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Exploring Self-regulated Learning Support for AI Related Work in an Insurance Firm

Roziah Mohd Rasdi (Fakulti Pengajian Pendidikan), Nordahlia Umar Baki (Fakulti Pengajian Pendidikan), Fahim Hafiy Idris (Fakulti Pengajian Pendidikan) and Roslina Mohd Rasdi (Language Department, Institute of Teacher Education, Melaka Malay Women Campus).

Self-regulated learning needs (SRL) to be enhanced and supported for sustainability of e-learning and skill development particularly in the context of workplace implementing artificial intelligence (AI). This study explores the support mechanism to SRL experienced by insurance agents in an insurance firm adopting AI technologies. The case study involves seven participants who were purposively selected based on the criteria of the study. Data were analysed using thematic analysis, and then triangulated and checked by members for trustworthiness and credibility. The themes emerged are: (i) training and development for agent; (ii) self-learning initiatives; (iii) knowledge sharing; and (iv) adaptation to change. To conclude, SRL practices require strong support from organization in order to provide stimulating learning environment. In addition, individual agency would empower SRL and make learning more engaging and effective.

Study on the Finite Element Modeling of the Mechanical Stresses of the Samples of Nuclear Structural Materials

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The evaluation of the structural integrity of the components in the active zone of a nuclear reactor is an essential domain for ensuring their good operation and operation under nuclear security conditions, having applicability from the design, manufacturing stages and up to the final decommissioning phase of the installation. Through a preliminary investigation of the stress-strain states present in traditional tensile test specimens, the research aims to highlight the behavior of structural materials operating in the active zone of nuclear reactors. To carry out this study, the finite element modeling method will be used, put into practice with the ANSYS code. The paper describes: the main steps required for the simulation and analysis with finite elements (FEA), the steps taken for the realization of some classical tensile specimens, as well as the simulation and analysis of the mechanical demands for these specimens.

Polyphase Implementation for Gaussian 2D FIR Filters with Circular Symmetry

Doru Florin Chiper ("Gheorghe Asachi" Technical University of Iasi) and Radu Matei ("Gheorghe Asachi" Technical University of Iasi).

This paper presents an analytical design procedure for a Gaussian-shaped circular band-pass 2D FIR filter and also an efficient implementation based on polyphase decomposition. The filter is designed in the frequency domain using a specific frequency mapping applied to a band-pass 1D prototype with Gaussian shape and imposed specifications (peak frequency, bandwidth). The frequency response of the designed 2D FIR filter results directly in factored form. The proposed implementation is described in a simpler case, namely for a smaller size of the filter kernel and also of the input image. Using the polyphase and block filtering approach, a convenient implementation is obtained for the 2D FIR filter at system level, with a relatively low computational complexity.

Enhancing Security and Scalability of Metaverse with Blockchain-based Consensus Mechanisms

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The metaverse is a shared virtual place where people can have engaging digital experiences. Its decentralized and linked nature makes it difficult to scale and keep safe. In this study, we look at how blockchain technology and the consensus processes that go with it could be used to make the metaverse ecosystem more secure and able to grow. Blockchain is a distributed ledger that is both decentralized and transparent. It has important security features like being unable to be changed, being checked with cryptography, and being run without a single authority. With the help of blockchain technology, we can make the metaverse safer and protect users' personal information and virtual identities. In this study, different blockchain-based consensus methods, such as Proof of Work (PoW), Proof of Stake (PoS), and Practical Byzantine Fault Tolerance (PBFT), are compared and contrasted to make sure the metaverse is safe. These consensus methods provide safe, decentralized ways to check transactions, stop wasteful spending, and get everyone on the network to agree on something. Also studied are the limits of blockchain technology's ability to scale in the metaverse, as well as possible scaling options like sharding, sidechains, and off-chain protocols. These methods allow for parallel processing, boost throughput, and cut down on the time it takes to complete a transaction. Because of this, they make the eco-system of the metaverse work better and more smoothly. Combining quantitative analysis, simulations, and experiments, the study method is used to figure out how secure and scalable blockchain-based metaverse consensus methods are. Changes will be measured quantitatively by

looking at key performance factors like the speed of transactions, the throughput of the network, and the amount of resources used.

Importance of Land Use Maps in Statistical Studies of Urban Mobility Based on Signaling Information Provided by Mobile Devices

Gabriel Papuc (Orange Romania and POLITEHNICA UNIVERSITY OF BUCHAREST) and Nicolae Vizireanu (Telecommunication Departament University Politehnica of Bucharest).

The study emphasizes the importance of land use maps in the calculation of statistical indicators from urban mobility studies, based on the signaling of mobile equipment in a mobile phone network. In the restrictive context of the GDPR, the introduction of land use maps in the process of statistical analysis of urban mobility becomes important and helps to distribute mobile network users who have signaled in an administrative territorial unit as close as possible to reality. The study found that, in some cases, it is necessary to use different types of land use maps for an area that is part of an administrative territorial unit, depending on the time of day and the social events that take place in the observation interval in which the statistical study of urban mobility is carried out. The study shows the difference between the methods of distributing mobile network users present in an administrative area. From the tests carried out in the study, a significant difference was found between the uniform distribution of mobile network users detected in a territorial administrative unit and the distribution based on the weight of population density given by land use in each area of the territorial administrative unit. Such weighted distributions, used in urban mobility statistical studies, can bring an advantage in business decision-making by large retailers, marketing agencies, as well as local authorities in planning public transport networks.

Classification of Chest CT Images for COVID-19 Detection Using an Ensemble of Twin CNNs with Decision Fusion

Gabriela-Loredana Ghenea (Polytechnic University of Bucharest) and Victor-Emil Neagoe (Polytechnic University of Bucharest).

This paper presents an approach of COVID-19 detection for chest Computed Tomography (CT) scan images using an ensemble of two twin Convolutional Neural Networks (CNNs) with the same architecture and training technique. For our investigation model, both CNN modules are intentionally trained with asymmetric volumes of training images belonging to the two considered categories (COVID-19 and NORMAL). Each of the CNN modules has been trained using N chest CT scan COVID-19 labeled images and (N/β) NORMAL labeled images, where β is the class asymmetry parameter defined as ratio of training volumes per class. The classification model uses a simple decision fusion technique, based on maximization of the NET functions in the output layer of each of the two twin CNNs. We have evaluated the influence of the asymmetry parameter β on decision performances. By selecting a small training set of only 142 chest CT COVID images, one obtains best detection performances for $\beta =1.5$, corresponding to indices OA of 99.67%, MAR of 0.65% and FAR of 0%.

P2G2P SYSTEM - CASE STUDY FOR A 5 MW PHOTOVOLTAIC PARK

Mihai Culcer (ICSI Energy Department, National Research and Development Institute for Cryogenics and Isotopic Technologies), Mariana Iliescu (ICSI Energy Department, National Research and Development Institute for Cryogenics and Isotopic Technologies), Elena Carcadea (ICSI Energy Department, National Research and Development Institute for Cryogenics and Isotopic Technologies), Maria Simona Raboaca (ICSI Energy Department, National Research and Development Institute for Cryogenics and Isotopic Technologies) and Adrian Enache (ICSI Energy Department, National Research and Development Institute for Cryogenics and Isotopic Technologies).

The results of the studies performed on a P2G system and a G2P system are presented, both used for the production of green hydrogen the energy provided by a 5 MW PV park. Results are materialized in data regarding the monthly distribution of resources and production, as well as those related to revenues and the expenses involved. Ways to increase system efficiency are also suggested.

Research on establishing correlations between the requirements of EN ISO 9001:2015 and EN ISO 3834-2:2021 standards for welded structure manufacturing organizations

Valentin Pîrvu (University Polytechnica of Bucharest), Dumitru Titi Cicic (University Polytechnica of Bucharest), Corneliu Rontescu (University Polytechnica of Bucharest) and Ana Maria Bogatu (University Polytechnica of Bucharest).

The main objective of the quality management system is to satisfy the requirements of customers, to generate their confidence in the ability of an organization to permanently satisfy their requirements, needs and expectations. According to an ISO survey published in September 2022, worldwide, the most frequently used standard by organizations within their management system is EN ISO 9001:2015. Welded structure manufacturing organizations that use fusion welding processes often aim to implement quality requirements for fusion welding of metallic materials, therefore, most often, they want to implement the EN ISO 3834-2:2021 standard. In the paper, the authors identified the correspondence between the requirements of the two references, including the presentation of some situations identified as non-conformities during an internal audit that had as audit criteria, among others, the requirements of the two standards, EN ISO 9001:2015 and EN ISO

3834 -2:2021. The final aim of the paper was to facilitate the integration of the EN ISO 3834-2:2021 standard requirements within the organizations that have already implemented the quality management system according to EN ISO 9001:2015.

Modified Low Power High Speed Approximate Adders For Energy Efficient Arithmetic Applications

Moola Vamsi Krishna Reddy (Mohan Babu University), Nusum Raja Sekhar Reddy (Mohan Babu University), Pinnepalli Naveen Kumar (Mohan Babu University), Ramireddy Praneeth Kumar Reddy (Mohan Babu University), Musala Sarada (Vignan University) and Dr Avireni Srinivasulu (Mohan Babu University, Tirupati, India).

The suggested circuits are crucial for increasing the effectiveness of circuit design in approximate computing since they are related to the design of approximate full adders for energy-efficient arithmetic applications. Adders, which are essential to computing machines, are composed of the building blocks of arithmetic circuitry. Digital signal processing applications commonly use arithmetic circuits, based on MOSFET technology. Using the Cadence Virtuoso tool and 90 nm CMOS technology, the suggested new designs are simulated. The proposed innovative circuits are examined and evaluated using Cadence Software for latency, power consumption, and mistakes.

Field-Oriented Control Based on Nonlinear Techniques for Wind Energy Conversion Systems

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This work represents the modeling, control, comparison, and simulation of the doubly fed induction generator (DFIG) based wind energy conversion system. In order to control the reactive and active power, synergetic control and super twisting algorithm are suggested. These two methods are used to overcome the problems of field-oriented control (FOC). So, it is necessary to conduct a comparative study between the two proposed strategies to know the best way to control the generator. Therefore, Matlab software is used to perform this comparison, where the focus is on current quality, ripple reduction ratio, power, dynamic response, robustness, and degree of complexity. According to the observations, the super-twisting algorithm outperforms the synergetic control in terms of minimizing harmonic current distortion and significantly reducing ripples in reactive and active power, which also granted acceptable solidity towards parametric variations.

Closed form of the Power Spectral Density for GFDM signals

Srinivas Ramavath (KIIT University), Bhargav Appasani (KIIT University), Nicu Bizon (University of Pitesti) and Umesh Chandra Samal (KIIT University).

Due to its desirable characteristics, a generalised multicarrier modulation called Generalized Frequency Division Multiplexing (GFDM), has widespread use in contemporary communication systems. Several methods, such as spectral precoding and pulse shaping, have been developed to shape multicarrier signals' power spectral density (PSD) due to its comparatively high out-of-band radiation. We arrive at a general PSD formulation that is applicable to pulses employed in various subblocks. The wide-sense cyclostationarity and properness statistical hypotheses are the only ones that apply to the vector-valued sequence modulating the active subcarriers. It is discussed whether the based on competence to certain well-known multicarrier systems. The applicability of the GFDM system result is examined.

IT integration concept for Integrated Local and area public Interest Service providers

Aurel Mihail Titu (Lucian Blaga University of Sibiu), Dorin Vasile Deac Suteu (Politehnica University of Bucharest), Maria Popa ("1 December 1918" University of Alba Iulia), Alina Bianca Pop (Technical University of Cluj Napoca) and Diana Dragomir (Technical University of Cluj Napoca).

Currently, a significant category of problems that arise during the evaluation and monitoring process of activities carried out in/for the public interest are related to differences in the understanding of monitoring and evaluation terms. Monitoring is the process of continuously collecting relevant information on how a policy is implemented, while evaluation is the process of using the information obtained during monitoring. In most situations, monitoring and evaluation are seen as simple, periodic tasks, limited in time to simple implementation monitoring reports (such as once a month or every three months, or at the beginning and at the end...) and therefore do not generate essential results and knowledge gained. This paper includes the analysis and presentation of an implementation concept of an IT integration solution between suppliers that also creates a correlation of specific quality indicators for public utility activities.

Movie Recommendation System

Rohit Kumar (ABES Engineering College ,Ghaziabad), Vishal Singh (ABES Engineering College , Ghaziabad) and Akhilesh Kumar Srivastava (ABES Engineering College , Ghaziabad).

Modern recommendation systems, which utilise collaborative filtering techniques to predict users' preferences, have revolutionised the way we search for objects of interest. Various areas, such as books, news, articles, music, videos, and movies, make extensive use of recommendation algorithms. this research present MRS, a collaboration filter-based movie recommendation system. MRS use user-supplied data to recommend films that is most relevant to the user at the moment. The suggested movie list is ranked using the K-means algorithm, which is based on past user ratings. MOVREC also assists customers in quickly and successfully finding their preferred films based on the experiences of other users. Dreamweaver 6.0 and Apache Server 2.0 were used to generate the PHP code for this system. To create suggestions, the proposed recommendation system uses user-specific knowledge and data, as well as information about accessible items and recent transactions. Users may effortlessly navigate the recommendations and discover a movie of their choosing without wasting time on useless information.

Optimum Energy Management of the Price-Maker Virtual Power Plant including Electric Vehicles

Hossein Shayeghi (University of Mohaghegh Ardabili), Nafiseh Taati (University of Mohaghegh Ardabili), Seyedjalal Seyedshenava (University of Mohaghegh Ardabili), Alireza Rahnama (University of Mohaghegh Ardabili) and Nicu Bizon (University of Pitesti).

The optimal energy management of a price-maker (PM) virtual power plant (VPP) that trades in the energy market (EM) and reserve markets (RMs) is the topic of this paper. The VPP sets prices in the EM and RMs and evaluates its offerings one day in advance to heighten its profit. It consists of an electric vehicle fleet, a wind farm, traditional generators, fixed energy storage, and flexible loads. A bi-level model is used to formulate the PM VPP's energy management challenge. The second level problem's objective is to clear the markets while taking the participants' social welfare in to consideration, whereas the first level problem's objective is to heighten the expected profit of the VPP. The bi-level model is converted to a single-level model by replacing the Karush-Kuhn-Tucker (KKT) conditions. The results of this study demonstrate that VPP may significantly boost its profit by setting market prices. The consideration of electric vehicles (EVs) in VPP also increases the profit of the VPP and improves energy management.

An Efficient Mixed Integer Nonlinear Program Model for Optimal Localization of Pressure Reducing Valves in Water Distribution Systems

Pham Duc Dai (Thuyloi University).

Water loss reduction in water distribution systems (WDSs) is a challenging task for water utilities worldwide. One of the most reliable and cost- effective ways to reduce water loss is to properly regulate operational pressure of the system through optimizing pressure reducing valve (PRV) placements and operations. This well-known engineering problem can be casted as a mixed-integer nonlinear program (MINLP) where binary variables are introduced to represent positions of PRVs. The existing MINLP model having been used until now for optimizing PRV locations is proven to be hard for MINLP algorithms based gradient methods and therefore is only suitable for small-scale WDSs with a limited number of demand patterns. In this paper, newly non-smooth constraints are proposed to model whether PRVs are placed on links for the optimal PRV locating problem. Since these constraints can be approximated by relaxed forms of complementarity inequalities, high quality MINLP solution can be achieved in a reasonable computation time. To demonstrate the efficiency of our new modeling approach, we compare the performance of the newly formulated MINLP with the existing one for solving optimal PRV locating problems for two case studies. The results have shown that using our new MINLP model, better and more reliable MINLP solution can be found even for WDSs with multiple demand patterns

Web-based Application for Dynamic Management of Hotel Reservations (Multi-tenant Highly Scalable Application in an Autoconfiguration Dataroom)

Joseph Wewasse Mahomy (University Politehnica Bucharest) and Maria Ioana Oproiu (University POLITEHNICA of Bucharest).

Conducting work to set up a dynamic hotel reservation management website; above all requires technical documentary skills (indexing, classification) but also a certain culture of modern information systems and various processing and dissemination tools on the Internet; hence the need for a reminder of some concepts related to web technologies, which technologies are used in this work. Our paper presents a hosted architecture fit for a highly scalable application.

Breast Cancer Detection using Thermal Infrared Image Analysis based on Dempster-Shafer Decision Fusion of CNN Classifiers

Iulia-Ramona Macașoi (Polytechnic University of Bucharest) and Victor-Emil Neagoe (Polytechnic University of Bucharest).

Breast cancer is the second most lethal kind of cancer worldwide. On the other side, thermography is a promising technology for early detection of breast cancer. We propose a new model of breast cancer detection in thermal infrared imaging using an ensemble of two Convolutional Neural Networks (CNNs). The considered classifier applies decision fusion according to Dempster-Shaffer theory. The considered CNN modules have an identical architecture, but they use an asymmetric training procedure. The ratio between the number of cancer labeled training thermograms and the normal training thermograms corresponding to first CNN module is denoted by k. The corresponding ratio for the second CNN module is chosen to be (1/k). We have evaluated the influence of the asymmetry training parameter k over the decision fusion classifier performances. One obtains the maximum overall accuracy (OA) of 98.02%, by choosing the parameter k of 1.2.

Impact of Feature Encoding on Malware Classification Explainability

Elyes Manai (Université Laval), Mohamed Mejri (Université Laval) and Jaouhar Fattahi (Université Laval).

This paper investigates the impact of feature encoding techniques on the explainability of XAI (Explainable Artificial Intelligence) algorithms. Using a malware classification dataset, we trained an XGBoost model and compared the performance of two feature encoding methods: Label Encoding (LE) and One Hot Encoding (OHE). Our findings reveal a marginal performance loss when using OHE instead of LE. However, the more detailed explanations provided by OHE compensated for this loss. We observed that OHE enables deeper exploration of details in both global and local contexts, facilitating more comprehensive answers. Additionally, we observed that using OHE resulted in smaller explanation files and reduced analysis time for human analysts. These findings emphasize the significance of considering feature encoding techniques in XAI research and suggest potential for further exploration by incorporating additional encoding methods and innovative visualization approaches.

Industrial PCB design for an H-bridge

Victor Stoica (POLITEHNICA University of Bucharest), Valentin Alexandru Stan (POLITEHNICA University of Bucharest) and Razvan Andrei Gheorghiu (POLITEHNICA University of Bucharest).

The H-bridge is a typical structure commonly used in electronics to connect a load to a DC supply in both forward and reverse bias, or to control DC, three-phase, multi-phase, or stepper electric motors. In addition to motor control, they are used in inverters that convert DC electricity to alternating current. Some challenges related to hardware development include the implementation of protection features and control procedures for equipment. In this paper, the authors propose hardware solutions for the realization of an H-bridge with both local control and remote control via 4G network, designed for industrial environments. These have been tested for validation using a prototype

Data Protection Device

Teodor BĂrbuceanu (Politehnica University of Bucharest), Răzvan CrĂciunescu (Politehnica University of Bucharest) and Eduard-Cristian Popovici (Politehnica University of Bucharest).

Data protection devices encompass a wide range of hardware and software solutions designed to secure data at rest, in transit, or in use. Data Protection Device (DPD) has been implemented both at the software and hardware levels, aiming to protect the information stored within storage media or destroy it in case the devices have been stolen. All these mechanisms are protected by the implementation of a physical component whose role is to verify the application of the instituted measures. In this paper we present a method that uses a signal based on the International Mobile Equipment Identity number and permanently blocks access to the internal storage, disabling it.

The X-ray and light fields alignment in diagnostic radiology

Radu Bazavan (MED-INNO™, Med-Inno Time Ltd, Ramnicu Valcea, Romania).

The alignment of X-ray, light and detector fields is a crucial acceptability criterion for a radiological system to perform exposure with all correct geometrical projections, thus ensuring an adequately limited and predictable irradiation dose for the patient. However, collimation, according to the investigated tissue performed by the medical staff over misaligned fields, can cause overexposure of the patient due to the larger radiation area than the visible area that was taken into account. Furthermore, as a result of this exposure, a clinically relevant image is not obtained, and the radiological investigation procedure needs to be repeated, which attracts another dose of radiation to be sent to the patient. Therefore, for the radiological equipment, a seemingly simple but, in practice, comprehensive check can significantly reduce the delivered dose, including the unwanted effects of ionizing radiation on human tissue. This paper exhibits and explains the delicate aspects that can negatively affect the work process associated with handling activity and applying the acceptability criteria

for using radiological systems in the diagnostic radiology department. There is also mentioned one of the primary causative sources that can lead to this field alignment errors and the overexposure consequence to avoid its occurrence. The last part of this paper gives a step-by-step example as guidance to check the alignment and centring of the radiological image fields along with the acceptable obtained values.

System for Smart Blood Donation and Stimulation with Blockchain

Florentina Magda Enescu (University of Pitesti), George-Cătălin Flintaşu (University of Pitesti - student), Mariana Mirela Jătaru (University of Pitesti - student), Nicu Bizon (University of Pitesti) and Valeriu Manuel Ionescu (University of Pitesti).

Thus, the purpose of this research, which uses blockchain technology, is to considerably increase the number of frequent donors by stimulating them with virtual currencies, which can be used to pay for medical services, investigations, medicines, even therapy programs, recovery, etc. As a result, a blood donation system architecture based on cryptocurrency, smart contract and distributed database is proposed by involving blockchain technology. A simple coin named - BloodCoin is being created, with a limited number from launch. The created database will contain all the donors registered on the platform. The virtual wallet will also be linked to the database. Experimentally, the steps that must be taken to be able to use virtual currencies are presented. This proposed stimulation system may have global implications in terms of attracting a greater number of volunteers in the blood donation process. The database can serve in crisis situations so that the donor is requested to solve emergencies.

Arrhythmia Classifier Based on Ultra-Lightweight Binary Neural Network

Ninghao Pu (Southeast University), Zhongxin Wu (Southeast University), Ao Wang (Southeast University), Hanshi Sun (Southeast University), Zijin Liu (Southeast University) and Hao Liu (Southeast University).

Reasonably and effectively monitoring arrhythmias through ECG signals has significant implications for human health. With the development of deep learning, numerous ECG classification algorithms based on deep learning have emerged. However, most existing algorithms trade off high accuracy for complex models, resulting in high storage usage and power consumption. This also inevitably increases the difficulty of implementation on wearable Artificial Intelligence-of-Things (AIoT) devices with limited resources. In this study, we proposed a universally applicable ultra-lightweight binary neural network(BNN) that is capable of 5-class and 17-class arrhythmia classification based on ECG signals. Our BNN achieves 96.90% (full precision 97.09%) and 97.50% (full precision 98.00%) accuracy for 5-class and 17-class classification, respectively, with state-of-the-art storage usage (3.76 KB and 4.45 KB). Compared to other binarization works, our approach excels in supporting two multi-classification modes while achieving the smallest known storage space. Moreover, our model achieves optimal accuracy in 17-class classification and boasts an elegantly simple network architecture. The algorithm we use is optimized specifically for hardware implementation. Our research showcases the potential of lightweight deep learning models in the healthcare industry, specifically in wearable medical devices, which hold great promise for improving patient outcomes and quality of life. Code is available on: https://github.com/xpww/ECG_BNN_Net

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Feature selection using genetic algorithms for improving accuracy in image classification tasks

Andrei Dugăeșescu (University Politehnica of Bucharest) and David Iancu (University Politehnica of Bucharest).

Feature selection can be an effective tool for increasing the robustness and predictive accuracy of classifiers, especially in the presence of noisy features or when their dimensionality is high. Genetic algorithms (GA) lend themselves well for optimizing the search for the best subset of features. This paper present how GA can be integrated in the training of neural networks (NNs) as a feature selection step in order to increase the model performance. The reported experiments cover the effect such a technique can have when confronted with various sizes for the trained NN in the context of both harder and easier datasets.

Preparing students for university and research careers in science and engineering

Maria Magdalena Dicu (University of Pitesti), Ancuța Mihaela Bălteanu (University of Pitesti) and Monica Bâldea (University of Pitesti).

In this review, the authors examine the strategy of professional training of students, preparation for academic and research careers in science and engineering, and the main types of funding support sources. This review aims to improve understanding of careers in today's dynamic work environment and provide major directions for future research.

Statistical Analysis of Capacity Loss for Stored Batteries

Luminita Constantinescu (University of Pitesti), Bogdan-Adrian Enache (University Politehnica of Bucharest), Georgiana Dogaru (University of Pitesti), Teodor-Iulian Voicila (University Politehnica of Bucharest), Irina Vilciu (Universitatea Politehnica din Bucuresti) and Silvia Vasile (Transelectrica S.A.).

Lithium-ion battery production is generally geared towards current demand from the main sectors: electric vehicles, consumer electronics, and energy storage. These sectors typically require the batteries to be as fresh as possible to ensure maximum lifespan and performance. Still, sometimes manufacturers work with buffer stocks and deliver batteries from different production series. In this context, the present paper examines stored batteries' capacity loss, employing an exhaustive statistical study. This study aims to establish if the capacity loss is statistically significant and can lead to battery pack unbalances.

Improving Air Pollution Forecasting in Smart Cities using Clustering Techniques

Maria Viorela Muntean (1 Decembrie 1918 University of Alba Iulia, Romania).

Air quality is a main concern for smart cities policies nowadays. This paper presents an approach for predicting Particulate Matter (PM) for air pollution using clustering techniques. Instead of predicting PM values for the entire dataset, better results were obtained when forecasting air pollution values for each discovered cluster.

Blockchain Technology in Improving Transparency and Efficiency in Government Operations

Abdusamad Nigmatov (New Uzbekistan University), Aneesh Pradeep (New Uzbekistan University) and Nafisa Musulmonova (New Uzbekistan University).

Blockchain technology has garnered significant attention and investment in various industries, including the government and public sector. This research paper explores how blockchain technology can enhance government operations by making them more transparent and efficient. A literature review and case studies of blockchain implementation in government are conducted to identify the key benefits and challenges of this technology. The results of the analysis indicate that blockchain technology has the potential to increase transparency and ac- countability in government operations, streamline processes, reduce costs, and enhance citizen trust. Recommendations for the implementation of blockchain technology in government is provided, and future research directions are identified.

Provision of IT security access to integrated applications for Local and Regional Utility Service providers approach

Dorin Vasile Deac Suteu (Politehnica University of Bucharest), Aurel Mihail Titu (Lucian Blaga University of Sibiu), Maria Popa ("1 December 1918" University of Alba Iulia), Alina Bianca Pop (Technical University of Cluj Napoca) and Diana Dragomir (Technical University of Cluj Napoca).

The purpose of application security is to protect software application code and data from malicious action. Application security can be addressed at any stage of the operational process, including the design, development and deployment stages of the IT application, so the scope of what protects application security is constantly growing to adapt to new attack vectors and threat methods. The article aims to perform an analysis of the potential dangers that can affect IT applications to enable management to properly rank the importance of different aspects of information security. Using security access management (SMA) as a tool to measure compliance and risk on the application portfolio in terms of potential exploits, vulnerabilities, misconfigurations and exploitable interfaces is one way to improve cyber security. Another way to improve cybersecurity is the use of multi-factor authentication. SMA can help mitigate risks that are related to insufficient or improperly implemented application security scans, security issues that continue to exist beyond established deadlines for established security standards, and over-privileged or unused access in security tools.

Optimized Architecture for Modular Online Store Based on Microservices for Heavy Load Transactional User Traffic

Alpha Amadou Balde (University Politehnica of Bucharest) and Constantin Viorel Marian (University Politehnica of Bucharest).

This paper proposes an optimized architecture that describe how to build a modular online web application based on micro services. The important benefit for this approach is the handling of a very heavy load traffic. This benefit is even more important when the application handles transactional traffic as used by major online commercial store applications. Cost wise, the implementation is using only open source software, no licensing is required.

Databases restoration processes in intellectual property organizations

Aurel Mihail Titu (Lucian Blaga University of Sibiu), Radu Costin Moisescu (Politehnica University of Bucharest) and Mihai Dragomir (Technical University of Cluj Napoca).

The scientific paper represents original research and analysis of the impact of the use of computerized data deduplication technologies in cases of restoring the Informix databases. Along with the economic growth, a permanent increase in the volume of computerized data was noted, thus showing the need to implement high-performance backup systems in different storage environments. In this context, it was concluded that it is necessary to ensure an improvement of the systems and applications management through which the processes of restoring these volumes of data are ensured. The presented research is a personal point of view of the authors, being argued on the basis of studies and tests carried out in the available computer systems with the aim of streamlining restoration processes and also testing the availability of permanent computer data.

Two-Stage Framework for Steady-State Analysis of Low Voltage Electric Distribution Networks Integrating Photovoltaic Prosumers

Gheorghe Grigoras ("Gheorghe Asachi" Technical University of Iasi), Bogdan-Constantin Neagu ("Gheorghe Asachi" Technical University of Iasi) and Vasilica Dandea ("Gheorghe Asachi" Technical University of Iasi).

The increasing number of photovoltaic systems integrated into the low voltage electric distribution network has raised the concerns of the Distribution Network Operators in the last period. Due to the various technical issues that affect the electric distribution networks, they should pay more attention to the data collected by the smart meters installed to the end-users (consumers and prosumers). This data should process with efficient data-driven algorithms and used in steady-state calculations. This paper proposes a two-stage framework that allows the Distribution Network Operators to analyze the steady state of the low-voltage electric distribution networks incorporating the PV prosumers. It will also help them improve the efficiency of their monitoring and analysis tools. The framework has been tested in a real LV EDN and obtained results confirmed their efficiency.

A Novel Approach for Hyperspectral Image Classification using Bat Algorithm to Optimize a CNN Classifier

Liviu Rujan (Polytechnic University of Bucharest) and Victor-Emil Neagoe (Polytechnic University of Bucharest).

We propose a novel hybrid classifier for hyperspectral images using Bat Algorithm (BA) to optimize the architecture of a Convolutional Neural Network (CNN). BA is applied by minimization of the CNN cross-entropy on the validation set. The objective function is represented as a matrix containing the parameters which define the CNN architecture. The proposed BAT-CNN classifier is evaluated on three hyperspectral datasets: Indian Pines, Pavia University and Salinas. The experiments lead to a better accuracy for the proposed hybrid classifier by comparison to the standalone CNN classifier, for each of the three considered datasets.

Fast Quality-Aware AMDF Based Pulse Rate Estimation from Compressed PPG Measurements for Wearable Vital Signs Monitor

P N Sivaranjini (Indian Institute of Technology Palakkad), M Sabarimalai Manikandan (Indian Institute of Technology Palakkad) and Linga Reddy Cenkeramaddi (University of Agder, Grimstad).

Modern wearable or portable health monitoring devices are capable of photoplethysmogram (PPG) sensing, processing, analyzing, storing and transferring signal and parameters wirelessly but are generally energy constrained and have more false alarms under noisy PPG recordings. In this paper, we present computationally-efficient reliable pulse rate (PR) estimation in compressed sensing (CS) domain. The proposed CS-PPG based PR estimation method consists of measurement generation, high-pass filtering, average magnitude difference function (AMDF) features based signal quality assessment (SQA), and AMDF based quality-aware PR estimation. The proposed unified framework is evaluated using a wide variety of normal and pathological PPG signals taken from five standard databases. The proposed framework had an average sensitivity (SE) of 98.75% and specificity (SP) of 63.35%. Results show that the CS-PPG based quality-aware PR estimation method had a mean absolute error (MAE) of 3.1 ± 4.6, Bland-Altman ratio (BAR) of 9.2% and root-mean-square error (RMSE) of 5.6 which are not only comparable with results of the PR estimation method with the original PPG signals but also the proposed framework reduces 80% of the overall computational load. The proposed unified framework has great benefits in reducing processing time and energy consumption and thus can maximize battery lifetime of battery-operated health monitors.

Handling Delayed Labeling of EEG Data Stream using Semi-Supervised Label Propagation

Hayder K. Fatlawi (Eötvös Loránd University) and Attila Kiss (Eötvös Loránd University).

Research interest in data stream classification is increasing through the development of adaptive machine learning techniques. These techniques involve continuously adjusting the classification model in response to changes in the data distribution. Most of these techniques assume instance labeling for the classes to perform the model adapting process, and this assumption is rare with actual data. This work proposes using a semi-supervised label propagation technique to infer many delayed labels (considered missing values) from limited known values in a data stream. The work's implementation included using two imbalanced EEG datasets, CHB-MIT Scalp and Siena Scalp datasets, to evaluate the proposed method with various values for missing ratios. The results showed the proposed method's ability to recover all the negative class values in both datasets with a missing percentage reaching 70%. Due to the rare positive class, the recovery of its value decreased with more than 30% missing ratio.

Upgrading Legacy Automation Equipment to Achieve Industry 4.0 Compatibility

Marius Constantin Marica (Doctoral School of Electronics, Telecommunications and Information Technology Politehnica University of Bucharest), Nicu Bizon (Department of Electronics, Communications and Computers University of Pitesti) and Ionel Bostan (Department of Electronics, Communications and Computers University of Pitesti).

The development of the Industry 4.0 concept has led to a significant gap between the equipment already existing in industrial plants and current technological standards. This gap can adversely affect efficiency and productivity, requiring significant investment in upgrading equipment to keep pace with new technologies. This paper proposes a solution to reduce this gap and at the same time improve the performance of old equipment by integrating a web server into the PLC structure and using I/O-Link devices. This solution aims to transform old equipment into intelligent devices capable of adapting to environmental and production changes without requiring a complete system reconfiguration, which may be a more cost-effective and feasible option than complete replacement. Through the integration of smart features, the upgrade of older equipment to comply with Industry 4.0 standards allows for adaptive functionality without the need for extensive reconfiguration. This transformation facilitates smooth data exchange, real-time monitoring, and augments operational efficiency, productivity, and flexibility.

MTAFinder - Unified OSINT platform for efficient data gathering

Cristina-Oana Rafailă (Academia Tehnică Militară "Ferdinand I"), Florina Gurzău (Academia Tehnică Militară "Ferdinand I"), Constantin Grumăzescu (Academia Tehnică Militară "Ferdinand I") and Ion Bica (Academia Tehnică Militară "Ferdinand I").

Due to the digital age and advancements in technology, an enormous amount of publicly available information is generated. Open Source Intelligence (OSINT) is a term used to describe the search, collection, analysis and use of information from open sources. OSINT has emerged as a formidable tool in cybersecurity, transitioning from its basic usage in social engineering to becoming a powerful tool in red teaming exercises and seamlessly integrating into the fabric of digital forensics. OSINT environment is constantly evolving with the emergence of new use cases and tools. This paper presents MTAFinder, a cross-platform application for automated data collection that integrates OSINT open source tools and free online services. The platform is highly modular, scalable and provides a web API designed mainly to gather data about people, phone numbers, web domains, e-mail addresses and IP addresses.

Design and Implementation of an Experimental Model for the Control and Telemonitoring of a 27.5kV High Voltage Bipolar Circuit Breaker with Vacuum Switching

Cristina Gabriela Săracin (University POLITEHNICA of Bucharest) and Bogdan-Adrian Enache (University POLITEHNICA of Bucharest).

The paper presents the design, components and implementation of the laboratory model created for the control and telemonitoring of a 27.5kV high voltage bipolar circuit breaker with vacuum switching. This proposed experimental model was used in testing in laboratory conditions of a remote control and telemonitoring system for an outdoor high voltage bipolar circuit breaker (Un=27.5kV, In=1250A, Ik= 25kA). This monitoring and control system is designated to traction substations used in the railway system and it is used to powering 25 kV electric lines. The remote control and telemonitoring system of the high voltage circuit breaker is a component of the experimental-demonstrative project 696PED/2022 started by the authors of this paper last year.

Intelligent System for Monitoring and Controlling the Energy Consumed

Cosmin-George Nicolăescu (University of Pitesti - master's student), Florentina Magda Enescu (University of Pitesti), Nicu Bizon (University of Pitesti, University Politehnica of Bucharest), Ana-Maria Țugulea (SNSPA, University Politehnica of Bucharest) and Valeriu Manuel Ionescu (University of Pitesti).

In the paper, a fuzzy logic-based system has been proposed representing an innovative solution for monitoring and controlling the consumption of electrical energy in houses or workspaces. Fuzzy logic is differentiated from Boolean logic by the fact that it is based on the imprecise decisions of people, so the truth values of the variables can be any real number between 0 and 1, where zero is considered the smallest form of truth, and one represents the state with the highest degree of truth allowed. The use of fuzzy logic allows automatic identification of consumption needs and available resources, allowing automatic adjustment of electricity consumption. This solution represents a way to make energy processes more efficient in order to reduce the costs of energy bills and carbon emissions, by using green energy. The implementation of this solution can contribute to the development of smart and ecological homes, and the use of fuzzy logic can improve energy efficiency, lower costs and reduce energy losses.

6G Initial Developments for Flagship Applications Experiments

Cristian Patachia (Orange Romania, Gheorghe Asachi Technical University of Iasi), Razvan Mihai (Orange Romania) and Marius Iordache (Orange Romania).

As the world transitions into the next generation of wireless communication technology, namely 6G, the potential for revolutionary advancements in connectivity and data transfer becomes increasingly evident. With the growing demands for higher bandwidth, ultra-reliable low-latency communications, and massive machine-type communications, 6G is expected to address the limitations of existing networks and unlock new possibilities for transformative use-cases in the year 2030. This research paper aims to provide a comprehensive analysis of the new software requirements needed for the transition towards future networks, drawing on currently available 5G Stand-Alone (SA) experimentation testbeds that implement the 3GPP Release 16 standard. It also looks at the new envisioned use-cases for 6G, developed in the context of EU founded research and innovation projects, focusing on the projected trends, requirements and initial developments that will shape the 6G landscape. Additionally, with its focus on the KPIs needed for B5G and 6G applications, the paper highlights the pressing need for an updated architecture to accommodate the unique challenges posed by the future cellular networks standards.

Experimental Comparison of STR and PI Controllers on a Nonlinear Liquid-Level Networked Control System

Hamid Reza Chavoshi (K. N. Toosi University of Technology.), Amir Hossein Salasi (K. N. Toosi University of Technology.), Omid Payam (K. N. Toosi University of Technology.) and Hamid Khaloozadeh (K. N. Toosi University of Technology.).

This paper discusses the design, practical implementation, and comparison of the adaptive controller using the indirect self-tuning regulator (STR) method and PI controller for a liquid-level networked control system. The system model is identified by using the least squares (LS) method and design a PI controller tuned by Ziegler-Nichols method. Also, the system parameters are estimated online, using the recursive least squares (RLS) method to implement the indirect STR adaptive controller. With the help of the estimated parameters, the STR controller should be designed through pole placement. To compare the performance of the controllers, the dynamics of the liquid-level control system have been changed by placing an external heterogeneous object inside the tank. Adaptive controllers are used in systems with variable parameters to detect dynamic changes and control the system appropriately. The results show that the indirect STR adaptive controller performs better than the PI controller in both transient and steady-state responses.

Web- Services Scheduled Outage Modeling

Swati Goel (Central University of Jammu) and Arvind Selwal (Central University of Jammu).

In mission-critical system's, any outage can severely impact the smooth functioning of the system. In Service Oriented Architecture (SOA)-based system, services are composed of multiple available services providing different functionalities. During the maintenance period or service upgradation, some services can become unavailable for a certain period of time. This process is known as a scheduled outage which has to be managed during maintenance or upgradation of the service. In order to effectively manage the scheduled outage of service, this study proposes Complex Service Scheduled Outage Model (CSSOM) in terms of the availability and unavailability of services in SOA-based system's. The model can assist in predicting- the dépendent services that are UP/Down during the outage period. This will help in early planning the outage of various services by taking appropriate mitigation action. Services unavailability/ availability cases in CSSOM are represented using rule-based technique in Machine Learning.

Electro-Thermal Equivalent Circuit of Lithium-Ion Battery Using COMSOL

Fatih Durmus (Ondokuz Mayis University Electrical and Electronics Engineering) and Serap Karagol (Ondokuz Mayis University Electrical and Electronics Engineering).

In this paper, the significance of electro-thermal equivalent circuits in enhancing the performance and safety of lithium-ion batteries is discussed. The electro-thermal equivalent circuit effectively models battery behavior by incorporating temperature distribution and internal resistances. The methodology for generating the equivalent circuit is described, employing physical analogies and establishing an analogy between electrical and thermal variables. The equivalent circuit represents the battery as a network of nodes and resistors, with voltage symbolizing temperature and current symbolizing heat flow. Additionally, the paper elucidates the process of simulation and data acquisition using COMSOL software, enabling the retrieval of temperature and heat flux values under various boundary conditions. The obtained data is utilized to construct the equivalent circuit and determine its parameters. The paper concludes with the testing and evaluation of the equivalent circuit's accuracy in predicting temperature values. The conducted tests demonstrate an accuracy exceeding 90%, affirming the reliability of the proposed approach.

Optimal Placement and Sizing of Static Var Compensators in Radial Distribution Networks Using Artificial Intelligence Techniques

Hussein Jafrouni (Karabuk University), Mohamed Almaktar (College of Electrical and Electronics Technology), Faisal A. Mohamed (Authority of Natural Science Research and Technology), A. M. Elbreki (Authority of Natural Science Research and Technology) and Zakaria Rajab (Benghazi University).

Energy conservation and efficiency are necessary actions in electrical power system. Therefore, the wasted energy that is dissipated in the transmission network needs to be minimized. The power loss can be reduced by using many techniques, including the use of reactive compensators. In this paper, intelligent algorithms are examined to find the best site and size of reactive compensators so as to improve the performance, power quality and economics of radial electrical networks. A Matlab program has been developed to find the status of a radial distribution network in terms of power flow, losses, and bus voltages. Two artificial intelligence (AI) algorithms namely genetic algorithm (GA) and particle swarm optimization (PSO) have been developed to cater for the optimal position and amount of reactive power compensation. The programmed approaches were tested in reference network of IEEE 15-bus system and then implemented on the Syrian network, specifically Al-Mayadeen distribution network comprising 64-bus. Transient Electrolyzer Program (ETAP) was used to simulate the different power systems. The study showed that the GA is superior and outperforms PSO in reducing total power loss hence the cost and also improving voltage profile. Overall, the two examined techniques can be used in any radial electrical network.

Experimental Research for the Analysis and Classification of EEG Signals With the Aim of Identifying Brain Activity Under the Mental Calculation Tasks

Daniela Andreea Coman (University of Pitesti), Silviu Ionita (University of Pitesti, Department of Electronics, Computers and Electrical Engineering) and Ioan Lita (University of Pitesti, Department of Electronics, Computers and Electrical Engineering).

This paper presents the results of some experimental studies on the electrical activity of the brain under the conditions of mental arithmetical tasks. It is known that the recognition of evoked potentials from brain bioelectrical signals is a difficult problem mainly due to the cumulative effects of brain waves and the very small level of the signal. The discrimination of states of mental activity specific to arithmetic calculation tasks in relation to the state specific to their absence is investigated by frequency analysis techniques of EEG signals and their classification by topological and temporal criteria. An EEG Biosemi system with 64 electrodes and three basic scenarios for mental tasks that were applied several times to the same subject were used for data acquisition. Each EEG signal was filtered in the dedicated bands δ, θ, α, β, and Υ. The results in this paper are based on the spectral power analysis for two specific bands: α, β. The evolution of the spectral peaks over time for all 64 recording signals provides a spatial temporal mapping of the electrical activity of the brain to identify the most relevant response channels and identify the most suitable conditions for discriminating mental states using a larger number of electrodes compared to other similar research reported.

Remaining Useful Life Prediction Method for the Rolling Element of an Electrical Machine Using Linear Regression Analysis of the Vibration Signal of a Faulted Bearing

Syed Safdar Hussain (National University of Sciences and Technology, NUST Islamabad, Pakistan) and Syed Sajjad Haider Zaidi (National University of Sciences and Technology, NUST Islamabad, Pakistan).

The anticipation of potential failures and provision of early warning signals are enabled by predictive maintenance, playing a vital role in ensuring the optimal performance and reliability of electromechanical systems. In this context, the research presents an effective and efficient approach for predicting bearing faults, focusing on the analysis of vibration signals from rolling elements, particularly bearings. By applying linear regression analysis, the vibration signal from each bearing sample is transformed into the frequency domain, enabling the calculation of the area under the curve. To estimate the remaining useful life (RUL) of the bearing, the research utilizes linear regression analysis, where the slope of the regression line serves as a crucial indicator. By proactively detecting and resolving potential faults, industries can effectively minimize costs linked to unexpected downtime, urgent repairs, and component replacements. Notably, the study utilizes benchmark data sourced from the NASA prognostics data archive.

Security Considerations at the Service Level Agreement in Cloud Computing Services

Malin Stefan (PhD student SD-ETTI, Polytechnic University of Bucharest), Mandita Dragos (PhD student SD-ETTI Polytechnic University of Bucharest), Chirana Paul (PhD student SD-ETTI Polytechnic University of Bucharest) and Babarada Florin (DCAE-ETTI, Polytechnic University of Bucharest).

This paper aims to identify the importance of Service Level Agreement (SLA) security in the low usage of Cloud Computing services in the economy. The first part of the article presents the shortcomings in the adoption of cloud services, showing the statistical level of adoption by country and industry. In the second part, the concept of SLA regarding the document that governs the cloud computing customer-provider relationship and the most important criteria for developing an SLA are presented. In order to provide services with a high level of confidence, the most important metrics for ensuring security at the SLA level are presented. In the last part, to increase trust in cloud services, a set of metrics that can be included in SLA

documents are proposed. These are the availability and maintenance time, list of services and resources that are offered by the provider to customers, application response time, advance notification schedule of network changes that may affect users, help desk response time for different categories of issues, consequences in case of breach of the agreement.

An Improved Fast Terminal Sliding Surface for Step-Down Converter

Cagdas Hisar (Gazi University), Guven Balta (Erzurum Technical University), Necmi Altin (Gazi Unbiversity) and Ibrahim Sefa (Gazi University).

In this study, an improved fast terminal sliding-mode control (FTSMC) is presented to control the output voltage of the DC-DC step-down converter. It has been compared to other techniques in the literature, including traditional sliding mode control (SMC) and terminal sliding mode control TMSC to demonstrate its performance. The proposed method and all other mentioned methods have been tested in simulation environment. The obtained simulation results are compared in terms of performance of converging error to zero for various conditions such as input voltage variations, step load change and tracking process. The obtained results show that the proposed improved FTSMC method provides the fastest convergence, the smallest rising time, and the smallest steady-state error than the SMC and TSMC method.

Using ChatGPT for Generating and Evaluating Online Tests

Valeriu Manuel Ionescu (University of Pitesti) and Madalin Ciprian Enescu (PhD Student - Political Sciences National School of Political and Administrative Studies).

Creating multiple choice online tests is a time-consuming task involving manual creation of both questions and possible answers in order to simplify and automate the process of test evaluation. This system is prone to cheating if the person being evaluated obtains the questions and answers. In some domains essay type questionnaires are needed, but they need time to be evaluated as the process cannot be automated. This paper investigates the use of ChatGPT-3 natural language processing to generate the quiz questions based on human prompt and to automatically grade the answers of an essay type test. This paper presents a NodeJS test implementation of such a system, the results obtained and the challenges of this process.

Experimental studies on binary system Er-H

Ciobanu Nicolae Tiberiu (Institute for Nuclear Research).

The main objectives of this paper are to obtain ErH3, to establish the hydrogen absorption parameters and to determinate the amount of hydrogen stored by erbium. In this article, experimental results obtained from the hydrogenation of erbium under certain conditions are presented. The hydride parameters to obtain ErH3 were determined, an analysis of the results from the experimental tests was carried out and the amount of stored hydrogen was presented.

High Density Crowd Scene Detection in Untrimmed Streaming Videos for Surveillance Purpose

Andrei Cosmin Jitaru (AIMultimediaLab, UPB) and Bogdan Ionescu (AIMultimediaLab, UPB).

This paper aims to develop a fast method that can estimate and extract the scenes with crowds from untrimmed streaming videos for surveillance purpose. To this end, we have proposed a simple but effective methodology using regression-based crowd counting algorithms and a custom scene change detector starting from PySceneDetect library. The proposed approach allows to extract crowd scenes from a large amount of data which are useful for crowd statistics, crowd dynamic analysis and crowd scenarios variations detection. The resulted data collection, named UrbanEvent, aims to enhance the performance of semantic segmentation algorithms on crowd scenes. In particular we conduct extensive experiments on crowd counting methods to use as a primary filter on the candidate scenes. The second filter comprises in the determination of a content value threshold, considering the frame-to-frame variety of the candidate changed scene for crowd surveillance purpose. In addition, the experiments show that the K-means clustering method based on feature embedding from ResNet-152 has good results in high and low crowded scenes, being insensitive on context variety, when the proposed method is sensitive to crowd density variations and also to extrinsic camera parameters changes, minimizing the true-negative collected samples, like the car crowded scenes and cars position changes.

Optical Communication Systems for Vehicles Light Units

Dragos Mandita (PhD student SD-ETTI Polytechnic University of Bucharest, Bucharest, Romania), Stefan Malin (PhD student SD-ETTI Polytechnic University of Bucharest, Bucharest, Romania), Paul Chirana (PhD student SD-ETTI Polytechnic University of Bucharest, Bucharest, Romania) and Florin Babarada (DCAE-ETTI Polytechnic University of Bucharest, Bucharest, Romania).

This paper tackles the need of high-speed communication in vehicles, given the need for ever-increasing automation. Given the eminence of connecting vehicles to the internet for monitoring, control and other innovations or facilities, there is a need to use increasingly rapid communication systems between vehicle sub-assemblies. The present paper aim is to present a new way of communication, namely, more efficient and cost-effective optical fiber in the automotive sector. Higher costs have

hampered implementation so far, but with the need for speed of communication, it becomes more cost-effective and imperative.

Predictive Current Control with Vector Selection of a Voltage Source Inverter

Nguyen Hoang Viet (ThuyLoi University) and Pham Duc Dai (Thuyloi University).

This paper analyzes the vector selection in the predictive current control scheme of a Voltage Source Inverter (VSI) with a Resistor – Inductive load (RL load). Three vector selection ways are considered based on information about the increase and decrease of the load current in the next predictive step. Afterward, the selected vectors will be used in the predictive model. The original predictive current control scheme uses seven vectors of the VSI for the calculation of the predictive model. The vector selection reduces the number of vectors used in the predictive model and also reduces the computational burden of the cost function optimization problem. All three ways are simulated with Matlab/Simulink and compared with the original predictive current control scheme. This selection can minimize computational burden, but the quality of the load currents can become poor. However, suppose the number of vectors in the vector selection way is three. In that case, the quality of the load currents of this method is equivalent to the quality of the load currents of the original predictive current control scheme.

Compressed ECG Sensing Based Fast/Slow HR and Regular/Irregular Rhythm Recognition for Resource-Constrained Health Monitoring Devices

Jomole Varghese V (INDIAN INSTITUTE OF TECHNOLOGY PALAKKAD, KERALA, INDIA.), M. Sabarimalai Manikandan (INDIAN INSTITUTE OF TECHNOLOGY PALAKKAD, KERALA, INDIA.) and Linga Reddy Cenkeramaddi (Information and Communication Technology University of Agder, Grimstad, Norway).

By considering resource-constrained affordable wearable or portable health monitoring devices, in this paper, we present a lightweight digital compressed ECG sensing with recognition of fast/slow and regular/irregular heartbeat patterns by using beat-to-beat intervals (BBIs) directly computed from compressed sensing (CS) measurements without ECG reconstruction process. For extracting BBIs, we presented a fast straightforward R-peak detection method in the CS domain without using sets of search-back detection rules unlike other methods. On the standard MIT-BIH arrhythmia database, the CS-ECG based R-peak detection method had an average accuracy of 99.47% with false positives of 381 beats and false negatives of 195 beats for a total of 109021 beats. The CS-ECG based HR classification method, with three classes of bradycardia, tachycardia and normal, had an accuracy of 96.75%, 91.18% and 99.02% based on the feature of number of BBIs and an accuracy of 95.64%, 82.35% and 98.81% based on the feature of average BBIs. The CS-ECG based regular/irregular rhythm (RIR) recognition method had sensitivity (SE) of 93.17%, specificity (SP) of 96.87% and accuracy (ACC) of 94.83% based on the variation between the BBIs that are determined by comparing the difference between the successive BBIs with a predefined BBI threshold. The proposed method can reduce computational resources and energy reduction of 75% with CS-based data reduction factor of 4 that has a great potential in energy-efficiency of battery operated wearable devices in long-term continuous health monitoring environments.

Data management in intellectual property organizations

Radu Costin Moisescu (Politehnica University of Bucharest), Constantin Oprean (Lucian Blaga University of Sibiu) and Aurel Mihail Titu (Lucian Blaga University of Sibiu).

Through this paper, we propose an analysis of methods for improving the management of computer data in the context of the need to save, protect and secure them. The implementation of a data saving and restoration system that corresponds to the ISO27001:2018 standard as proposed in this document has the advantage of ensuring an environment in which, in case of disasters, saved data and important applications can be recovered ensuring thus the possibility of continuing the institution's operations in disaster cases. We will present a point of view on the principles and technologies that must be implemented to ensure the restoration of data and the continuation of the operations of intellectual property (IP) organizations after a possible disaster scenario.

Sentiment Detection through Emotion Classification Using Deep Learning Approach for Chinese Text

Yuxin Huang (Xiamen University Malaysia) and Shaidah Jusoh (Xiamen University Malaysia).

Emotion classification and sentiment analysis represent crucial research areas within the field of Natural Language Processing. Previous studies have primarily focused on conducting sentiment classification and emotion classification as separate tasks. Only a limited number of researchers have delved into exploring the relationship between these two aspects and invested efforts in deriving one from the other. This study aims to determine sentiment by employing emotion classifications. Specifically, we utilise the ERNIE Tiny deep learning model to classify emotions in Chinese texts, while sentiments are detected through our devised rules. For instance, if emotions such as 'happiness' or 'like' are present, the sentiment is classified as positive. Conversely, emotions like 'sadness', 'disgust', 'anger', or 'fear' classify the sentiment as negative. The experimental results demonstrate the F1 score of 93.00% and 90.14% for positive and negative sentiment,

respectively, in Chinese song reviews. These findings substantiate the validity and feasibility of utilising emotions to extract sentiment.

Revolutionizing Customer Experience with AI: A Path to Increase Revenue Growth Rate

Harsha Vijayakumar (sp jain school of global management).

In this 21st century, customers expect every company or product organization to deliver amazing customer experience not just in terms of amazing product experience, its support or service, execution, commitment to delighting the customer at every step of their journey e.g.: Apple, Inc. has been a pinnacle customer experience company of 21st century with largest market cap, revenue, and customer base due to its commitment towards experience and delighting customers in every step of the journey either in stores or product. Customer experience has a significant impact on a company's revenue growth rate. Companies that deliver a positive customer experience are more likely to retain and attract new customers, leading to increased revenue, this shows up in recurring revenue and annual growth rate. In contrast, companies that fail to deliver a good customer experience may experience a decline in customer satisfaction and loyalty, resulting in reduced revenue. Adding some spice to the customer experience is AI, Artificial Intelligence has been a very hot top topic of discussion in the 21st century, every organization wants to build an AI-Powered product and technology that can simplify the human effort to do things. e.g.: ChatGPT (AI-Powered Search Interface by OpenAI) has been the talk of the town with every company wanting to integrate with it to give a better customer experience. This research paper aims to explore the relationship between AI-Powered customer experience and revenue growth rate by analyzing the impact of customer experience on companies' annual subscriptions ($ value). This research paper discusses the critical characteristics of AI-Powered customer experience like NPS(Net promoter Score), event attendance, product upgrades, partner involvement, elevated productivity with automation, and product adoption. By understanding the importance of customer experience and how it impacts revenue growth, companies can take steps to optimize AI usage to drive customer experience and long-term business success.

Study on Thermal Behavior of Composite Materials with Polymeric Matrix

Gheorghe Vasile (University of Pitesti) and Cosmin Paunescu (University of Pitesti).

Modern material technology composites are based on two main techniques: impregnation of materials of filling with a polymer melt and compounding the materials offiller with molten polymer. But this does not mean, of course, that no there are other procedures and, above all, that new techniques do not always appear. A an example of this is filling during polymerization. The article present an experimental work on thermal behavior of composite materials with polymeric matrix.

Performance Evaluation of Block Size Influence on Blockchain-Enabled IoT Data Storage

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The increasing number of IoT devices has led to a significant growth in the number of generated data packets that require secure storage and processing solutions. Blockchain technology offers potential benefits for storing IoT data, leveraging its decentralized, distributed, and immutable nature. In a blockchain, the data provided by IoT sensors is stored as transactions within data blocks that form the blockchain network. However, the block size plays a crucial role in ensuring the security and scalability of IoT applications. To address this, our research paper focuses on determining the optimal block size for storing information from IoT sensors. By carefully selecting the optimal block size, we aim to address the unique requirements of IoT applications, ensuring their security and scalability while leveraging the potential of blockchain technology for securely storing and processing IoT data packets.

IoE simulation with Cisco Packet Tracer

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This work aims to simulate several practical Internet of Everything (IoE) scenarios that one can experience in real world applications. The network components are based on IoE sensors. The network architecture is one where all devices are connected, and a backend intelligence performs logic and data analysis based on the collected sensor information. This work supplies a fully functional network using various Cisco components such as: routers, wireless router, switches, an internet connectivity cloud, and backend IoE servers. Additionally, in the simulation, there are examples of IoE smart devices already connected to the local network. Also, the backend logic is provided, and the programming of these sensors has been created in order to provide configuration examples for more complicated cases.

Statistical Control Process Becomes a Common Tool in the Chassis Industry Improvement Process in the Information Era

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This article we'll present how in the chassis industry the improvement process is conducted in the information era. According to the external root cause Pareto diagrams, analyzed in solving problem process by Quick Response Quality Control, we determined that the statistical tools: statistical process control (SPC) becomes a mandatory choice. The SPC provides an overall approach to reduce defects and increase customer satisfaction. Statistical Process Control, part of IATF 16949 core tools, that is a preventive tool that allows to the chassis production to determine if the process will generate defective parts. SPC has the main advantage of detecting problems before they have appeared and that's why it is the most successful method nowadays. We'll use the SPC tools for normal distributed data: control charts and capabilities index to take decision just in time to correct the process and to avoid that the non-conform product are generated. This new approach is applied by the authors directly in the working station of the bus chassis production line without to gathered data and make SPC analysis in the offices. So, the reactivity at the deviations of the process indexes will be just in time and not after the product is already packed and deliver. In the digital era we need to speed up the reactivity by using preventive method like SPC direct in the operator station. The authors used directly the capability indexes and not only control diagrams like the classical approach.

Optimal Sizing of Security Constrained Unit Commitment Problem Integrated with Renewable Energy Sources and PEVs

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The optimal sizing of SCUCP in the presence of solar energy and plug-in electric vehicles is very important from the point of view of electric power system operation and planning. This research paper addresses the optimization of sizing of solar energy and PEVs system with a Chaotic arithmetic optimization algorithm by minimizing the cost value. This research proposes an optimization framework that simultaneously optimizes the sizing of solar power plants and the requirements of EVs within the SCUCP. The framework incorporates probabilistic forecasting models for solar power generation and utilizes EV charging profiles derived from realistic travel patterns and charging infrastructure characteristics. It aims to find the optimal sizes of wind power plants and EV charging infrastructure to meet system demand while minimizing costs, and emissions, and addressing system reliability. To solve the optimization problem, the Chaotic Arithmetic Optimization Algorithm is used. This method provide efficient and effective solutions for determining the optimal sizing of solar power plants and EV charging infrastructure while considering the complexities of the SCUCP. The proposed research is evaluated using a 10, 30, 50, and 100 dimensions benchmark test system using Chaotic Arithmetic Optimization Algorithm, considering both small and medium power systems. The obtained solutions facilitate informed decision-making by identifying the optimal capacities of solar power plants and charging infrastructure that leads to improved system reliability, reduced greenhouse gas emissions, and minimized overall costs.

Application of Harris Hawks Optimization in single objective optimal power flow

Murtadha Al-Kaabi (University POLITEHNICA of Bucharest), Virgil Dumbrava (University POLITEHNICA of Bucharest) and Mircea Eremia (University POLITEHNICA of Bucharest).

In power system, the optimal power flow (OPF) is one of the main significant issues that should be solved to achieve the optimal operation, planning, and energy management. Many stochastic optimization algorithms have been suggested to solve OPF problems. Harris Hawks Optimization (HHO) is one of the meta-heuristic techniques, inspired by the behavior of Harris Hawks, that have been recently applied in power systems. The main aim of this paper is to find optimal objective functions such as total fuel cost (TFC) of generators, emissions (Em), active power loss (APL), and voltage deviation (VD) at load bus. The control variables must be setting to obtain optimal objective function are active power of generators (except the swing bus generator), voltage magnitude at load bus, sources VAR compensations that are connected to transmission lines to compensate the reactive power on the network and tap changer setting at the transformers. To prove the superiority and efficiency of HHO in power system applications, IEEE 57-bus power test is the standard grid that has been applied to it. The comparison results of objective functions confirmed the superiority of HHO in providing better solutions than the well-known algorithms reported in the literature.

Intelligent System of Analysis of the Level of Gain of Development Hegemony for Great Powers

Mădălin-Ciprian Enescu (National School of Political and Administrative Studies, Bucharest, Romania), Cosmin-George Nicolăescu (Department of Electronics, Communications and Computers, Pitesti, Romania) and Cosmin Stirbu (University of Pitesti).

The aim of this study is to analyse and determine the level of development of countries in different areas using the fuzzy logic approach. Due to the intense competition between the major powers we will analyse two countries, the United States of America and the Republic of China, as they show stages of development in different areas. The proposed methodology includes a research system with a specific architecture, detailing indices, sources of data and statistical model and offering the possibility to add in the future other countries in the analysis process. In this research and paper, there is established a natural limit to major powers, only to the study of the mentioned group (USA and China). In the methodological process of realizing the system architecture the authors used fuzzy logic, not only because it differs from Boolean logic in that it is based on the imprecise decisions of people, but also because it is more adequate to the decision theory, so the truth values of variables can be any real number between 0 and 1, where 0 represents the lowest form 1 the maximum state of truth allowed. The way of modelling knowledge is determined by the application of IF-THEN rules, allowing a simplification of the way of writing, using words instead of definite values. This process is similar to human reasoning, where decisions can be reached by imprecise rules. Also, the basic rule was developed using four different types of inputs and an output that determines a value covering the state of the analysis taking into account the criteria used on the system inputs. The system inputs use actual values extracted from candidate country statistics. Therefore, four different areas have been established for the stage of competition analysis: economic development, budget allocated for military progress, technological and research developments and active military forces. Some final remarks underline some limits of the model, including different risks.

Building a Social Credit System: The Dystopian Future We Seem to be Heading Towards

Cornel Iorgulescu-Priceputeanu (Faculty Of Computer Sciences BIOTERRA University Of Bucharest).

The purpose of this paper is to understand how a social credit system may be built and implemented. We explore the implications of using machine learning and large datasets to monitor and evaluate citizens' behaviours, as well as to reward or discourage certain actions. Through analysis of the current state of the art, we aim to contribute to the ongoing discourse on the social impact of emerging technologies. The evolution of machine learning and neural networks has played a crucial role in enabling the technical possibility of building a system that governs social interaction, such as a social credit system. These advancements have empowered researchers and developers to leverage large datasets and complex algorithms to analyze, interpret, and predict human behaviour on an unprecedented scale.

The Significance of Artificial Intelligence in the Second Scientific Revolution A Review

Fyodor Amanov (New Uzbekistan University) and Aneesh Pradeep (New Uzbekistan University).

Artificial intelligence has been gaining its powers for the last four hundred years, and now, in nearly two decades, it has superseded almost any technology we've ever had . AI was integrated into our daily lives and made almost invisible to our eyes, so it became a quintessential part of our world. Face ID on our phones, search algorithms, voice assistants, self-driving cars, online maps, smart home systems, and many more technologies are powered by AI. However, the applications of AI are not limited to social interactions and search. AI is powerful enough to help us invent, create, and accelerate scientific progress.

Development of Tools for Decision Support System Based MIKE simulation and IoT System for Water Irrigation Canal

Pham Duc Dai (Thuyloi University), Uong Huy Hiep (Vietnam Academy for Water Resources), Dang Khoa Nguyen (Faculty of Applied Sciences, International School, Vietnam National University, Hanoi) and Quang Huong Bui (National Center for Water Resources Planning and Investigation (NAWAPI)).

Smart Agriculture is of important for countries worldwide. In the situation of water scarcity, the effective use of water is urgent for every sectors, especially in Vietnam. A large areas of agriculture field in Vietnam is irrigated through branches of rivers where valve gates are installed to take water for irrigation channel. The existing operations of irrigation channels are based on human experience with assumption that water level at front of the channels is always sufficient. However, now a day, with the effect of climate change and the conditions of complicated agriculture activities, the river conveys water levels and flows to irrigation channels are so different, as it varies with short time interval. The use of control policy without predictive model therefore lacks reliability and affect on the irrigation planning. In addition, the operations of irrigation channel systems at different areas on the same river should be cooperated to ensure the goal of sufficient water supply. In this paper, with the innovative technology of IoT and simulation cores, we developed a new computation framework which combines IoT real time data and MIKE 11 model to predict water flows and water levels for irrigation channels. The application is evaluated on An Kim Hai river in Vietnam

Controlling industrial robots with Simulink

Cosmin Bucur (Ovidius University of Constanta, Faculty of Engineering), Alexandru Andrei (Faculty of Industrial Engineering and Robotics) and Sorin Tasu (Ovidius University of Constanta, Faculty of Engineering).

Implementing machine learning algorithms like reinforcement learning in robotics is a continuously changing topic due to continuous tool changes and updates to keep track of new algorithms and tools. This paper presents a new toolchain to implement such algorithms with open-source packages like ROS2 for industrial robots. We developed new tools and procedures to enable the implementation of reinforcement learning algorithms through simulation or controlling real robots with Matlab.

Numerical solution of the problem of turbulent currents that occur in the case of edge hardening

Marius Codrean (University of Oradea), Mihaela Cornelia Novac (University of Oradea), Mihaela Codrean (University of Oradea), Cornelia Emilia Gordan (University of Oradea), Ovidiu Constantin Novac (University of Oradea), Gyongyi Bujdoso (University of Debrecen) and Francisc Slovac (University of Oradea).

The aim of this work is to develop numerical procedures for analyzing edge hardening using induction heating by turbulent currents. The section through the steel bar, whose lower edge needs to be hardened, is presented. For the inductor adapted to the piece configuration, the 2D model is assumed. The surface treatment of the piece must be differentiated: in the tip area, the heating must be greater than in the rest of the surface. Only the tip area needs to be subjected to hardening, while the rest of the piece must remain elastic to ensure the desired mechanical strength. The main purpose of this work is to propose inductor models for achieving differentiated heating of the blade.

The Study of Creep in the Case of Pressure Vessels

Cosmin Paunescu (University of Pitesti) and Gheorghe Vasile (University of Pitesti).

The problems shown in the operation of equipment under pressure have led to the emergence of several methods of study for chemical composition and some mechanical properties. In the Romanian literature we do not find data on the study of these problems. This article presents a study on the creep behavior of a heat exchanger. This mechanical article proposes to conduct experimental research on the creep behavior of a material used in the manufacture of a heat exchanger.

A brief Overview of Electrical Fire Extinguishing, Detection and Signalling Equipment: Current and Future Technologies

Robert-Nicolae Boștinaru (Politehnica University of Bucharest), Nicu Bizon (Politehnica University of Bucharest), Sebastian Drăgușin (Politehnica University of Bucharest) and Florin-George Gionea (Technical University of Civil Engineering Bucharest).

This paper focuses on the equipment used for fire extinguishing, detection and signaling. The work begins by defining and explaining the importance of these types of equipment in preventing and reducing damage caused by fires. The main types of technologies used in fire extinguishing and detection equipment are presented, highlighting their advantages and disadvantages. Examples of fire-fighting and detection equipment available on the market are also provided, together with tables to compare their characteristics and functionalities. The paper also presents current and future technologies used in fire safety equipment and their potential applications. Finally, the relevant international and local regulations and suggestions for future research directions are provided. In general, the paper aims to provide a comprehensive overview of the latest advances in fire safety equipment and its importance in protecting lives and property.

An AI Based Enhanced and Customized Doodler-Bot with Vector Mutation & Clustering

Ilisha Walia (Samsung Electronics), Mayank Mangla (Samsung Electronics), Manjula Gupta (Samsung Electronics) and Ankita Dixit (Samsung Electronics).

Currently high usage of smart phone is observed in millennials for learning, playing games or drawing. Drawing being quite popular among all age groups of people, still the most generic problem faced is the fear to draw neatly and correctly. We have tried to make drawing experience more innovative and effective by proposing a unique AI based Doodler-Bot which will help people of all age groups to improve their drawing skills. There exists some way through which the user's sketch can be improved by replacing it with the professionally drawn sketch stored in database, but by doing this the user's originality of sketch is lost. Our proposed work will help user in drawing better sketches by generating new and unique sketches which are better version of user's sketch. Whenever user draws a sketch, the application would first predict the class of sketch and then the generator model will be used to generate new sketches depending on user's sketch and display all similar suggestions to user as output. The results are improvised in comparison to existing Sketch RNN model. First, by modifying the model architecture i.e. by mutating the latent space of user sketch with similar latent space of sketches available in cluster data. Secondly, the model is also trained on improvised dataset (Quickdraw dataset + Newly generated dataset). New dataset is generated by converting the SVG format images to the stroke format($\Box x, \Box y, \Box$) as required by model for training. The proposed AI based Doodler-Bot will intelligently guide and improve the drawing skills of the person.

Industrial Expert System for Intelligent Traffic Lane Allocation Using Machine Learning and Pattern Recognition

Catalin Iordache (University POLITEHNICA of Bucharest) and Constantin Viorel Marian (University POLITEHNICA of Bucharest).

This paper highlights how existing infrastructure can be used to feed data to an expert system for smart vehicle traffic management. The use of existing video cameras in road intersections for traffic pattern analysis is often overlooked due to their perceived limitations and varying technical specifications. Our proposed system architecture incorporates a Convolutional Neural Network for traffic lane occupancy detection and optimizes the allocation of additional lanes based on occupancy data, thereby improving vehicle traffic flow. Using existing video camera infrastructure for data collection offers a cost-effective approach that enhances traffic safety, enables emergency corridors, and allows flexibility in lane allocation.

Reinforcement learning continuous controller of DC motor

Cosmin Bucur (Universitatea Ovidius din Constanta, Facultatea de Ingineria Mecanica, Industriala, Maritima) and Sorin Tasu (Universitatea Ovidius din Constanta, Facultatea de Ingineria Mecanica, Industriala, Maritima).

Electric motors control is a very knows topic in research and most of activities are drawn towards classic PI or model predictive control methods. Implementing reinforcement learning techniques in the field of motor control depends on fidelity environments, types of considered motors and modeled power electronics used for control. Training a RL speed controller means finding an optimal control policy by offline training using an environment, before implementing it in a real-world scenario. Different environments and techniques have been developed for training RL controllers, most of them being extensions of Open AI gym environments. This paper presents trained RL speed controller, developed through Reinforcement learning techniques, specifically TD3 RL algorithm, applied to permanently excited dc motors. In this work, the open-source Python package gym-electric-motor (GEM) [1] is used for environment setup, and pytorch framework for developing the controller [2].

Investigation of Deep Learning Based Techniques for Prognostic and Health Management of Lithium-Ion Battery

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Lithium-ion batteries (LBs) have become increasingly popular for use in electric vehicles, aircraft, and portable electronic devices due to their high-energy storage capacity and extended lifespan. As a result, the demand for Li-ion batteries has risen significantly compared to other rechargeable batteries. During normal working conditions, any fault in the battery may lead to severe damage to equipment or human. As a preventative measure, developing a Prognostic and Health Management (PHM) system that can detect faults early on is essential. PHM systems can provide early warning of faults and improve reliability and safety. A Prognostic and Health Management (PHM) system for batteries comprises three components: determining the State of Charge (SOC), the State of Health (SOH), and the Remaining Useful Life (RUL). This paper will explore deep learning (DL) techniques to predict the SOC, SOH, and RUL of batteries. Generally, DL based method for PHM has four main stages, data collection, extraction of features, training, and testing. DL-based techniques for PHM of LB will be discussed in detail and also make comparisons to understand the effectiveness.

Transfer Learning and Dual Attention Network Based Nuclei Segmentation in Head and Neck Digital Cancer Histology Images

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Histology analysis is currently a gold standard in analyzing cancer. Nuclei segmentation is vital in histopathology analysis. However, it is challenging due to limited data and extreme conditions. With the advent of transfer learning methods, the solution to this problem is possible. We propose a transfer learning-based approach for segmenting the nuclei in Head and Neck (H&N) cancer histology images. The suggested technique comprises two stages. In the first stage, we train our previously proposed architecture, DAN-Nuc Net, on generic histology data to achieve generic nuclei segmentation in histology. We use the PanNuke dataset, which has over 8000 histology images, to train DAN-Nuc Net. In the second stage, we use transfer learning techniques to optimize our network for two types of histology mages, i.e., Hematoxylin and Eosin (H&E), and P63 independently. Selected deep layers of the pre-trained DAN-Nuc Net are frozen. Then the model is re-trained on the new datasets. Compared to the state-of-the-art, our method has shown superior performance in DSC and JI (0.8702 and 0.7596).

A New Field-Oriented Control for Induction Motor Drive Using a Synergetic-Super Twisting Algorithm

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In this work, a new field-oriented control strategy is proposed to control the induction motor drives. The field-oriented control method stands out because of its use, simplicity, and fast dynamic speed. However, there are disadvantages to this strategy. One of its disadvantages is that there are ripples in the torque, flux, and levels at present. In addition, the electric current has a high total harmonic distortion value in comparison to non-linear control. The synergetic control and super twisting algorithm are strategies of non-linear control, a novel solution is offered to address these issues and enhance the performance and effectiveness of this approach to total harmonic distortion, which is proposed and employed in the conventional field-oriented control strategy to reduce the ripples of torque, current, and total harmonic distortion. To simulate the proposed strategy of IM drive, Matlab/Simulink software has been used. Comparison results between the proposed control and a traditional FOC technique can illustrate the proposed control greatly improved performance and robustness.

Soccer Pitch Areas Segmentation with Hierarchical U-Net on the SoccerNet Dataset

Miguel Santos Marques (2Ai – School of Technology, IPCA), Ricardo Gomes Faria (Mobileum), Pedro Santos (Mobileum) and José Henrique Brito (2Ai – School of Technology, IPCA).

Soccer video analysis is a challenging area of research in computer vision. Several soccer video analysis systems exist for tasks such as player detection and tracking, player performance analysis or team behaviour analysis. These systems are composed of several building blocks, such as image classifiers for shot classification, object detectors for player and ball detection, or object trackers for player and ball tracking. Another useful building block is an image semantic segmentation module, which may be used to segment different elements in the frame. In our setting, it is used to segment the different areas of the soccer field. This paper describes a semantic segmentation network, that segments the 10 different areas of the soccer pitch. This work builds on our previous work for soccer field line segmentation. Our current method directly segments the areas in the image, using a Deep Learning Convolutional Neural Network, based on U-Net, with hierarchical outputs, and balanced or unbalanced loss weights. The hierarchical output contains four outputs with segmentation masks for different segmentation tasks, arranged in a hierarchical tree. Balanced or unbalanced loss weights allow the system's training to be more influenced or less influenced by the accuracy of a particular output. Our best model produces visually convincing results, and is able to achieve an Average Precision of 80.4%, Average Recall of 73.1%, Average F-score of 76.1%, Average Accuracy of 95.1%, and Average IoU of 62.4%.

Optimal Design of a Hybrid Controller for DC-DC Buck Converter

Hossein Shayeghi (University of Mohaghegh Ardabili), Reza Mohajery (University of Mohaghegh Ardabili) and Nicu Bizon (University of Pitesti).

The world of electrical energy applications heavily relies on power electronic converters. They are found in various fields and are crucial to efficient power management. Due to the nonlinear characteristics of DC-DC converters, the output voltage fluctuates periodically, causing the device to be sensitive to even little changes when the circuit parameters are varied. Consequently, the nonlinear structure and rapid dynamics of these converters add to the complexity of their control process. This paper presents a modified method for controlling the conventional DC-DC buck converter by cascading a Proportional-Integral-Derivative (PID) controller with a One plus Proportional-Integrator (PI) controller. The optimal implementation of the controller parameters is achieved by utilizing the slime mould optimization algorithm (SMA). This mechanism regulates the output voltage in response to changes in the input voltage and output load. With the ISTSE index serving as the objective function, the suggested controller coefficients aim to obtain the lowest possible value for the time-domain performance indexes of the closed-loop system. Then the effectiveness of the proposed PID(1+PI) controller has been shown via comparisons to the widely used PID controller. According to the simulation findings, the SMA-based PID(1+PI) controller outperforms the PID controller in settling and rise time reduction over various operating conditions.

Guidelines for Developing a Power-Grid Cybersecurity Database in Europe

George Seritan (University Politehnica of Bucharest), Bogdan-Adrian Enache (University Politehnica of Bucharest), Radu Porumb (University Politehnica of Bucharest), Daniel Balaci (Transelectrica S.A.), Irina Clima (Electrica S.A.) and Cristinel-Bogdan Bărbulescu (Electrica S.A.).

The growing interconnectivity of power grids has significantly increased their vulnerability to cyber threats. Adopting reliable communication protocols and standards that provide robust security measures is essential to mitigate these risks. One potential solution to address the growing cyber threats is developing a cybersecurity database tailored explicitly for power grid systems. This paper will examine the advantages and challenges of creating such a database and potential strategies for overcoming these challenges.

IoT solution for thermal comfort and air quality monitoring

Ioana Udrea (University POLITEHNICA of Bucharest), Viorel Ionut Gheorghe (University POLITEHNICA of Bucharest), Cristian Gabriel Alionte (University POLITEHNICA of Bucharest), Angel Madalin Dogeanu (Technical University of Civil Engineering Bucharest) and Laurențiu Adrian Cartal (University POLITEHNICA of Bucharest).

The Internet of Things (IoT) has undergone an exponential growth recently and this is due to its usefulness. With its help, the data received from the sensors can be sent to the cloud and displayed in real time. The centralization of data and their recording in databases is also facilitated. In the context of the current energy crisis, a very important aspect is human thermal comfort. It can be evaluated through various indexes, which include the parameters that can be measured with sensor systems. In this article, such a system of sensors that measure temperature and relative humidity with the help of which the Heat Index (HI) is calculated is made. One of the parameters related to comfort is air quality, it is evaluated with the help of CO_2 level. The sensor system made also measures the CO_2 level and sends all the data to the cloud. The present study tries to see what is the combined influence of the two comfort indicators.

Use of Yolo Algorithm for Traffic Sign Detection in Autonomous Vehicles and Improvement Using Data Replication Methods

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Autonomous vehicles use many technologies and methods to detect and act on surrounding objects. The most common among these technologies is an algorithm called YOLO (You Only Look Once). This algorithm quickly detects objects in an image and classifies these objects accurately. This study examines the use of the YOLO algorithm for signage detection in autonomous vehicles and how this algorithm can be improved. First of all, the basic principles and working mechanisms of the YOLO algorithm are explained. Then, it is explained in detail how this algorithm can be used for plate detection in autonomous vehicles. Various models were trained using the YOLO algorithm and the data set created with real data, and the trained models were tested on real-time systems. Finally, suggestions for the improvement of the YOLO algorithm are presented and how this algorithm can be improved further in the future is discussed.

Multiple Usage Virtual Reality Based Application - Example Scenario for Medical Purposes

Maria Ioana Oproiu (University Politehnica of Bucharest) and Constantin Viorel Marian (University POLITEHNICA of Bucharest).

The post-traumatic stress syndrome is a common condition in people who have had contact with stimuli that cause and trigger stress. The application described in this article is a system, created with the help of virtual reality, which aims to treat people who are affected by post-traumatic stress syndrome in the military field. We have also integrated several scenarios, which the user must go through, thus going through the exposure treatment. We also introduce the designed entity component system, which is specific to applications in the field of infographics and which will facilitate the entire process of developing the application.

PV fed water pump system with golden section search and incremental conductance algorithms

Hamza Alrajoubi (Karabuk University) and Selim Oncu (Karabuk University).

Abstract—In this study, a novel hybrid maximum power point tracking (MPPT) algorithm is proposed for a photovoltaic (PV) fed brushless DC (BLDC) motor driven water pump. A proper design with accurate and fast MPPT is required to maximize the PV energy. In the proposed algorithm, the golden-section search (GSS) and incremental conductance (INC) based MPPT methods are used to acquire global efficiency through two loops. The GSS method quickly achieves the initial searching of the global peak, while the INC MPPT algorithm tracks the optimal power during the final loop. The algorithm model is tested under different irradiation using MATLAB/Simulink. Applying the algorithm and a proportional-integral (PI) controller yields that a voltage source inverter (VSI) transfers the optimal solar power to the pump. The BLDC motor is driven efficiently with more than 99% MPPT efficiency.

Smart System using Blockchain for Medical Diagnosis

Florentina Magda Enescu (University of Pitesti - UPIT), Cosmin-George Nicolăescu (Department of Electronics, Communications and Computers University of Pitesti) and Nicu Bizon (University of Pitesti; University Politehnica of Bucharest).

Blockchain is a technology that is currently widespread in many fields, it is used to transmit information between two or more parties in a secure way, without the possibility of data loss or interception by an unwanted third party. A blockchain network represents the creation of innovative solutions for the healthcare system, as patient data can be exchanged across hospitals, diagnostic labs, pharmacy firms and doctors. In this paper the topic of blockchain technology and its significant

benefits in the field of medical diagnostics is addressed. With the proposed solution a misdiagnosis can be avoided, as there is the possibility to ask for other opinions from other health professionals. The highest level of security information storage allows authorised doctors to access your data from any geographical location, with no territorial limitations. Provides fast, versatile interconnection and enhanced security of patient information. In conclusion, this technology can be incorporated into the current medical system.

Intelligent solution for associating problems with lessons learned used in automotive manufacturing

Laurentiu-Mihai Ionescu (University of Pitesti), Nadia Ionescu (University of Pitesti), Elena-Luminita Stirbu (CalitateOnLine), Nicoleta Rachieru (University of Pitesti), Cosmin Stirbu (University of Pitesti) and Alin Gheorghita Mazare (University of Pitesti).

The paper presents a solution implemented in industry (automotive) through which a database consisting of accumulated lessons learned is consulted and updated with the current problem using an intelligent algorithm with deep learning - artificial neural networks (DL-ANN). The solution falls within the strategies of implementing Industry 4.0 technologies in the enterprise: the use of intelligent technologies in the industry. The use of libraries of lessons learned to identify certain current problems and the solutions to solve or reduce their impact is a strategy frequently found in enterprises. The challenge in using this strategy was related to the way the problems are formulated by the technical team that ascertains and analyses them as well as the possible linguistic differences that occur between the different points and branches of the factory. Thus, in several situations, although the lessons learned library contained the respective problem, it could not be identified correctly or even at all. The solution proposed in this article solves the identification problems through an intelligent problem recognition in the library with lessons learned. The paper also presents a case study where the solution was applied.

Adapting the PPVO framework for Audio Reversible Data Hiding

Alin Bobeica (Valahia University of Targoviste), Ioan Catalin Dragoi (Valahia University of Targoviste), Henri-George Coanda (Valahia University of Targoviste) and Dinu Coltuc (Valahia University of Targoviste).

Pixel-based pixel value ordering (PPVO) represents an efficient solution for reversible data hiding in digital images.The main novelty of this approach is the selection between two distinct prediction values for each potential host pixel. This paper maintains and refines this feature and adapts it for audio reversible data hiding. For each audio sample value, three possible prediction values are considered: a simple average of neighboring samples around the current position and two weighted averages. Differences between neighboring pixels are used to select between the two weighted predictors. The PPVO framework is then used to select from the two remaining predictors. The data embedding algorithm is also adapted to allow for multi-bit embedding, which better exploits the prediction error histogram of audio sample values.

Domain-Specific Language for Modeling Fluent API

Milica Vukovic (Faculty of Electrical Engineering, University of East Sarajevo), Vladimir Vujovic (Faculty of Electrical Engineering, University of East Sarajevo), Zorana Staka (Faculty of Electrical Engineering, University of East Sarajevo) and Snjezana Milinkovic (Faculty of Electrical Engineering, University of East Sarajevo).

The fluent API is most often used when there is a need to implement a certain flow of execution of operations, which is achieved by the method chaining technique. Conventional methods of implementing fluent API such as manual coding require a lot of development time and increase the chances of errors. The lack of visual representation of the relationships between interfaces and methods makes it difficult to understand them. This paper presents the design and implementation of the model-based graphical development tool, which is built using Domain-Specific Language that relies on fluent API grammar rules. The proposed tool is implemented as a Microsoft Visual Studio extension using DSL Tools, and it can be used for graphical modeling of the fluent API structure. Such a graphical development tool is the first step towards the automated process of generating the code skeleton of the fluent API structure out of its domain model.

Challenges in Spoofing Bluetooth Low Energy devices in an IOT environment

Cristian Nicolae Capota (University Politehnica of Bucharest), Vasile Madalin Popescu (University Politehnica of Bucharest), Simona Halunga (University Politehnica of Bucharest) and Octavian Fratu (University Politehnica of Bucharest).

In the last decade the rapid development of the communications and IoT systems have risen many challenges regarding the security of the devices that are handled wirelessly. Therefore, in this paper, we intend to test the possibility of spoofing the parameters for connection of the Bluetooth Low Energy (BLE) devices, to make several recommendations for increasing the security of the usage of those devices and to propose basic counter measurements regarding the possibility of hacking them.

GSM Wireless Sensor Node Prototype for Infield Environmental Parameters Acquisition

Dragos Ioan Sacaleanu (University POLITEHNICA of Bucharest), Irina-Petra Manciu (University POLITEHNICA of Bucharest), Stefan-George Rosu (Universitatea Politehnica din Bucuresti), Lucian-Andrei Perisoara (University Politehnica of Bucharest), Adil Tannouche (Higher School of Technology of Béni Mellal Sultan Moulay Slimane University) and Loredana-Elisabeta Stelian Crețu (University of Agronomic Sciences and Veterinaty Medicine of Bucharest).

Wireless Sensor Networks (WSN) are an important part of the general framework known as the Internet of Things (IoT). Sensors collect data from any kind of environment: indoor or outdoor, terrestrial, or aerial (even space), commercial, industrial, agricultural, or domestic. As in any other type of network, communication is an essential element of the system. In the process of network design, a particular interest is shown in the resources available in order to ensure communication functionality. In agriculture, wireless communication is usually considered the most suitable for this task due to environmental conditions and communication distance. For outdoor applications, GSM protocol permits flawless communications over those large areas where the service coverage is available. The main advantage of the GSM is the coverage around the world, while the drawback is the high current consumption that has a direct impact on the system lifetime powered with batteries. In this paper, a GSM wireless sensor node (GWSn) is proposed for infield data acquisition. Tests were performed in the laboratory to analyze the current consumption and infield to observe the feasibility of the proposed prototype. To ensure an increased lifetime considering the current consumption acquired, the GWSn was equipped with a photovoltaic panel.

Autoencoders and AutoML for intrusion detection

Alina Florina Glavan (University POLITEHNICA of Bucharest) and Victor Croitoru (University POLITEHNICA of Bucharest).

Industrial internet of things and operational technology (IIoT/OT) lead the edge use case implementations. 5G and multi-access edge computing (MEC) offer the means to implement IIoT scenarios, ensuring business growth and deployment protection against network attacks. A variation of MEC and IIoT security measures are studied in the literature, and intrusion detection solutions are consequently proposed – including machine learning based solutions for anomaly detection. Automated machine learning (autoML) frameworks aim to create high accuracy models for users with little expertise in machine learning. This paper suggests autoencoders to improve autoML best model performance on a learning task: binary classification of network traffic. The experiment was performed on a benchmark dataset with intrusion detection examples: Network Security Laboratory - Knowledge Discovery in Databases (NSL-KDD). In order to optimize the learning process, autoencoders are suggested for feature encoding. The approach presented in this paper achieves a 4% increase in model accuracy and lower training time, when compared to the AutoML baseline model.

Low Cost Sensor-based Gait Monitoring System

Ion Caciula (Valahia University of Targoviste), Giorgian Marius Ionita (Valahia University of Targoviste), Henri George Coanda (Valahia University of Targoviste), Nicoleta Angelescu (Valahia University of Targoviste), Daniela Hagiescu (Advanced Slisys SRL) and Felix Albu (Valahia University of Targoviste).

In this study, a low-complexity gait monitoring system using an ESP32 microcontroller, and an MPU-9250 module with an accelerometer, gyroscope, and magnetometer is described. Its performance for binary gait classification using a multilayer perceptron is shown.

A short review of the ADAS progress in the last decade and the potential concept of Human-Machine Symbiosis (HMS)

Mihăiță Nicolae Ardeleanu (University Valahia of Targoviste), Ioan Corneliu Sălișteanu (University Valahia of Targoviste), Valentin Dogaru-Ulieru (University Valahia of Targoviste), Ștefan Broscăreanu (SC CERTIO SRL), Bogdan Sălișteanu (University Valahia of Targoviste) and Mihail Mihai (University Valahia of Targoviste).

This short review highlights the main sensor structures that are used in the ADAS (Advanced Driver Assisted System) field, in order to outline the progress at this moment (2023). Starting from this achieved level, we have proposed another approach to the ADAS problematics, regarding the prospects for development after the current moment, a different perspective than the one that has AV (Autonomus Vehicle) as its endpoint. Computer Assisted Driving represents a necessary and sufficient solution for increasing traffic safety in the near future. The integrated driver concept in the assisted environment implies a symbiotic human-machine collaboration. This collaboration requires a psychological acceptance of the ADAS system on behalf of humans, as an essential part of the current and future automobile. The progress highlighted by the documentation undertaken allows us to imagine a concept of a symbiotic human-machine system, based on the communication between ADAS and an external computing resource that assists the driver, based on the long analysis of recorded car events. Future automobiles must include an ADAS system that provides a subtle human-machine synapse, based on a series of computerized warnings to the driver generated in a timely manner, resulting from the high predictive capacity of AI-DLM algorithms. The computing speed of the local ADAS algorithms will be supplemented by the external server processing resource, accessed at the right time, to resolve an unexpected deadlock in the car roll.

Additional Power Losses Estimation in Harmonic Polluted LV Distribution Grid using a Ward's Hierarchical Clustering Method

Bogdan Constantin Neagu (Gheorghe Asachi Technical University), Grigoras Gheorghe ("Gheorghe Asachi" Technical University of Iasi) and Razvan-Petru Livadariu (Gheorghe Asachi Technical University of Iasi, Romania).

The paper investigates the power losses for LV distribution networks in harmonic polluted state. Actually, the low voltage (LV) distribution networks supply a significant number of nonlinear consumers which causes a distorted and unbalanced state. A negative effect of these states is represented by the increase of power losses in distribution network elements. Even if the symmetrical sinusoidal state is initially considered for the power losses, in reality this often leads to power lines overloading, especially for the neutral. The method for power losses estimation in LV distribution network in harmonic polluted environment is very difficult to use. The aim of this paper is to present a reasonably accurate approach to evaluate the effects of harmonic currents on power losses for LV distribution networks using a clustering-based methodology. Moreover, to highlight the proposed Ward's Hierarchical Clustering Method, a study case to classify the additional power losses due to the distorted state of the LV grid is provided. The proposed approach can be considered as an Expert System to evaluate the influence of harmonic losses in the total LV power losses.

Graph Signal Processing Based Classification of Noisy and Clean PPG Signals Using Machine Learning Classifiers for Intelligent Health Monitor

Sai Priyanka Surapaneni (Indian Institute of Technology Palakkad) and M.Sabarimalai Manikandan (Indian Institute of Technology Palakkad).

Photoplethysmography (PPG) signals play an important role for automatic measurement of pulse rate, blood pressure, non-invasive blood glucose level and respiration rate. Most of the PPG monitoring devices are prone to motion artifacts and noises under different PPG recording conditions. Thus, automatic assessment of PPG signal quality is most essential for discarding unacceptable PPG signals and reducing false alarms due to the noisy measurements. This paper presents a new PPG signal quality assessment (SQA) method by using the average degree feature extracted from the horizontal visibility graph (HVG) of the PPG signal and six different classifiers such as random forest (RF), Naive Bayes (NB), decision tree (DT), support vector machine (SVM), multilayer perceptron (MLP), convolutional neural network (CNN). On a wide variety of standard databases, evaluation results show that the CNN based SQA method had an overall accuracy of 99.24% that outperforms other five SQA methods in terms of overall accuracy. The NB based SQA method had an accuracy of 99.21% with lower memory space of 1 kB as compared to other SQA methods.

Blockchain-based Security Framework for Metaverse: A Decentralized Approach

Anand Singh Rajawat (School of Computer Science & Engineering, Sandip University, Nashik, India), S.B. Goyal (Faculty of Information Technology, City University, Petaling Jaya, Malaysia), Ramkumar Solanki (School of Computer Science & Engineering, Sandip University, Nashik, India), Maria Simona Raboaca (ICSI Energy Department National Research and Development Institute for Cryogenics and Isotopic Technologies), Traian Candin Mihaltan (Faculty of Building Services, Technical University of Cluj-Napoca), Zoltan Illies (Department of Media and Educational Informatics, Faculty of Informatics, Eötvös Loránd University) and Chaman Verma (Department of Media and Educational Informatics, Faculty of Informatics, Eötvös Loránd University).

People can act out fake social exchanges in the Metaverse, which is an online community. Security has become a problem in the Metaverse because there are so many online transactions and digital assets. In this thesis, a Blockchain-based security system for the Metaverse is proposed. This would be a decentralised way to keep the virtual world safe. Our system uses Blockchain's autonomous structure to make sure that all financial transactions in the Metaverse are safe, anonymous, and true. We suggest a new consensus process that combines Proof of Stake (PoS) and Proof of Authority (PoA) to make networks safer and allow them to grow. We also have a user-focused, decentralised identity management system that keeps their information safe. We also suggest a way to process Metaverse transactions safely that is based on smart contracts. Our method makes sure that transactional proof, recording, and validation are done in a safe and reliable way. We also show a reputation system that benefits people who follow the law and punishes people who break the law. Lastly, we test how well our suggested structure works with simulations and real-world tests. The results show that our way works to reduce possible security risks in the Metaverse and create a safe, scalable environment for online business. Overall, our Blockchain-based Security Framework for Metaverse: A Decentralised Approach is a good way to keep the security and privacy of digital activities in Metaverse.

Design and Implementation of a LoRa-based Home Monitoring System with Heltec ESP32 Gateway

Akmaljon Latifov (New Uzbekistan University) and Aneesh Pradeep (New Uzbekistan University).

The design and implementation of a smart home monitoring system using LoRa and a Heltec ESP32 gateway are presented in this paper. The suggested system uses several LoRa-based sensors dispersed throughout a house to track various environmental factors like temperature, humidity, and air quality. The Heltec ESP32 gateway, which serves as the system's hub, receives the sensor data wirelessly after being gathered. The gateway processes the sensor data, stores it in a database,

and provides the user with real-time monitoring and control capabilities via a web-based interface. We demonstrate the effectiveness of the proposed system through experimental evaluations in a simulated home environment

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Sensor redundancy for monitoring of sensitive transports

Victor Stoica (POLITEHNICA University of Bucharest), Valentin Iordache (POLITEHNICA University of Bucharest) and Razvan Andrei Gheorghiu (POLITEHNICA University of Bucharest).

When it comes to application logistics, there are many solutions whose main purpose is to move goods or people from point A to point B in the best possible conditions. However, an increasingly important element is the monitoring of goods that are sensitive to changes in transport conditions. There are many shipments of perishable goods or agricultural products that can be damaged or even cause damage if not properly monitored. Grains can be affected due to high humidity and oily products such as sunflower seeds can form hot spots leading to spontaneous combustion. This paper implements a system for monitoring parameters for sensitive goods and transmitting them to a database via the Internet. Parameters such as humidity, temperature and pressure can be useful in preventing the degradation of transported goods if a real-time monitoring solution is used.

Power transformers loss of life evaluation using winding insulation resistance calculation model

Bogdan Leu (Transelectrica), George Serițan (Politehnica University of Bucharest, Faculty of Electrical Engineering), Bogdan Enache (Politehnica University of Bucharest, Faculty of Electrical Engineering), Gabriel Tănăsescu (Simtech International), Radu Porumb (Politehnica University of Bucharest, Faculty of Energy Engineering) and Irina Vilciu (Politehnica University of Bucharest, Faculty of Electrical Engineering).

The conventional loss of life calculation of power transformers is based on IEC and IEEE thermal models that are used already for a long time in the energy sector to evaluate the ageing of transformers and they are integrated in most of the condition monitoring systems. Due to some recent research studies, there was determined a new method to calculate the consumed and remaining lifetime of power transformers, based on a winding insulation resistance model. In this paper, will be presented a study were this new ageing evaluation model will be used to calculate the loss of life of several power transformers installed in the Romanian transmission power grid. The results of this case study will be statistically compared with the results of the conventional thermal model, using data from the condition monitoring systems installed on the power transformer.

Detection and Analysis of Motricity and Somato-Functional Indices of 3X3 Basketball Players to Customize Sports Training

Mihai Oproescu (University of Pitesti), Ion Mihaila (University of Pitesti), Nicu Bizon (University of Pitesti), Dumitru Tudosoiu (University of Pitesti), Vasile-Gabriel Iana (University of Pitesti), Leonard Julien Fleancu (University of Pitesti), Florin Cojanu (University of Pitesti), Vladimir Potop (University of Pitesti), Ilie Mihai (UNIVERSITY OF PITESTI) and Daniela Corina Popescu (UNIVERSITY OF PITESTI).

In the game of basketball in general and in the game of 3x3 basketball, the emphasis is on general physical training and not on specific training, thus allowing the players to have a multilateral training. In order to facilitate the players' positional specialization, the paper aims to improve the body's main functions, allowing adaptation to effort and, at the same time, optimizing athletes' performances. The research that represents the premises of this paper is based on motricity, somato-functional and medical evidence and aims to identify, using predictive and corrective techniques with artificial intelligence (AI), the factors that contribute to the development of an adaptive sports training model for basketball players 3X3. Thus, the goal is to optimize the performance of 3x3 basketball players. By adapting the acquisition of somato-functional and motricity indices respectively, the training model can be applied in other individual or team sports.

Development of energy efficient WSN based smart monitoring system

Asrorbek Eraliev (Andijan Machine Building Institute, Uzbekistan) and Uktam Salomov (Fergana Polytechnic Institute, Uzbekistan).

In agricultural greenhouses, the traditional method of monitoring the agricultural parameters is carried out by manually measurements. This method requires time and human-resources depending on the scale of the greenhouses. However, the measured data are sometimes inaccurate and leads to wrong activities, such as irrigation, which may make negative effects on plants, soils and increase unnecessary resource expenses. Fortunately, in the recent years, different modern technologies have been applied to agricultural sphere and implemented smart monitoring, smart irrigation and other hi-tech systems. However, it is still a great challenge to achieve better energy efficiency and lower the cost for monitoring real time parameters in high quality. In this research work, we de-veloped and implemented a wireless sensor network (WSN) based monitoring system for specifi-cally greenhouses and focused on solving the two main issues: longer life-longevity of WSN devices and lower the system cost. In order to achieve the longer life-longevity of wireless devices we de-veloped specific WSN devices consist of the most low-power consuming electronic components. Besides, operational algorithm and measurement method has been developed, as well. On the purpose of decreasing the hardware material costs, we did choose the most optimal priced electronic components. WSN sensor nodes make measurements of four parameters, soil moisture level, soil

temperature, air humidity and temperature. The measured data is sent to coordinator node which forwards each received data packets to web platform of the system. Gardeners can monitor the real time agricultural parameters of their greenhouses with 5% maximum error through the web platform on any point of the earth where internet connection is available.

The dimensions balance of the energy trilemma and the current energy crisis

Claudiu Pirnau ("Politehnica" University of Bucharest), Liviu Daniel Ghiculescu ("Politehnica" University of Bucharest), Mironela Pirnau ("Titu Maiorescu" University) and Marian Florentin Ghena ("Politehnica" University of Bucharest).

The balance between the three dimensions of the energy trilemma – security, affordability, and sustainability – puts pressure on entities and decision-makers involved in managing the current energy crisis. Erroneous or ineffective management can compromise or prevent the decarbonization trajectory that has as its target "zero emissions", by moving to a carbon-neutral economy, which aims to reduce energy consumption by 50% in the next 10 years. As in the case of economic crises, these in the energy sector have a cyclical characteristic. The only mention is that the current energy crisis is different from previous ones in terms of causes and effects, with an emphasis on climate change and global warming. In this context, this paper aimed to identify the components of the energy trilemma using the "Keywords Everywhere" extension that suggests relevant keywords "Related Keywords" associated with internet queries. The energy trilemma dynamics were analyzed at the Web of Science database level for the period 2017-2023.

IoT ESP32 device for remote experiment manipulation within a LiFePO4 energy storage study

Fadelallah Issa (Valahia University of Targoviste), Mihaita Nicolae Ardeleanu (Valahia University of Targoviste) and Emil Diaconu (Valahia University of Targoviste).

The need to create an experimental setup, geographically isolated, intended for a study regarding the storage of electricity in LiFePO4 type batteries, required the creation of an IoT device through which data can be retrieved and a series of targeted parameters can be obtained. ESP32 is a cheap and powerful microcontroller, easily programmable, with IoT capabilities. The present work presents the concept that was the basis of the creation of the device, the presentation of the device made in the prototype stage and supported by experimental data obtained through the effective exploitation of the equipment. The focus of the work is on the excellent performance of the ESP32 offered on the market at a very affordable price.

Pre-AI Musical Style Analysis Via Their Spectral Distributions

Antonela Toma (University POLITEHNICA Bucharest, Department of Mathematical Methods and Models), Theodor Fratu-Halunga (University POLITHENICA Bucharest, ETTI Faculty) and Andrei Beliciu (University POLITHENICA Bucharest, ETTI Faculty).

In this paper, we will revisit a pre-AI method of identifying musical genres. To do that, the spectrograms of a number of fragments of melodies belonging to various genres will be generated, with the aid of the spectrum analyser included in the Digital Signal Processing Toolbox from Simulink, Matlab, as well as the spectrum analyser of the audio editing and analysis program Audacity. Then, there will be an attempt at identifying the defining spectral features for each of the analysed genres, with the aim of identifying said genres via Fourier analysis. Included in this paper will be a revision of key theoretical concepts pertaining to the Fourier analysis of analog signals as well as digital, as well as an enumeration of the relevant musical theory concepts.

VoIP system for Wi-Fi networks and smart terminals

Cristian Stanescu (Valahia University of Targoviste), Eduard Gabriel Militaru (University Valahia of Targoviste), Predusca Gabriel (University Valahia of Targoviste), Liana Denisa Circiumarescu (Valahia University of Targoviste), Nicoleta Angelescu (Valahia University of Targoviste) and Dan Constantin Puchianu (Valahia University of Targoviste).

The purpose of this paper is to analyze Voice over Internet Protocol (VoIP), the wireless network, and the security protocols used in this network environment. VoIP (Voice over Internet Protocol) is a technology that makes it possible to make calls using the Internet connection instead of the analog telephone line. The Voice over Wireless service was developed in early 2003 and was used in locations with many employees, such as hospitals, factories, and office buildings, where employees contact each other through Voice over Wireless LAN services that do not involve an additional management cost.

Preliminary Architecture and a Pilot Implementation for a Malicious Emails Detection Solution

Cosmina Stalidi (BEIA Consult International), Eduard-Cristian Popovici (POLITEHNICA University of Bucharest) and George Suciu (BEIA Consult International).

Cyber-attacks are one of the most common and dangerous actions that can affect the activity of a small business, when personal data or any other type of sensitive information are stolen. The aim of this paper is to present a preliminary architecture and a pilot implementation, created around a plug-in, that detects malicious emails. The main idea is to collect a series of emails with suspected malicious content, to use text mining techniques to identify the essential words in the emails,

and to create classification models that the plug-in could use to detect malicious emails. The pilot implementation was tested on several emails both malicious and clean, the include plug-in being able to distinguish the emails that are a source of infection with a high degree of accuracy. The novelty of our work consists in the resulting efficient and easy to use tool, based on Machine Learning algorithms, appropriate in the environment of small enterprises.

Intelligent blocking system for mobile communications initiated by unauthorized users

Eduard Badula (Doctoral School of Electronics, Telecommunications and Information Technology), Simona Halunga (Faculty of Electronics, Telecommunications and Information Technology), Octavian Fratu (Faculty of Electronics, Telecommunications and Information Technology) and Mircea Popescu (National Institute for Research and Development in Electrical Engineering ICPE-CA).

Smartphones are nowadays extremely popular mobile devices and have the potential to make people's lives easier, but there are times and places where phones should not be used. A possible solution to this problem is a mobile phone jammer system with the purpose to effectively disrupt the mobile service between the user equipment and the base station. The proposed solution consists of a mobile phone emission detector that identifies the increase in power level in one of the monitored Long Term Evolution (LTE) uplink bands which indicates data traffic between the mobile phone and the base station and triggers the entry into operation of the jamming device creating a denial-of-service attack in the LTE downlink band corresponding to the detected uplink emission. In order to ensure minimum power consumption, while maintaining full efficiency of the jamming system, after an adjustable period of time the emission operation is stopped and the system goes back into detection mode. The system can be build using Software Defined Radio (SDR) technology and GNU Radio software to program and control the SDR devices.

Creating personality model using genetic algorithms and behavioral psychology

Ciprian-Ionut Nutescu (University Politehnica Bucharest) and Mariana Mocanu (University Politehnica Bucharest).

In this paper, we propose a genetic algorithm based on behavioral psychology developed by Carl Gustav Jung (16 Personalities model), in which we describe the person's behavioral features related to his personality. The model used for inherence is based on 40 years of psychology studies from the book "The 16personalityy types that determinate how we live, love and work" by Otto Kroeger and Janet M. Thuesen, published in 1988, but using inference extracted from an MBTI (Myers-Briggs Personality Type Indicator) dataset of online posts based on person personality and it thinks from 2018.

Theory and application of reversible cellular automata in cryptography

George Cosmin Stanica (University of Pitesti) and Petre Anghelescu (University of Pitesti).

The widespread use of telecommunications technologies and networks in various fields of activity has increased the concerns regarding the security and privacy of transmitted data. To address this concern, this paper proposes a different approach for constructing cryptography algorithms using cellular automata (CA). Specifically, we propose an encryption concept based on a class of one-dimensional CA with reversible rules, which offer enhanced information preservation and security. The complexity and parallel nature of CA make them highly attractive for cryptography applications. The proposed algorithm belongs to the class of symmetric key cryptosystems based on stream cipher and can be implemented using both software and hardware. To facilitate experimentation and evaluation, we present a software application that enables the testing of various combinations of reversible rules for data encryption. Experimental results prove the effectiveness of the proposed algorithm in terms of information security and randomness.

A Brief Overview Of Current Encryption Techniques Used In Embedded Systems: Present And Future Technologies

Sebastian Dragusin (University of Pitesti), Nicu Bizon (University of Pitesti) and Robert Bostinaru (University of Pitesti).

This paper examines the evolution of encryption techniques, focusing on the first encryption techniques, encryption norms in embedded systems and current encryption techniques. It also addresses encryption norms that are applied in built-in systems, such as AES (Advanced Encryption Standard) and RSA (Rivest-Shamir-Adleman) standards, highlighting their importance in ensuring data security. In addition to presenting existing technologies, the paper also examines a possible direction of encryption techniques in the future. Possible developmental directions such as quantum encryption and machine learning encryption are discussed, providing insight into the future of this area. Finally, the paper synthesizes the information presented, emphasizing the importance of further research and development in the field of encryption, given the constant growth of cyber threats and the importance of protecting information in today's digital world.

Unveiling the Post-Covid Economic Impact Using NLP Techniques

Kanishk Barhanpurkar (Thomas J. Watson College of Engineering and Applied Science, Binghamton University, USA), Nikita Mandlik (Thomas J. Watson College of Engineering and Applied Science, Binghamton University, USA), Anand Singh Rajawat (School of Computer Sciences & Engineering, Sandip University, Nashik 422213), S.B. Goyal (Faculty of Information Technology, City University, Petaling Jaya, 46100, Malaysia), Constantin Filote (FEECS, Stefan cel Mare University of Suceava, Universitătii Street, No.13, 720229 Suceava, Romania), Chaman Verma (Department of Media and Educational Informatics, Eötvös Loránd University, 1053 Budapest) and Maria Simona Raboaca (ICSI Energy Department, NRDI for Cryogenics and Isotopic Technologies, 240050 Ramnicu Valcea, Romania).

The research paper presents a novel analysis of textual data based on Natural Language Processing (NLP) techniques to analyse New York Times articles from January 2019 to May 2023. The purpose of this paper is to gain an understanding of the economic impact that follows Covid-19 disease. New York Times (NYT), it was started in 1884 is one of the most prominent newspapers in the world. Additionally, we have used the New York Times Archive API to collect the data for the given timeframe. By analysing sentiment analysis, topic modelling, entity recognition, and keyword extraction, valuable insights can be gathered into market trends, industry shifts, and policy interventions. The authors have created a data science pipeline using Amazon Web Services (AWS), which enables data collection, storage, and visualization. It contributes to a better understanding of the pandemic's short-term and long-term economic effects. The results of this study demonstrate Natural Language Processing techniques' potential as a tool for financial analytics, assisting policymakers, economists, and businesses in formulating recovery strategies.

Pinewood Knot Detection Method Using Color Analysis

Dumitru Abrudan (Telecommunications Department, University Politehnica of Bucharest), Ana-Maria Drăgulinescu (Telecommunications Department, University Politehnica of Bucharest) and Nicolae Vizireanu (Telecommunications Department, University Politehnica of Bucharest).

Since ancient times the pinewood is the most used construction material for living houses and bridges. The material density for fresh cut tree is 830 kg/m3 and it decreases to 460 kg/m3 for dry tree and it can be found in dedicated stores for construction material as timber. Because pinewood is a low weight material with bending resistance, for wooden houses with ground floor or ground floor and attic height regime, the weight loads are distributed through beams (wood structural components). In this work we propose to detect pinewood knots from an images database. The contributions presented in this paper are as follows: mathematical morphology operators (MMO) applied to color images (particularly dilation and erosion) followed by a RGB value filter (RGBVF). The MMO removes the pixels with weights lower than the structuring element defined in the proposed paper. RGBVF highlights the presence of knots if are detected. Experimental results on several sets of images with regards to proposed method are shown and discussed. The global implication: improvements in construction buildings' safety and financial advantages for pinewood buyers.

Web Search Optimization using PSO

Nishkarsh Verma (Department of Computer Science & Engineering ABES Engineering College Ghaziabad, India), Pratham Gupta (Department of Computer Science & Engineering ABES Engineering College Ghaziabad, India), Ravi Kumar (Department of Computer Science & Engineering ABES Engineering College Ghaziabad, India), Latha Banda (Department of Computer Science & Engineering ABES Engineering College Ghaziabad, Uttar Pradesh), Chaman Verma (Department of Media and Educational Informatics, Faculty of Informatics, Eötvös Loránd University), Maria Simona Raboaca (ICSI Energy Department, National Research and Development Institute for Cryogenics and Isotopic Technologies,) and Constantin Filote (Faculty of Electrical Engineering and Computer Science, Stefan cel Mare University of Suceava).

The Internet is a vast and constantly growing entity. It presents a significant challenge to locate valuable information within its expansive resources. When users make inquiries, they are often overwhelmed with millions of webpages as search results. Complicating matters further, the lack of ratings on these websites makes it difficult for users to identify relevant information related to their query. This study introduces an innovative approach to prioritize web publications by considering factors such as web content, usage, and structural data. The proposed method holds considerable potential for various applications, including but not limited to web customization, adaptive web development, recommender systems, search engine optimization, and business intelligence solutions.

A Reliability Analysis of Self-Driving Vehicles: Evaluating the Safety and Performance of Autonomous Driving Systems

Aneesh Pradeep (New Uzbekistan University), Mironshokh Bakoev (New Uzbekistan University) and Nazokat Akhroljonova (New Uzbekistan University).

Self-driving cars are a ground-breaking invention with the potential to revolutionize the transportation sector. As technology develops, it is more crucial than ever to guarantee the dependability of self-driving cars. The dependability analysis of self-driving cars is the main topic of this research article. The multiple levels of automation in self-driving cars and their accompanying reliability requirements are covered in the first section of the study. Afterwards, it examines the many parts of a self-driving car system, such as the perception, decision-making, and control subsystems, and talks about the

dependability issues that each of these parts faces. The paper ends by highlighting the value of reliability analysis in assuring the security and wide acceptance of self-driving cars. In order to overcome the remaining issues and provide more sophisticated methods for self-driving car dependability evaluations, the report advocates for additional research

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Transmission Techniques in Data Acquisition Systems using Arduino and ESP32

Maria-Elena Stanciu (University of Pitesti), Rodica-Mihaela Teodorescu (University of Pitesti), Grigore-Adrian Iordachescu (University of Pitesti) and Daniel-Alexandru ViŞan (University of Pitesti).

The purpose of this work is to present three methods of data transmission using two acquisition boards (ESP32 Node MCU and Arduino UNO) and two design platforms (Labview and Blynk). With the help of temperature, brightness, and humidity sensors, the acquisition boards can acquire data regarding the environmental parameters within a plant cultivation framework. The ESP32 Node MCU acquisition board achieves data transmission through serial communication and via Blynk, while the Arduino UNO acquisition board achieves data transmission through serial communication and via Labview. Data acquired using the two boards (Arduino and ESP32) and through the three methods (serial, via Blynk and via Labview), are compared in order to highlight the performance of each in terms of transmission speed, complexity, costs and user accessibility. It was demonstrated that coupling the Arduino board with the Labview platform greatly enhances the user interface, making it on par with an interface achieved by the ESP32 board via the modern Blynk on-line server. The methods presented in this paper can be applied as didactical aids in many university laboratories.

Unveiling Threats: Leveraging User Behavior Analysis for Enhanced Cybersecurity

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The rapid evolution of cyber threats has made it imperative for organizations to develop robust cybersecurity strategies. While traditional defense mechanisms focus on network and system-level protection, recent research has highlighted the critical role of understanding user behavior in preventing and mitigating cyberattacks. This paper introduces a novel approach which utilizes advanced analytics techniques to analyze and interpret user actions, patterns, and anomalies to identify potential threats and enhance overall cybersecurity measures. The methodology employed in this research leverages user behavior analysis (UBA) as a proactive defense mechanism against emerging cyber threats. By collecting and analyzing data from various sources, including user interactions, login activities, system logs, and application usage patterns, the proposed approach aims to identify abnormal behaviors that could indicate the presence of malicious actors or compromised user accounts. Furthermore, by incorporating machine learning algorithms and anomaly detection techniques, the system can adapt and learn from evolving attack vectors, increasing its effectiveness over time.

Performance Comparison of 15-Level Multilevel Inverter Topologies

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Multilevel inverters (MLI) have gained a lot of attention in the area of renewable energy applications in recent years. The popularity of MLIs is due to their ability to efficiently convert the energy from renewable sources, such as solar and wind power, into usable electrical energy. One key advantage of using reduced multilevel inverter configurations is that it can help to reduce the overall cost of the system by decreasing the number of components required. The reduction of components in the inverter circuit results in the reduction of complexity in design and lower cost of system. This paper proposes a fifteen-level modified cascaded h-bridge multilevel inverter with a reduced number of switches. The simulation results of the proposed inverter demonstrate that the inverter is able to effectively reduce harmonics and with reduced number of components required while still providing good performance. The proposed inverter design is also evaluated on its harmonic reduction characteristics, providing a cleaner output waveform and less distortion.

The Optimal Shape of the Surface Hardening Head Obtained by Numerical Modeling

Mihaela Cornelia Novac (University of Oradea), Marius Codrean (University of Oradea), Mircea Gordan (University of Oradea), Mihaela Codrean (University of Oradea), Mihai Oproescu (University of Pitesti), Ovidiu Constantin Novac (University of Oradea) and Francisc Slovac (University of Oradea).

This paper presents some aspects of the numerical modeling performed in order to study the process of induction heating applied to a workpiece, using Flux 2D and FEMM (Finite Element Method Magnetics), two software tools specifically designed for electromagnetic simulations. The paper presents a significant technical finding regarding the optimal shape of the surface hardening head. Various shapes of the inductor were analyzed, focusing on solving the eddy current problem

using the commercial program FEMM. The induction heating process was numerically simulated using the FLUX 2D program for a semi-finished punch made of OLC 45 steel, specifically for hot surface heat treatment. The simulations were conducted utilizing the program's simulation capabilities.

Machine Learning Techniques for Analysis of Mars Weather Data

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The exploration of Mars has provided vast amounts of weather data that present unique challenges for analysis and prediction. To address these challenges, this research paper focuses on the application of machine learning techniques for the analysis of Mars weather data. The objective is to develop models that can effectively extract patterns, uncover hidden relationships, and enable accurate predictions in the Martian weather system. The research begins with a comprehensive review of the available Mars weather data. The dataset, consisting of historical records, serves as the foundation for training and evaluating machine learning models. The analysis of the Mars weather dataset reveals the planet's icy and harsh climate, with average maximum temperatures of around -21°C and average minimum temperatures of -80°C. The temperature variations show that the minimum temperature fluctuates within a narrower range of 20–30°C over the course of Mars sols from 0 to 2000, while the maximum temperature experiences larger variations of about 40–50°C. During this time, the atmospheric pressure on Mars fluctuates between 720 Pa and 950 Pa. In addition, using the elbow method revealed that 3 clusters were the ideal number for identifying distinct patterns in the weather data. The linear regression model also attained an accuracy of 85%, demonstrating its efficacy in forecasting weather patterns on Mars.

An Isolated High-Power Bidirectional Five-Level NPC Dual Active Bridge DC-DC Converter with Anti-Windup PI Controller for Electric Vehicle-to-Home Application

Elanur Ekici (Adana Alparslan Turkes Science and Technology University), Tahsin Koroglu (Adana Alparslan Turkes Science and Technology University) and Doğan Çelik (Van Yuzuncu Yıl University).

This paper introduces the design and analysis of an isolated bidirectional five-level neutral point clamped (NPC) dual active bridge dc-dc converter with an improved antiwindup strategy using proportional-integral (PI) controller for electric vehicle-to-home applications. The proposed converter is more advantageous in that it provides a five-level output voltage at the high-frequency isolation transformer sides thanks to its NPC structure compared to the conventional full-bridge circuit. Reducing switching stresses, providing galvanic isolation, ensuring bidirectional power flow and simple control strategy are the highlights of the proposed structure. A single phase shift (SPS) modulation strategy has been employed to regulate the output voltage and to generate switching signals of the proposed dc-dc converters' switches. To improve the dc-link voltage and to reduce the output voltage tracking errors, the anti-windup PI (PIAW) controller has been utilized instead of the conventional PI controller. To demonstrate the verification of the proposed converter and its controller, a simulation model has been developed in MATLAB/Simulink software. The performance and effectiveness of the proposed converter have been evaluated under steady-state and dynamic variations by the simulation results.

Study of the influence of frequency converters on electrical power quality indicators

Alexandru Savulescu (Petroleum Gas University of Ploiesti), Alina Daniela Handra (Petroleum Gas University of Ploiesti) and Cristina Pupaza (University of Petrosani).

The increase in the share of receivers with non-linear characteristics, among the most common being static frequency converters, produce important voltage and current distortions in electrical networks and require the adoption of effective measures to limit them. The paper presents details regarding the realization and results of an experimental study that reveals how the frequency converters that feed the asynchronous motors influence the electric power quality transmitted to the receivers. The measurements performed in stationary mode highlight the shape and parameters of the line and phase voltages at the output of the converter for various operating frequencies and various load torques, analyze the frequency spectrum and the variation of the coefficients kd and THD.

A Digital Twin Approach of A-vent Wireless Sensor for Real-Time and Predictive Monitoring of Patient Ventilator Asynchrony

Carlos Oppus (Ateneo de Manila University), Paul Ryan Santiago (Ateneo de Manila University), Justin Bryce Torres (Ateneo de Manila University), Neil Angelo Mercado (Ateneo Innovation Center), Paul Cabacungan (Ateneo Innovation Center), Reymond Cao (Ateneo Innovation Center), Nerissa Cabacungan (Ateneo Innovation Center) and Gregory Tangonan (Ateneo Innovation Center).

Prior to the recent work on a low-cost Ateneo mechanical ventilator machine named A-vent, this study demonstrated a simple Digital Twin approach for a real-time monitoring system that can be useful to any mechanical ventilator unit. Previous research concentrated on A-vent design, Near Cloud data caching, and Machine Learning model development. However, it lacks Internet of Things capabilities for remote monitoring applications. This work incorporates new software components to a Near Cloud server that stores and monitors the ventilator and patient data across the wireless network. Wireless sensor nodes attached to the A-vent and patient interaction model capture the time-series waveform of the ventilator, its predictive analysis, and oximeter values. The data queries command displays the data stored in the Near Cloud databases on the monitoring dashboard. It shows a digital representation of the system, allowing real-time updates to be viewed remotely and easily comprehended.

Markup language model transformation with ATL

Zorana Staka (Faculty of Electrical Engineering, University of East Sarajevo), Vladimir Vujovic (Faculty of Electrical Engineering, University of East Sarajevo), Milica Vukovic (Faculty of Electrical Engineering, University of East Sarajevo) and Snjezana Milinkovic (Faculty of Electrical Engineering, University of East Sarajevo).

Nowadays, Internet communication and global data exchange rely on markup languages, which represent one of the most commonly used modern digital technologies. Due to the lack of a global standard, the conversion of content from one markup language to another is usually a complicated task. One of the most common solutions found in related research is based on the use of code-centric software engineering, which requires a significant investment of time and shifts the focus from the problem domain to the technical implementation. These drawbacks can be overcome by proposing a Model-Driven Engineering (MDE) approach, which observes a problem on a higher level of abstraction. Based on the previously created meta-models of markup languages, this research aims to show that it is possible to convert the content between different markup language models using the ATL Model-to-Model (M2M) transformation language. To verify this approach, a real-life example of the conversion of content from the Markdown language model into an HTML model using ATL transformation is provided. The developed transformation represents one of the necessary prerequisites for a comprehensive solution to the content conversion from one markup language to another.

Battery Energy Storage System for Frequency Control in Power System

Al Hasheme Jaleel (University POLITEHNICA of Bucharest), Lucian Toma (University POLITEHNICA of Bucharest) and Mircea Eremia (University POLITEHNICA of Bucharest).

The demand for frequency regulation services has expanded in recent decades in line with the unprecedented degree of penetration of renewable energy sources in power systems. Simply increasing the capacity of conventional generators may not be a viable approach for immediately delivering frequency regulation services due to the limited ramp rate and economic constraints of conventional generators. In some renewable energy integration projects, a large-scale battery energy storage system has been used as a promising approach for frequency management. High renewable energy penetration in power systems typically causes the displacement of traditional synchronous generators. As a result, when a load-generation imbalance occurs, the power system's inertia decreases, leading to a higher frequency deviation and potential system instability. The ability of BESS to provide virtual inertia and contribute to system frequency management is studied and validated using simulations on a two-zone linked power system.

Artificial Intelligence in Data Analysis for Open-Source Investigations

Teodor-Cristian Radoi (Web Vortex).

Open source investigations are challenging due to the vast amounts of data to verify and the likelihood of encountering incorrect data. To address these issues, an agent needs a tool that can process data in real-time and simplify the processing of large volumes of information. This can be achieved by integrating a GPT model that learns from the data it processes. The study introduces an OSINT platform that uses a GPT model to enhance the efficiency of open source investigations. The OSINT platform developed by us organizes data in a hierarchical graph, with a particularly interesting feature: the integration of a GPT model, which allows the user to process large data faster and more easily. To communicate with this GPT model, the user may chat with a virtual agent in natural language to give data processing commands. The study assessed different natural language processing models, including BERT and GPT models, and focused on the benefits of pretraining, fine-tuning, and generative models for open source investigations. GPT models have an advantage in pretraining, allowing them to capture complex relationships between words and phrases. This pretraining makes the models customizable for specific tasks, providing investigators with a powerful tool for analyzing text data. The generative nature of GPT models is a key advantage for OSINT investigations, as it allows the model to generate human-like text for analyzing data. Fine-tuning is also critical, as it enables investigators to train the model on specific topics and customize it to their needs. By using natural language processing models in open source investigations, investigators can generate more accurate and reliable results while reducing the time and effort required for data analysis. Overall, this work highlights the importance of incorporating natural language processing models in OSINT investigations and provides a foundation for future research in this field.

Comparison of Node.Js and Spring Boot in Web Development

Ovidiu Constantin Novac (University of Oradea), David Ghiurău (University of Oradea), Mihaela Cornelia Novac (University of Oradea), Cornelia Emilia Gordan (University of Oradea), Mihai Oproescu (University of Pitesti) and Gyongyi Bujdoso (University of Debrecen).

In this paper we present two types of server implementation, we will look at the advantages and disadvantages of each technology. Node.Js server application, built with Express.Js, a single threaded server which will treat the requests in an asynchronous manner, with a non-blocking principle, whilst Spring Boot is a more robust and more common approach of a server technology with the benefits of having a strongly typed architecture and multiple threads available. These types of application will behave the same, making almost impossible to tell the difference between a Node.Js and a Spring Boot web server.

Neural Circuits and Their Electronic Models

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With the time passing the advances in electronics are seriously challenging the natural world in efficiency and organization. Already there are some advanced artificial intelligence achievements that make some scientists asks if it is for the safe of the humanity to be met in practice. Although is seems that are unexplored human brain capacities actually unexplored by common peoples, which would make them superior for a long time in the competition with the electronic brain. The brain functioning relay on some common circuit type. The electronic circuit were not designed in order to copy the neuronal circuits but unavoidable resembling them, as time as are respecting the same natural laws of logical and efficiency.

NEAT algorithm for simple games

Cristian-Bogdan Pătrașcu (University Politehnica of Bucharest) and David Iancu (University Politehnica of Bucharest).

Evolutionary algorithms are a subfield of artificial intelligence, which, even if deep learning is the leading factor nowadays, gained more attention in recent years, due to the increase of processing power. One of the most popular topics in this field is Neuroevolution, since is combines the advantages of evolutionary algorithms with the advantages of neural and deep neural networks. In this paper, we demonstrate how can NeuroEvolution of Augmenting Topologies (NEAT) be used for game playing. The AI that we trained was able to rapidly learn how to play 2 very popular games, namely Dinosaur Game and Flappy Bird, without the need of any specialized computational device (no GPUs were needed).

Effective solution to extend the lifespan of the LIFEPO4 battery by minimizing temperature variation

Fadelallah Issa (Valahia University of Targoviste), Mihaita Nicolae Ardeleanu (Valahia University of Targoviste) and Emil Diaconu (Valahia University of Targoviste).

Energy storage is an essential point for defining both the energy capacity of the off-grid photovoltaic system and ensuring the longest possible exploitation of the battery group. The life of batteries depends on how they are operated as well as how they are stored. We will refer in this paper only to the aspect of their storage. We focused on demonstrating that proper storage can ensure a constant optimal operating temperature at negligible cost. Earth's energy is an essential component of the innovative battery storage system. The reduction of thermal fluctuations specific to the seasons becomes achievable by using underground thermal energies. In addition, the proposed storage system involves the recycling of decommissioned or discarded refrigeration equipment casings from manufacturing, eliminating the costs of recycling and the carbon footprint induced by the related processes. The measurements were obtained during the experiments with an IoT device based on the ESP32 controller developed by the authors which will be the subject of a different paper. Thus, with extremely low costs, energy storage becomes ideal from a thermal point of view, regardless of the succession of seasons, in a continental temperate zone. The scientific work is a synthesis of the resulted experimental data that create a perfect profile for the innovating system behavior.

Game-based Resource Allocation for Secure UAV Communication in Wireless Networks

Riya Kakkar (Deptartment of Computer Science and Engineering Institute of Technology, Nirma University), Rajesh Gupta (Deptartment of Computer Science and Engineering Institute of Technology, Nirma University), Smita Agrawal (Deptartment of Computer Science and Engineering Institute of Technology, Nirma University), Sudeep Tanwar (Deptartment of Computer Science and Engineering Institute of Technology, Nirma University) and Emil Pricop (Petroleum-Gas University of Ploiesti).

Unmanned aerial vehicles (UAVs) are one of the applications of device-to-device (D2D) technology, where two UAVs can communicate with or without the existence of a base station. It facilitates high content delivery, low latency, low cost, and

high data rate communication in wireless networks. Despite the aforementioned benefits, an eavesdropping attack is one of the critical challenges that cause interference in UAV communication in the presence of an eavesdropper. To mitigate the aforementioned challenges, we proposed a secure resource allocation for UAV communication in wireless networks. The applied single carrier orthogonal frequency division multiple access (SC-OFDMA) technique utilize the orthogonality feature to provide secure UAV communication in wireless networks. Moreover, a zero-sum game approach is considered to enable the secure and optimal resource allocation for UAV communication. The main aim of the zero-sum game theory is to maximize the communication channel's data rate and secrecy capacity to achieve a secure and optimal UAV communication scenario in wireless networks. Finally, the performance and simulation of the proposed approach are evaluated against the existing random approach in terms of various metrics such as data rate and secrecy capacity of the communication channel.

An AI based Formulated Conference Calling System using Bluetooth

Ankita Dixit (Samsung Research Institute Noida) and Mohit Vashishtha (Samsung Research Institute Noida).

Conference call using mobile refers to the telephonic call in which several people talks to each other simultaneously. This is one of the most eminent feature now-a-days. This concept is already existing using LTE technology for mobile phones supporting SIM cards. Hence, currently conference call is possible only with support of SIM card, i.e. Mobile operator. Bluetooth is a short-range wireless technology which is used for exchanging data between devices placed over short distances (up to 240 meters). This is a booming technology which is easily and freely available and have no dependency on network operators. Our study work proposes a smart system to enable conference call with more than two mobile users without SIM support communicating with each other simultaneously. AI based proposed solution willbe self –governed, self-learnedand will be intelligent enough to smartly switch between all callers connected via Bluetooth in conference call. This proposed solution system will greatly increase the potential of using Bluetooth technology from a wider applicability perspective of conference calls, which is currently only possible over LTE mobiles.

A Modern Paradigm for Effective Software Development: Feature Toggle Systems

Cosmin-Ioan Roșu (Computer Science Dept., Military Technical Academy) and Mihai Togan (Computer Science Dept., Military Technical Academy).

Feature management represents the strongest method in supporting continuous integration and continuous delivery. It it a method of modifying characteristics of an application while on production, without reaching the code. Developers can create functions commutations by creating a decision point which will decide the way the system would then be running. In other words, these commutations permits fast and easy delivering of context sensitive software. The main aspects of a system that manages these feature toggles would be the ability to flip the state in real time, furthermore the segmentation of user base by offering a context and lastly the ability to modify values involved in some kind of operations, from outside the system. Through an evaluation of these key features, this analysis aims to provide insights into the suitability and effectiveness of each system for managing feature toggles in software development scenarios. Moreover, in addition to the comparative analysis, this paper aims to propose a custom solution that addresses the identified challenges and limitations of existing systems. Our custom implementation is designed to enhance the management of feature toggles, offering improved organization and streamlined processes. By detailing the main resources utilized in our custom system, including environments, projects, feature toggles, and client SDKs, we present a novel approach that aims to simplify and optimize feature toggle management.

Survey of Electrical Ambient Intelligence (AmI) Devices Built for Environmental Monitoring

Aurel Ștefan Pica (Doctoral School of Electrical Engineering, Politehnica University of Bucharest) and Isabela Elena Bănescu (Faculty of Electrical Engineering, Electronics, Information Technology, Valahia University of Targoviste).

This paper presents a thorough survey of the evolution of electrical devices used for environmental monitoring. The technologies that make up these equipments are carefully investigated, several efficient solutions of devices built for this type of measurements are proposed and compared. The aim of this article is to describe their characteristics and highlight future challenges, especially for the software and knowledge engineering communities.

Sequential Convex Program for Variable Speed Pump Scheduling in Water Distribution Systems

Pham Dai (TLU).

Operation of water distribution systems (WDSs) to reduction of water leakage can be achieved by properly operating variable speed pumps (VSPs). This practical problem can be casted into a nonlinear program (NLP) where decision variables are relative speeds of pumps and or pressure settings of pressure reducing valve while the state variables are flows and nodal heads. The formulated NLP consists of both convex and non-convex constraints, for this reasons, we proposed to apply the sequential convex programming technique (SCP) for solving the NLP. The advantage of the SCP method lies in the fact that instead of solving the non-convex NLP, we solve sequential convex NLPs and the convergent rate of the approach is linear. The effectiveness of the approach was demonstrated on two WDSs for optimal VSP scheduling problem.

Trends and Advantages in Using Nanomaterials for Air Filtration

Mihai Oproescu (University of Pitesti), Omar Ahmed (University of Pitesti), Vasile-Gabriel Iana (University of Pitesti), Maria Magdalena Dicu (University of Pitesti), Ancuța Mihaela Balteanu (University of Pitesti) and Monica Baldea (University of Pitesti).

In recent years, substantial progress has been achieved in the preparation and characterization of nanostructured materials, which have become available for a wide range of applications with filtering properties. In such materials it has been observed that, with decreasing crystallite sizes, grain boundaries contribute significantly to the material's microscopic properties. Numerous fundamental physical properties change dramatically when the dimensions of materials become in the nanometer range. Nanostructure properties are highly influenced by the interface between different particles, layers, or crystals or amorphous domains. An increasing number of studies are being done on metal oxide nanoparticles such as MgO, ZnO, CaO, CuO, Ag2O, TiO2, Ag, and carbon nanotubes for their potential application as antimicrobials in food, environment, and health settings. The paper aims to summarize the importance of using nanomaterials to increase the efficiency of filtration media.

Compressive Sensing-Based Automatic PPG Signal Quality Assessment Using CNN for Energy-Constrained Medical Devices

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Smart wearable and portable healthcare devices are used for continuous patient health monitoring but have limited battery power and on-board memory. Therefore, there is a huge demand for an automated photoplethysmogram (PPG) signal quality assessment (SQA) for energy-constrained smart medical devices. In this article, we propose a novel convolutional neural network (CNN)-based compressive sensing PPG-SQA method for low-power wireless healthcare devices. The main focus of this paper is to find a best compressive sensing matrix to directly classify the compressed PPG segments into noise-free and noisy segments using the optimal one-dimensional CNN architecture. The proposed CS-PPG SQA method was evaluated using 4-layer and 32 filters with a rectified linear unit (ReLU) activation function. Evaluation results showed that the binary block diagonal (DBBD) sensing matrix with a compression factor of 2 outperforms the existing methods with original PPG signal. The proposed method had an accuracy (ACC) of 99.55% for noise-free PPG (NF-PPG) versus wrist-cup noisy PPG database (MA-DB01), 99.99% for NF versus random noise-added PPG (RN-PPG) segments and 72.71% for NF-PPG versus acceleration corrupted PPG database (MA-DB02). The proposed method can reduce false alarms by discarding noisy PPG segments and reduce model size, and computational time by 50% as compared to other existing SQA methods.

Prediction of Heat Energy Release Rate for Ammonia Combustion in a Constant Volume Combustion Chamber: A Machine Learning Approach

Lijia Fang (Department of Engineering and Applied Sciences Sophia University), Hardeep Singh (University of Windsor, Ontario), Mitsuhisa Ichiyanagi (Department of Engineering and Applied Sciences Sophia University), Takashi Suzuki (Department of Engineering and Applied Sciences Sophia University), Maria Simona Raboaca (ICSI Energy Department National Research and Development Institute for Cryogenics and Isotopic Technologies), Traian Candin Mihaltan (Faculty of Building Services, Technical University of Cluj-Napoca, 40033 Cluj-Napoca, Romania;) and Chaman Verma (Department of Media and Educational Informatics, Faculty of Informatics, Eötvös Loránd University).

Addressing global warming requires immediate and concerted action. Transitioning to renewable energy sources, such as solar and wind power, reducing emissions from transportation and industry, and implementing sustainable land-use practices are crucial steps. Therefore, Ammonia attracts researchers when used as a fuel, offers several potential benefits such as higher energy density, Carbon-Free fuel, and Versatility. However, due to poor combustion speed of ammonia offers slower energy release, the need for larger combustion chambers, difficulties in ignition, limited combustion stability. To enhance the average flame velocity of ammonia, the current investigation employed the exhaust gas expelled from the secondary chamber to compress the mixture within the primary chamber and facilitate its HCCI combustion. The main goal of research is the optimization on air-fuel equivalence ratio to contribute to the development of more efficient and sustainable constant volume combustion. However, the time required for constructing physical prototypes and conducting experiments can be considerable, thus, to mitigate these challenges, the authors turned to AI tools as an alternative approach. In the proposed research, the linear regression model is used to predict and validate the experimental values. The results evaluated through linear regression model reveals that experimental values are close to predicted values and hence validate the results.

Urban transformation processes and material stock techniques to facilitate circular economy and urban resilience

George Suciu (BEIA Consult International), Ioana Petre (SC BEIA CONSULT INTERNATIONAL SRL) and Cosmina Stalidi (BEIA Consult International).

The most significant material stock accumulated in modern society comprises construction materials. The global material stock accumulation rate is increasing every year. This growth results from high resource and energy consumption, demolition

waste emissions, and environmental impacts at the global and local levels, leading to increased greenhouse gas emissions. Thus, material efficiency and the circular economy represent important strategies for reducing these emissions. This paper presents the CREATE project's scope, which aims to support municipalities in developing strategies towards a local/regional Circular Economy approach focusing on buildings, municipal roads, water infrastructure, and wastewater pipes. To inform decision-makers and support a circular built environment, the project will further enhance already existing, validated, and deployed tools and arrangements. The project will follow a co-creation process and a living lab participation approach. Even though the entire Circular Economy range of strategies is discussed, the focus will be on empowering the recycling and reuse of materials stocked in existing buildings and infrastructure.

Analysis, Combination and Integration of Neuroevolution and Backpropagation Algorithms for Gaming Environment

Andrei Darii (University of the Bundeswehr Munich), Maximilian Moll (University of the Bundeswehr Munich), Marian Sorin Nistor (University of the Bundeswehr Munich), Stefan Pickl (University of the Bundeswehr Munich), Ovidiu Constantin Novac (University of Oradea), Cornelia Mihaela Novac (University of Oradea), Ioan Mircea Gordan (University of Oradea) and Cornelia Emilia Gordan (University of Oradea).

This paper provides a method of combining Neuroevolution with Backpropagation to achieve lower training times than Neuroevolution when training agents in a video game environment. The combination of these algorithms is reproduced by an alteration of the step of creating a new generation from the most capable agents with the creation of a new generation through the Backpropagation method using the preventively saved data of the most capable agent from the environment. Thus, for the new generation, a Neural Network trained with backpropagation is assigned instead of the best-performing Neural Network from the previous generation. As a result, the Neuroevolution with the Backpropagation method shows better performance when increasing the target of the environmental performance of the agent.

A novel approach to extract digital signatures from handwritten character images

Daniel Bekker (Georgia Southern University) and Ionut Iacob (Georgia Southern University).

Manuscript character recognition is undoubtedly an interesting and practical problem. While the current state of the art solutions are very effective, they mostly rely on Artificial Neural Network based models for performing characters recognition. Such models typically require significant amount of training data in order to produce high accuracy results.

We are proposing a method for extracting the most significant features of character images and creating a low dimensional space numeric signature for each character image shape. Such signature can be used to measure similarities between character images, and subsequently perform clustering, classification or searching for character images. Our methodology is suitable to manuscript character images, for which, typically, there are no pre-trained advanced models that can be used to perform clustering or classification tasks.

Path Planning Optimization of Automated Guided Vehicles using Chaotic Marine Predators Algorithm

Zahidi Rahman (MIMOS Berhad) and Wen Chek Leong (MIMOS Berhad).

This paper presents the collision-free path planning approach for automated guided vehicle (AGV) in an intelligent warehouse environment, optimized by means of recent well-known meta-heuristic algorithms. This novel approach is an assessment and possibilities for path planning and scheduling of the multi-AGVs to complete the given tasks in a minimal travel distance with optimal operation time. Six different metaheuristic algorithms such as PSO, MELGWO, GTO, SFS, MPA and chaotic-improved MPA are compared for the AGVs path optimization capability. In order to test the robustness of the proposed approaches, four different scenarios are presented which include a general obstacle avoidance and three tasks in simple maps that treated as an intelligent warehouse environment. In each scenario, the obstacles are placed in such a way to increase the overall path complexity for an AGV to reach the target destination. The exploration and exploitation phases in the MPA algorithm are enhanced simultaneously by replacing the conventional Gaussian random with chaotic operators to ensure its effectiveness in AGVs path planning optimization. The chaotic MPA algorithm outperforms other algorithms based on the statistical analysis results with overall improvement of 11.0171% in comparison to unoptimized probabilistic roadmap method (PRM) planner. In conclusion, the chaotic MPA algorithm can be efficiently optimized the AGVs path planning in all aforementioned environments.

Recognition of Handwritten Mathematical Symbols Affected by Noise using DNN

Dumitru Abrudan (Telecommunications Department, University Politehnica of Bucharest), Ana-Maria Drăgulinescu (Telecommunications Department, University Politehnica of Bucharest) and Nicolae Vizireanu (Telecommunications Department, University Politehnica of Bucharest).

Abstract—In all world's countries, mathematical symbols (MS) are international and are hand-written or typed using the same symbol. This is not the case with the alphabet where each country has his own letter. The expression for an equation is written as a combination of letters and MS, e.g. "a+b". In the case of handwritten documents, proper recognition of the MS is necessary to check if the mathematical expression is written or solved correctly. This paper focuses on the MS handwritten recognition affected by noise during image acquisition. The architecture of the proposed algorithm is to create a deep neural

network (DNN), to remove noise from a capture image using mathematical morphology operators (MMO) filters, and to check if the filtered image can be classified by our proposed DNN. Finally, the results of MS handwritten recognition after noise removal are shown and discussed.

Zero-Load: A Zero Touch Network based router management scheme underlying 6G-IoT ecosystems

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The rising data volumes force significant bottlenecks on the 6G for IoT (6G-IoT) network management functions, which limits the control, flexibility, and interoperability among devices, protocols, and end applications. Solutions like software-defined networking (SDN), and network function virtualization (NFV) are proposed with 6G, but the core management operations are still manual. Thus, to automatically upscale these 6G-IoT networks at reduced cost orchestration complexity, zero- touch networks (ZTN) are proposed. ZTN in 6G-IoT allows a high degree of automation and seamless integration of services. The article proposes a scheme, Zero-Load, that integrates ZTN at the core routing functionality of the 6G-IoT applications. We present a load balancing and traffic classification scheme through the ZTN networking stack for core routers. The ZTN router configuration fabric connects applications with the core services. Further, we present a Gaussian kernel-based support vector machine (SVM) classifier at the ZTN automation layer, which classifies the normal traffic and attack traffic. The proposed work is compared for parameters like mean time to response (MTTR), and resolution latency against baseline SDN and NFV schemes. Using ZTN, an average improvement of 32.45% is obtained in MTTR, 87.89% in resolution latency (against a query). Using the Gaussian RBF kernel, an accuracy of 0.9914 is reported. These results indicate that ZTN-based management paves the way toward a more dense and intelligent 6G-IoT network.

Chaotic American zebra search optimization algorithm for benchmark challenges

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In this research, we presented a modification to the recently developed swarm premised American zebra search optimization algorithm (AZOA) using chaos. The particular Singer mapping was proposed by the so-called chaotic AZOA and was already known to perform better in optimization. Twelve uni, multi modal benchmark functions, three-bar truss and ten bar truss optimal structural designs were tested. The chaotic AZOA with Singer map would perform more effectively, more consistently, and quicker than the classical AZOA and other recent metaheuristics in optimization, according to the results, which also supported the viability of the modifications. It was discussed if the chaotic AZAO could be optimized with the original AZOA, and the chaotic AZOA was suggested for use in applications for actual engineering challenges

Formation of Specific Competences in the Engineering Career by Educational Software – methodological landmarks applied to the "Initiation in research" discipline

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Since a curricular concept oriented towards the formation of competences is very topical, the informational and educational technologies are characterized as a transdisciplinary and interdisciplinary field, which provides tools for the elaboration of educational applications, which can eventually be implemented in technical disciplines. Since both teachers and students often see only a part of the TIC (Information and Communication Technologies) possibilities, we believe it is necessary to research and bring to the attention of the pedagogical opinion the formative valences of modern technologies, which are no longer just an element of impact, but tend to already become everyday tools with perspective in the formation of transversal competences in most technical disciplines. In the context of formative-productive education, in this paper, we are concerned with the study of engineering disciplines through traditional strategies and methods, the formation of positive attitudes of students towards the immanent values of engineering and their correlation with the techniques and strategies for the development of informational and communication skills. Thus, there is a need to use the computer as a tool for learning, taking into account the fact that it is precisely this type of study that is of great value from a functional point of view. Specifically, the aim of this research is to define the methodological configuration of the development of educational software (SE) in the modern educational system through the prism of the transdisciplinary and interdisciplinary character of informatics and TIC, on the example of the discipline Initiation in research in the University of Pitesti, through the act of implementing software products, profiling the contribution on the formation of transversal competences to the aforementioned discipline.

A method of analyzing the supply and demand for mining equipment

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The permanent competition between companies, the increasing demands of customers, the need to reduce costs and maximize profits, the adaptation to the competition between Romanian companies of machine building and mining technological equipment and multinational companies increasingly present in Romania or in any other part of the world, require a rigorous planning, based on scientific and generally applicable principles of management, of the activity. In this paper, we have tried to find and present solutions for revitalizing the activity of a company producing mining equipment.

Solar Water Pumping System With Modified CSS-INC MPPT Algorithm

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Photovoltaic water pumping systems is a practical alternative to traditional systems in remote areas. However, the efficiency of solar energy utilization heavily relies on the optimal design of the maximum power point tracking (MPPT) algorithm that can increase power extraction from PV panels. In this paper, a modified MPPT algorithm is proposed for driving a single-stage PV water pumping system with a three-phase induction motor (IM) driven by scalar V/f control technique. The proposed modified CSS-INC MPPT algorithm combines the benefits of two modes algorithm, the Confined Search Space (CSS) algorithm and the Incremental Conductance (INC) MPPT algorithm. The CSS algorithm is utilized to decrease the search area for the INC MPPT algorithm in tracking the maximum power point (MPP) of the P-V curve, resulting in improved and faster tracking capabilities. MATLAB simulation was conducted to evaluate the performance of the proposed CSS-INC MPPT algorithm, and the results were compared with the conventional INC MPPT algorithm under varying weather conditions. Simulation results demonstrated that the proposed modified MPPT algorithm achieves much better performance compared to the conventional INC MPPT algorithm where the modified MPPT algorithm can improve the efficiency and productivity of PV water pumping systems under varying weather conditions.

In-Memory Versus On-Disk Databases: Best practices, Use Cases and Architectural Designs

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The performance of an information system is first and foremost determined by the database architecture's design. An unresponsive software application or an increased latency in transaction duration often indicates an incongruous compatibility between the implemented persistence mechanisms and the business features. This paper highlights the differences between in-memory and on-disk databases, starting with the memory types used by each, and their functionality differences. The research continues with the execution of performance tests on two different databases, conducted with the assistance of specific benchmarking tools for each type of tested technology. The investigation continues with a follow up analysis on the previous results, guided by performance indicators, that underlines the importance of choosing the most suitable solution imposed by the business requirements. A dedicated section is focused on the best practices that should be considered when designing a new database or refactoring a legacy architecture, in order to obtain a performant persistence mechanism.

A Lightweight Image Cryptography Approach via Invertible Transformation

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Abstract—Image security is a critical issue in the recent era of multimedia applications. Mostly, there has been an exponential growth in image data communication among various parties. Due to exchange of confidential image data via communication channels, the attackers may intercept the communication channel that led to serious security breaches. In this manner, the confidential data in the digital images may be illegally misused by the unauthorized adversaries. To counter these attacks, one of the viable solutions is to apply image cryptography algorithms for secure communication between sender and receiver. The existing image cryptography methods exhibit a trade-off between security and performance. In this paper, we expound a lightweight image cryptography algorithm for the encryption of digital images. Our approach makes use of simple linear bitwise operator along with various encryption keys that is shared between sender and receiver. The proposed approach is efficient in terms of complexity and highly secure to send data among different users. The method exhibits a, mean square error (MSE) of 13218.83, peak signal-to-noise ratio (PSNR) of 7.364 and signal-to-noise ratio (SNR) of 16.864 respectively.

Preliminary Study on the Application for Monitoring Work Parameters in the Experimental Testing Facility under the Operating Conditions Generation IV Nuclear Reactors

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The concerns about the availability of energy resources, climate change, air quality, and energy security suggest the important role that nuclear power has in the future energy supply. While current Generation II and Generation III types of nuclear power plants provide an economically acceptable source of electricity for many markets, future advances in the design of Generation IV nuclear power systems may expand opportunities for the use of nuclear energy. The Research-Development-Innovation activity carried out by RATEN ICN regarding Generation IV energy systems is focused, through several research directions, on the development of the ALFRED demonstrator (Advanced Lead Fast Reactor European Demonstrator). In this paper, the need for monitoring the working parameters in the experimental facilities dedicated to generation IV reactors is highlighted and a software application developed for a thermo-mechanical test facility in a liquid lead environment is presented. The developed application is useful for carrying out experimental work in research laboratories within the Nuclear Research Institute. This application aims to integrate new project concepts that want to be used, on an industrial scale, in power plants to demonstrate and make available viable technical solutions to facilitate the qualification and licensing process.

Types of mobile telecommunications user location errors encountered in urban mobility statistical analyses

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The study has relevance in the development of urban mobility statistical analysis applications, based on mobile equipment signaling data from telecommunication networks and best-server radio coverage prediction. The errors that occur can influence the statistical analysis of mobility more or less. The study shows what errors can be identified, their influence on various categories of statistical indicators, as well as what actions can be taken to limit the influence of errors on the results.

Energy efficiency analysis of relay railway interlockings

Florin Bădău (POLITEHNICA University of Bucharest), Valentin Alexandru Stan (POLITEHNICA University of Bucharest) and Razvan Andrei Gheorghiu (POLITEHNICA University of Bucharest).

Among the multitude of safety systems deployed on the railway network, the interlocking is the most important one. Such systems have been built with various technologies depending on the specific era. Many currently operating interlockings still employ legacy technologies; among them, the relay interlocking is most common. The relatively high number of relays belonging to an interlocking require a large amount of energy for operation. Solutions which decrease the energy demands without lowering the safety level of such systems are highly sought after. This paper analyses the viability of using a PWM-based relay command method to achieve a higher energy efficiency.

On the Decomposition Parameter of the RLS Algorithm Based on the Nearest Kronecker Product

Robert-Alexandru Dobre (University Politehnica of Bucharest), Constantin Paleologu (University Politehnica of Bucharest), Jacob Benesty (INRS-EMT, University of Quebec) and Felix Albu (Valahia University of Targoviste).

Decomposition-based algorithms have gained much attention lately, in the context of low-rank system identification problems. These algorithms exploit the nearest Kronecker product (NKP) decomposition of the impulse response (usually of long length) and take advantage of low rank approximations. Among them, the recursive least-squares (RLS) algorithm developed in this framework, namely RLS-NKP, has been found to be very suitable in challenging system identification problems that involve long length impulse responses, e.g., like in acoustic echo cancellation. The performance of the RLS-NKP algorithm depends on its decomposition parameter, which is related to the accuracy of low rank approximation. The current paper focuses on the investigation of this aspect and proposes a simple solution for choosing the decomposition parameter, using a preprocessing stage that relies on a low-complexity algorithm. Experiments are performed in the framework of acoustic echo cancellation and the obtained results support the validity of the proposed solution.

Single-Phase AC-DC PFC Converters for EV Chargers: An Overview

Basit Asipita Jimoh (Universitatea Politehnica din Bucuresti) and Stefan-George Rosu (Universitatea Politehnica din Bucuresti).

Power electronics converters have extended their use from renewable energy to the recent Electric Vehicles (EVs) and/or Hybrid Electric Vehicles (HEVs) market and because of this extensive use there has been a need to improve their designs to meet the demands of various applications. In this paper, different single-phase AC-DC PFC power converters topologies like the bridge, bridgeless, and totem-pole type used in battery chargers in EVs and HEVs have been presented. To have a

wider knowledge of which topology best suites a particular specification, the advantages and drawbacks of these converters are explained. A comparison of the topologies was performed using several performance indicators.

Outlier detection approach for discovering anomalous maritime profiles

Alexandru Pohontu (Politechnica University of Bucharest), Robert Gheorghe (Romanian Navy) and Constantin Vertan (Politechnica University of Bucharest).

Maritime authorities play a key role in ensuring the safety and security of shipping lanes and ports. The port state control mechanism enables these authorities to physically verify suspect vessels (e.g., involved in smuggling or piracy events), but choosing the most relevant vessels to be inspected represents a challenging task. This decision can be enhanced by AI-powered systems that analyse large amounts of data, identify patterns and report all observed discrepancies. This paper presents a statistical analysis on the temporal durations of four types of naval statuses: sailing, docked in port, waiting at anchor and not transmitting AIS data. These durations were extracted from the historical activity of different classes of vessels that passed the Black Sea region (Romanian Exclusive Economic Zone) in 2022. Probability density functions were built for these vessels and all statuses' durations were fitted into known parametric distributions. Finally, the paper shows the results of multiple outlier detection algorithms that searched for anomalous data in a multivariate manner.

AI Games and Algorithms: An Overview of Categories

Shaidah Jusoh (Xiamen University Malaysia) and Hejab Al Fawareh (Xiamen University Malaysia).

AI games are one of the growing fields along with the advancement of computing technologies. Many computer games have been deployed as AI games. To the best of our knowledge, there is no clear category of algorithms used for AI games. The aim of this paper is to survey and classify AI games according to their algorithms. In this paper, AI games are classified into two categories: AI games that have been developed using traditional AI methods and AI games that have used machine learning (ML) approaches. The classifications highlight genres, techniques, and approaches used in game development. Researchers and developers in the field of AI games can use this paper as a quick reference to further explore the use of AI and ML algorithms in games.

Deep Learning-Assisted Iris Liveness Detection Mechanisms

Zeenat Zahra (Central University of Jammu), Arvind Selwal (Central University of Jammu) and Deepika Sharma (Central University of jammu).

Iris recognition systems are attaining wide consideration for securing critical computing infrastructure. Though, these systems are exposed to a various kind of attacks or threat that may degrade the performance of the overall system in real-time scenario. Among all, spoofing attacks are the most attempted once, where an adversary tries to break the security by offering a fake artifact of a real biometrical trait. In this paper, we explore most recent development in the area of iris vitality detection mechanisms that are inspired by deep learning-based models. Besides, we illustrate an analysis of iris vitality detection (IVD) anti-spoofing datasets and performance evaluation protocols. Our overall instigation indicates that majority of the recent methods perform well in known attack scenario, however exhibit limited performance in unseen attacks set-up. One of the major challenges is to develop a robust IVD method with smaller datasets that has demonstrates superior performance in cross-scenario settings.