could be vastly enhanced by including fruits, total costs of the whole business instead of just the plants, cost-recovery simulations based on the current economy, etc. The application could also be upgraded into an app to be used in real-time, adjusting the various necessary parameters of the plants from on the spot or remotely.

Vertical farming makes us think at words like “expensive” or “complicated”; this concept is, indeed, expensive and complicated at first, but we intend to show how to make it easier and profitable. The code we developed allowed us to perform simulations using data such as: available space, amount of water needed, optimal amount of light, optimal temperature, optimal humidity and nutrients used.

The findings underscore the viability of vertical farming as a sustainable agricultural method, particularly in urban settings with limited land availability.

Tecky: Multimodal Local Agents for Intelligent macOS Automation

Alexandru – Emil SOFONEA

Tecky is an AI-powered automation application for macOS, designed to transform how users interact with the operating system. It combines a modern Swift and SwiftUI-based interface with a local AI server running LLMs optimized for Apple Silicon via MLX, enabling users to issue natural language commands that translate into executable system actions. Central to Tecky's architecture is a multimodal AI pipeline: a Vision model, based on a YOLO architecture and enhanced with OCR capabilities, analyzes periodic screenshots of the screen to detect and interpret visible UI elements. This visual context is then passed to the LLM, which integrates it with the user's instruction to generate structured action plans. These plans are output as JSON and executed through native Foundation libraries to simulate user interactions such as clicking, typing, and navigating across applications. By coupling on-device vision understanding with language-driven planning, Tecky performs robust, flexible macOS automation entirely offline. This paper details the system's architecture, the interaction between its visual and language components, the challenges of multimodal integration, and the potential of local AI agents within the Apple ecosystem.

Web-based Intelligent System for Dynamic Text Rendering and Interactive Content Management in Full-screen Environments in the Music Industry

Kristian SPASOV, Martin DZHUROV, Serkan SADULOV

This scientific report explores the design, development, and implementation of a web-based system created for dynamic text rendering tailored specifically for full-screen usage in musical performances. Addressing existing limitations of conventional methods, such as printed song lyrics and manually managed teleprompters, the proposed solution offers real-time interactive content management, automatic resizing of text to optimally fit various display devices, and intuitive control via specialized hardware – foot switches and numeric keypad interactions. The developed system leverages modern web technologies (HTML5, CSS3, JavaScript, PHP, MySQL, AJAX, JSON, Bootstrap, and jQuery) to ensure efficient, seamless, and intuitive user experience. This paper provides a comprehensive analysis of existing solutions, clearly defines the objectives and tasks of the new system, and presents the architectural decisions, functional design, data organization strategies, and detailed descriptions of the implemented functionalities. The report concludes by evaluating the effectiveness of the proposed solution and identifying directions for future enhancements.

Organ 3D Model Reconstruction using Point Clouds and Delaunay Triangulation

Matei-Cristian STEAVU

There are multiple techniques when trying to reconstruct the 3D model of an organ, as well as multiple formats in which to process all this data. Each of these methods is unique and has its own strength and weaknesses. The purpose of this paper is to present the best format to use in the context of 3D bioprinting, comparing each method's strengths as well as to describe the use of a technique generally found in geographic information systems, namely Delaunay triangulation.

Using Supervised Machine Learning Models for the Management of Quality Indices

Marin-Eusebiu ȘERBAN

Quality indices are widely used to evaluate the status of various types of resources, such as water, air, human capital, and more. These indices often aggregate multiple parameters into a single classification level, offering a simplified yet informative overview of resource quality. However, in many cases, multiple indices may lead to inconsistent classifications for the same resource, due to differences in parameter selection, classification thresholds, or evaluation goals. This work proposes a machine learning–based framework designed to detect and analyze such inconsistencies in resource classification. The approach builds upon our previous research on water

quality indices and introduces a generalized methodology applicable across different resource types. The framework operates on two levels. The first level involves dataset preparation, parameter analysis, and preprocessing, while the second one focuses on selecting and applying supervised learning models tailored to each specific index and data type. The framework output enables many key contributions: prioritization of resource parameters based on their influence in classification tasks, detection of classification inconsistencies between indices, especially in cases where index values lie near threshold boundaries and assessment of indices robustness. These outputs can be used as valuable tools in the management process of quality indices. A notable advantage of the proposed framework is its flexibility in handling incomplete datasets and its adaptability to different evaluation contexts.

The solution was implemented using Python and an object-oriented class hierarchy, allowing for modular preprocessing and testing of multiple supervised machine learning models. Additionally, the framework supports both local and global evaluations, from single-resource case studies (e.g., air quality in a specific region or human resources in a specific institution) to cross-resource comparisons (e.g., multiple rivers or human resources across institutions).

We applied our framework to a case study, more precisely the assessment, comparison and selection of water quality indices, using publicly available data from rivers in India. Furthermore, as a secondary outcome, the framework also allows for the assessment of the robustness of individual

indices across different machine learning, offering a novel metric for cross-domain generalizability.

Predictive Maintenance using On-Board Diagnostics (OBD-II) Data: An Analysis

Tanya TERESSE, Jarin J. V., Deepthi Das KULKARNI

The On-Board Diagnostics II (OBD-II) system changed the course of the car maintenance by offering the lowest access to critical data in real time. This paper discusses the historical development of OBD-II and its modern day applications in predictive maintenance, along with examples of incorporating machine learning algorithms for improved diagnosis and anomaly detection. We analyze road conditions with the help of a dataset containing OBD-II sensor readings, predict maintenance needs as well as identify anomalies using advanced models. Random forests provide high accuracy and robustness for both classification and regression tasks and have desirable traits for practical applications. Our study highlights the potential of OBD-II data and machine learning in transforming how we optimise the reliability and safety of vehicles.

Personalized Medical Service Matching Platform

Elena-Iuliana TRIFAN

MedMatch addresses the critical need for seamless patient–clinic interaction by combining symptom-based probabilistic diagnosis with specialty recommendations and location-aware clinic discovery. Built on Django, the platform ingests user-reported symptoms to suggest likely diagnoses and directs patients to the nearest qualified clinics, enriched by verified user reviews. Clinics maintain a dedicated dashboard to highlight services, manage bookings, and collect feedback for continuous quality improvement. Early usability testing indicates that MedMatch reduces the time to appropriate care and enhances patient confidence in decision-making. Future work will integrate real-time geolocation and patient-profile data to refine recommendation accuracy and further personalize the user journey.

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