Union of Electronics, Electrical Engineering and Telecommunications (CEEC)

Federation of the Scientific-Technical Unions in Bulgaria (FNTS)

Ministry of Transport and Communications

Communications Regulation Commission

Union of Scientists in Bulgaria

Technical University of Sofia - Faculty of Telecommunications

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32nd NATIONAL CONFERENCE
WITH INTERNATIONAL PARTICIPATION

TELECOM 2024

THE WAYS TO CONNECT THE FUTURE

P R O G R A M M E

21 - 22 November 2024
National Science and Technical Centre,
108 Rakovsky St. – Sofia &Virtual room

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Telecom 2024 Sessions Timetable

Date	*Time*	*Sessions*
Wednesday 20.11.2024	**15.00-16.00**	**Registration of participants & test the system** **(Virtual Room 1)** Meeting ID: , Passcode: Zoom Platform (Phone: +359 2 987 97 67, Mail: ceec@mail.bg)

Thursday 21.11.2024		
	10.00 – 12.00	**Conference Opening, Greetings** **Plenary Session 1, Hall 1 & Virtual Room 2** Meeting ID: , Passcode:
		Chairmen: Assoc. Prof. Plamen Vachkov, PhD Prof. Seferin Mirtchev, DSc
		Presentations: **1. CRC, 2. MTC, 3. A1, 4. Kamen Rangelov, 5. Ivan Ganchev - invited paper** **Section Session 1, Hall 1 & Virtual Room 2** Meeting ID: , Passcode:
	12.30 - 14.00	**INTERNET OF THINGS (IoT). MACHINE LEARNING.**
		Chairman: Assoc. Prof. Rositsa Goleva, PhD
		Presentations: Papers 1.1, 1.2, 1.3,.1.4, 1.5, 1.6, 1.7, 1.8
	14.15 – 15.45	**Section Session 2, Hall 1 & Virtual Room 2** Meeting ID: , Passcode:
		TELECOMMUNICATIONS THEORY. SIGNALS AND SYSTEMS. IMAGE PROCESSING AND CODING.
		Chairman: Eng. Stefan Patchedjiev, PhD
		Presentations: Papers 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8
	16.00 – 17.30	**Section Session 3, Hall 1 & Virtual Room 2** Meeting ID: , Passcode:
		ARTIFICIAL INTELLIGENCE IN ICT. EDUCATION METHODOLOGIES IN ICT.
		Chairman: Prof. Seferin Mirtchev, DSc
		Presentations: Papers 3.1, 3.2, 3.3,.3.4, 3.5, 3.6, 3.7, 3.8
	17.35 – 17.50	**Plenary Session 2, Hall 1 & Virtual Room 2** Meeting ID: , Passcode:
		Chairmen: Prof. Seferin Mirtchev, DSc
		Presentations: **1. Alliance of the Technology Industry (ATI)**
	18.00 – 20.00	**Informal meeting forum - Cocktail – Hall 3**

Date	*Time*	*Sessions*
Friday 22.11.2024	**08.30 – 10.00**	**Section Session 4, Hall 1 &** Virtual Room 3 Meeting ID: , Passcode: **TELECOMMUNICATIONS NETWORKS. SOFTWARE DEFINED NETWORKS. SMART HOME AND CITIES.** Chairman: Eng. Stefan Patchedjiev, PhD **Presentations**: Papers 4.1, 4.2, 4.3,.4.4, 4.5, 4.6, 4.7, 4.8
	10.15 – 11.45	**Section Session 5, Hall 1 &**Virtual Room 3 Meeting ID: , Passcode: **TELECOMMUNICATIONS THEORY. SIGNALS AND SYSTEMS. IMAGE PROCESSING AND CODING.** Chairman: Prof. Seferin Mirtchev, DSc **Presentations**: Papers 5.1, 5.2, 5.3,.5.4, 5.5, 5.6, 5.7, 5.8
	12.00 – 13.00	**Section Session 6, Hall 1 &** Virtual Room 3 Meeting ID: , Passcode: **WIRELESS SYSTEMS. MOBILE COMMUNICATIONS.** Chairman: Assoc. Prof. Kamelia Nikolova, PhD **Presentations**: Papers 6.1, 6.2, 6.3,.6.4, 6.5
	13.30 – 15.00	**Section Session 7 Hall 1 &** Virtual Room 3 Meeting ID: , Passcode: **COMMUNICATION TECHNOLOGY IN INTELLIGENT TRANSPORT SYSTEMS. CLOUD COMMUNICATIONS.** Chairman: Assoc. Prof. Georgy Petrov, PhD **Presentations**: Papers 7.1, 7.2, 7.3,.7.4, 7.5, 7.6, 7.7, 7.8
	15.15 – 17.00	**Section Session 8, Hall 1 &** Virtual Room 3 Meeting ID: , Passcode: **TELETRAFFIC ENGINEERING. RESEARCH/EDUCATION METHODOLOGIES IN ICT.** Chairman: Assoc. Prof. Ivan Nedyalkov, PhD **Presentations**: Papers 8.1, 8.2, 8.3,.8.4, 8.5, 8.6, 8.7, 8.8, 8.9
	17.05	**Closing of the Conference, Hall 1 &** Virtual Room 3 Meeting ID: , Passcode:
		Prof. Seferin Mirtchev, DSc

CONFERENCE PROGRAMME

Wednesday, 16.00 – 17.00 20.11.2024 г.

Registration of participants & test the system, Zoom Platform (**Virtual Room 1**) Meeting ID: 886 1960 4478, Passcode: 290395

Thursday, 21.11.2024 г.

NATIONAL SCIENCE AND TECHNICAL CENTRE
Hall 1 & Virtual Room 2 Meeting ID: , Passcode:

10.00 – 12.00 21.11.2024 г.

Conference Opening, Greetings
Plenary Session 1, Hall 1 & Virtual Room 2
Meeting ID: , Passcode:
Conference Opening, Greetings
Chairmen: Assoc. Prof. Plamen Vachkov, PhD
Prof. Seferin Mirtchev, DSc

1. „Digital Services Act - Objectives and Implementation"
Mila Malinova, State Expert in the Department of Regulation of Electronic Communications, Directorate of Regulation.
Communications Regulation Commission

2. „European Commission Study on the Future Development of the Postal Sector"
Ilyana Karafizieva - Director of Communications Directorate,
Ministry of Transport and Communications

3.„5G Stand Alone – Why and When"
Alexandar Puntchev
A1 Bulgaria EAD

4. "Notes on Telecommunications – 2024"
Kamen Rangelov – CEEC

5. "Service Provider Initiated Hot Change of Access Network Facilitated by Trusted Third Party" - invited paper
Ivan Ganchev - University of Plovdiv "Paisii Hilendarski", Plovdiv; Institute of Mathematics and Informatics – Bulgarian Academy of Sciences, Sofia; Telecommunications Research Centre (TRC), University of Limerick, Limerick

12.30 – 14.00 21.11.2024 г.

Section Session 1, Hall 1 & Virtual Room 2
Meeting ID: , Passcode:
INTERNET OF THINGS (IoT). MACHINE LEARNING.
Chairman: Assoc. Prof. Rositsa Goleva, PhD

1.1. 4$ LuatOS-based 4G IoT Gateway
Zhanlin Ji, Ivan Ganchev

1.2. A Novel Decentralised Identity Platform using Blockchain
Sulakshna Puttoo, Roopesh Kevin Sungkur

1.3. Comparison of IoT Low-Power Wide-Area Networks for Smart City Organisation
Yurii Karaush, Mykola Patlaienko

1.4. Safeguarding Mobility: YOLOv8n-Enabled Road Surface Detection and Classification
Vivek Kumar, Hitesh Singh, Kumud Saxena, Boncho Bonev, Shruti Karn, Garima Tiwari

1.5. Predictive Modeling of Gamma Radiation Levels during Solar Eclipses: A Machine Learning Approach
Hitesh Singh, Vivek Kumar, Tausif Quadri, Boncho Bonev

1.6. Method for Monitoring the Quality and Quantity of Consumed Electrical Energy in Real Time
Todor Todorov, Emil Iontchev

1.7. Universal Interpersonal Communication Application (UICA) – File Transfer
Lazar Pendov

1.8. Blockchain-Enabled Dynamic Spectrum Usage Rights: A Framework for 5G/6G Spectrum Allocation and Pricing
Deyan Paroushev, Petko Ruskov

14.15 – 15.45
21.11.2024 г.

Section Session 2, Hall 1 & Virtual Room 2
Meeting ID: , Passcode:
TELECOMMUNICATIONS THEORY. SIGNALS AND SYSTEMS. IMAGE PROCESSING AND CODING.
Chairman: Eng. Stefan Patchedjiev, PhD

2.1. Matrix Spectral Factorization for Alpert Multiwavelet Filter Bank
Vasil Kolev, Todor Cooklev

2.2. Advanced Methods for Development of Microwave Antennas for Integration in Space-based Radar Systems
Yoana Ivanova, Rosen Pasarelski, Georgi Petrov

2.3. Colour Fluctuations in HDR Images
Olena Osharovska, Mikola Patlaeynko, Valentina Solodka, Ivan Tomashevkyi, Okeksandr Hohniak, Andriy Doroshuk

2.4. AtmoCell: Advanced Home Air-Quality Monitoring Using Low-Power Embedded Systems
Yassen Gorbounov

2.5. Decentralized Identity and Verifiable Credentials – Trends and Advancement
Anastasios Liveretos, Prof. Milena Lazarova

2.6. Development of a System for Monitoring Hardware Metrics
Aleksandar Hristov

2.7. Application of Analysis of Variance in Evaluating Skin Temperature Changes in the Throwing Hand of Female Handball Players During Training Using Thermal Imaging
Kalin Dimitrov, Emil Avramov, Milena Avramova, Dimitar Asenov

2.8. Intelligibility Measurements in Wireless Voice Communication Relative to Distance, Indirect Visibility and Obstacles
Ivan Bojilov, Aleksandar Bekyarski, Shezhana Pleshkova

16.00 – 17.30
21.11.2024 г.

Section Session 3, Hall 1 & Virtual Room 2
Meeting ID: , Passcode:
ARTIFICIAL INTELLIGENCE IN ICT. EDUCATION METHODOLOGIES IN ICT.
Chairmen: Prof. Seferin Mirtchev, DSc

3.1. Forework: A Real-Time, Distributed Digital Forensic Analysis Framework
Sahil Varma Penmetsa

3.2. Predictive Optimization of Energy Consumption in Smart Building through AI_Gen Scenarios
Ekanand Mungra, Roopesh Kevin Sungkur

3.3. Penetration Tests on Linux Server
Ivan Ivanov, Mariyana Dimitrova, Martin Voynov

3.4. Trying to Develop and Assess Computational Thinking in Computer Science Unplugged Activities with Gamification
Serafeim A. Triantafyllou, Theodosios Sapounidis, Andreas Oikonomou

3.5. Educational Remote Platform for Programming and Control of CNC 3D Printers
Ventsislav Nachev, Daniela Gotseva

3.6. Educational Remote Platform for Programming and Control of Unmanned Aerial Vehicles
Ventsislav Nachev

3.7. An Interactive Application for the Analysis of Continuous Systems
Hristina Andreeva, Radoslava Gabrova, Luchezar Mihov

3.8. Design and Implementation of a Prototype Web Platform to Enhance Student Motivation through Specific Functionalities
Nikolay Nikolov

17.35 – 17.50
21.11.2024 г.

Plenary Session 2, Hall 1 & Virtual Room 2
Meeting ID: , Passcode:
Conference Opening, Greetings
Chairmen: Prof. Seferin Mirtchev, DSc

2. „The Future of Digital Connectivity in Europe"
Andreana Atanasova - Chairperson of the Managing Board
Alliance of the Technology Industry (ATI)

Friday,
22.11.2024 г.

NATIONAL SCIENCE AND TECHNICAL CENTRE
Hall 1 & Virtual Room 3 Meeting ID: , Passcode:

08.30 – 10.00
22.11.2024 г.

Section Session 4, Hall 1 & Virtual Room 3
Meeting ID: , Passcode:
TELECOMMUNICATIONS NETWORKS. SOFTWARE DEFINED NETWORKS. SMART HOME AND CITIES.
Chairman: Eng. Stefan Patchedjiev, PhD

4.1. Design Considerations for Transition from MPLS to SD-WAN Solution
Stefan Sarafoff, Kamelia Nikolova, Georgi Iliev

4.2. Performance Analysis of Docker Swarm on Raspberry Pi Clusters
Milen Hrabarov Todorov

4.3. Design Consideration for Assembling of PV System for Small Enterprises
Gergana Vacheva, Plamen Stanchev, Nikolay Hinov

4.4. Study of the Influence of the Output Capacitor on the Operating Modes of a Buck DC-DC Converter
Gergana Vacheva, Plamen Stanchev, Nikolay Hinov

4.5. Application of Digital Twins for Design and Operation of Power Electronic Devices
Nikolay Hinov, Gergana Vacheva, Plamen Stanchev

4.6. Web-Based Management System for Network of Autonomous Smart Hydrogen Refueling Stations
Petko Danov

4.7. Methodology in Intelligent Control in Expert System and Neural Networks
Petar Raykov, Ivo Dochev

4.8. Matching Text from Start to Finish Against Multiple Regular Expressions
Ivan Stankov, Alex Tsvetanov

10.15 – 11.45
22.11.2024 г.

Section Session 5, Hall 1 & Virtual Room 3
Meeting ID: , Passcode:
TELECOMMUNICATIONS THEORY. SIGNALS AND SYSTEMS. IMAGE PROCESSING AND CODING.
Chairman: Prof. Seferin Mirtchev, DSc

5.1. Directional 2D FIR Filters Synthesis Using Sigmoidal Function
Peter Apostolov, Dimitar Shopov

5.2. Improving Human-Computer Interaction with Generative Adversarial Networks by Covering ISO 9241 Standards in Interaction Design
Varbinka Stefanova-Stoyanova, Petko Danov, Kamelia Raynova

5.3. Development of Graphical User Interface for Creating Audio Effects in Music Production with Artificial Intelligence
Snezhana G. Pleshkova, Konstantin Kostov

5.4. YOLO Performance Comparison on Stock Images of Grocery Products
Aykut Ismailov, Vladimir Hristov

5.5. AI Algorithms Enhancing Threat Detection and Reinforcement Data Protection
Elina Tlachenska, Kiril Ivanov, Maria Nenova

5.6. Increasing of the Vegetable Oils Purification Efficiency in an Electromagnetic Field
Petr Osadchuk, Yurii Enakiev, Dmitry Domuschi, Ivan Mortev, Valentyna N. Bandura

5.7. Investigation of Data Extraction Process with Anonymizations using Different Data Types
Grigor Sotirov, Maria Nenova, Valeria Nenova, Ivelina Teneva

5.8. Reinforcement Learning for Key Management in Distributed Systems
Lyubomir Nenov

12.00 – 13.00
22.11.2024 г.

Section Session 6, Hall 1 & Virtual Room 3
Meeting ID: , Passcode:
WIRELESS SYSTEMS. MOBILE COMMUNICATIONS.
Chairmen: Assoc. Prof. Kamelia Nikolova, PhD

6.1. Comparing Azure Sentinel and ML-extended Solutions Applied to a Zero Trust Architecture
Ivan Stankov, Evgeni Dulgerov

6.2. Computer Vision Model for Semantic Segmentation of Electronic Components in 2D Space
Danail Slavov, Veselin Krachunov

6.3. Frequency Domain Measurements of Radio Channels in a Typical Agriculture Environment
Nikolay Atanasov, Blagovest Atanasov

6.4. Specific Absorption Rate Induced in a Plant Leaf from a Wearable Antenna for Smart Agriculture
Blagovest Atanasov, Nikolay Atanasov

6.5. Wearable Antennas: General Requirements for SAR Numerical Assessment
Nikolay Hristov, Gabriela Atanasova

13.30 – 15.00
22.11.2024 г.

Section Session 7, Hall 1 & Virtual Room 3
Meeting ID: , Passcode:
COMMUNICATION TECHNOLOGY IN INTELLIGENT TRANSPORT SYSTEMS. CLOUD COMMUNICATIONS.
Chairmen: Assoc. Assoc. Prof. Georgi Petrov, PhD

7.1. A Nonlinear Control for the Path Tracking Problem of Autonomous Bi-Steerable Vehicles
Plamen Petrov, Ivan Kralov

7.2. Integration of Generative AI for Intelligent Diagnostic of Vehicles
Vladimir Ranchev, Rumen Jordanov, Rosen Miletiev

7.3. Automation Deployment in Azure Cloud with a Modular Terraform Approach
Vladislav Manolov, Prof. Ph.D Daniela Gotseva, Neven Nikolov

7.4. Cloud Practical analysis of Google Cloud Platform and Microsoft Azure
Vladislav Manolov, Daniela Gotseva, Danko Valkov

7.5. Application of Reinforcement Learning in Autonomous Mobile Robots
Anastasiya Slavova, Vladimir Hristov

7.6. Investigating the Influence of the Environment on the Detection and Monitoring of Cattle with an Unmanned Aerial Vehicle using Infrared Radiometry
Hristo Hristov, Kalin Dimitrov

7.7. Thermal Infrared Imaging of Near-Freezing Objects with Unmanned Aerial Vehicles and the Influence of Observation Height in Real Conditions
Kalin Dimitrov, Iliyan Damyanov

7.8. Infrared Thermography Analysis of Temperature Changes and Performance in Active and Inactive Sportsmen across Multiple Laps
Tsvetan Valkovski, Kalin Dimitrov

15.15 – 16.45
22.11.2024 г.

Section Session 8, Hall 1 & Virtual Room 3
Meeting ID: , Passcode:
TELETRAFFIC ENGINEERING. RESEARCH/EDUCATION METHODOLOGIES IN ICT.
Chairmen: Prof. Ivan Nedyalkov, PhD

8.1. Behavior of VoIP Traffic QoS Metrics in Loaded Networks
Vladimir Vichev, Todorka Georgieva

8.2. Exact Queuing Model of Heterogeneous Local Communication Network
Elchin Gezalov

8.3. Windows or Linux – the Most Suitable Platform to Run the GNS3
Ivan Nedyalkov, Georgi Georgiev, Anton Gogushev, Vencislav Duev

8.4. Mathematical Approach to Social Network Modelling
Petar Marinov

8.5. University Parallel Computing Micro-Cluster Build with Second-Hand Computer Systems
Rosen Pasarelski, Georgi Petrov, Krasen Angelov

8.6. Wireless Measurement Station using Arduino
Marin Dochev, Ivo Dochev, Lilyana Docheva, Stoycho Manev

8.7. Microprocessor System for Studying the Operating Characteristics of the Photovoltaic Panels
Angel Chekichev, Anatoly Parushev, Rumen Popov, Nikolai Paunkov, Milena Bundeva

8.8. Using ESP32 and Air Quality Sensor in Engineering Student Education
Ivan Maradzhiev

8.9. In-Depth ECG Signal Processing with Hardware Modules and Python Programming for Enhanced Engineering Education
Lyubomir Laskov, Kalin Dimitrov

16.55
22.11.2024 г.

CLOSING OF THE CONFERENCE, Hall 1 & Virtual Room 3
Meeting ID: , Passcode: .
Prof. Seferin Mirtchev, DSc

CONTENTS

Service Provider Initiated Hot Change of Access Network Facilitated by Trusted Third Party

Ivan Ganchev
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A new vision is presented in this paper allowing a service provider to change an access network, currently utilized by a mobile user (consumer) during an active service session, in case of unsatisfactory network performance. The change is facilitated by trusted 3rd Party Authentication, Authorization and Accounting (3P-AAA) entities and trusted 3rd Party Charging and Billing (3P-C&B) entities, operating under a single administration, within a new type of wireless environment established on the consumer-based techno¬business (CBM) model, which enables loose dynamic, and even casual, associations between consumers and service/network providers for using the respective services. The key technological innovations required to support this vision are explained, along with outlining the corresponding techno-business implications.

1.1. 4$ LuatOS-based 4G IoT Gateway

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This paper presents a cost-effective 4G IoT gateway, developed with the LuatOS script running framework for integration into the EMULSION IoT platform. The hardware Bill of Materials (BOM) is kept around 4 USD, making it highly suitable for large-scale IoT deployments. The hardware includes a TTL serial port, built-in GPS, an NTC thermistor for temperature measurement, and an LIS2DH12TR three-axis accelerometer. For 4G connectivity, the Air780EG module, based on the UNISOC EC618 chipset, is employed. The software utilizes LuatOS. To provide flexible and efficient hardware maintenance, a management cloud software, provided by EMULSION, is used to support the parameter management and firmware Over-The-Air (OTA) upgrading. The practical use of the gateway was successfully demonstrated in Chongqing city (China) for manhole monitoring and control, and in a Water IoT application.

1.2. A Novel Decentralised Identity Platform using Blockchain

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Recently, the world has been witnessing an increase in the number of data breaches and privacy threats and centralized identity systems are having a tough time to safeguard sensitive user information. Considering the challenges highlighted above, decentralised identity has emerged as a promising solution to mitigate these challenges. This research presents a decentralised identity framework that leverages the power of blockchain technology. By adopting distributed ledgers and cryptographic techniques, the platform seeks to revolutionize identity management, offering enhanced security and control to users. This decentralization significantly reduces the risk of data breaches, as there is no single point of failure and is less vulnerable to attacks. The platform also empowers users by allowing them to securely store and manage their personal data on the blockchain. Users can selectively grant access permissions to third parties, ensuring that only authorized entities can access specific pieces of their information. The web application has been implemented with Angular and provides the users with an intuitive interface to manage their credentials effectively, enhancing security and user control over their digital identities.

1.3. Comparison of IoT Low-Power Wide-Area Networks for Smart City Organisation

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This paper compares Low Power Wide Area Networks (LPWAN) for Internet of Things (IoT) applications in smart city management, evaluating key protocols and their advantages and limitations. The findings indicate that LPWAN selection depends on the specific requirements of smart city initiatives.

1.4. Safeguarding Mobility: YOLOv8n-Enabled Road Surface Detection and Classification

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In an era marked by continual technological advancement, road safety emerges as a critical global concern, with potholes posing persistent threats to commuters and vehicles alike. This research paper explores the realm of road surface classification, with a particular emphasis on automating pothole detection through innovative technological integration. Leveraging the state-of-the-art object detection algorithm YOLOv8n, we aim to revolutionize the identification and mitigation of road imperfections. Our proposed methodology seamlessly processes video data, transforming it into an accessible and optimized format, while utilizing YOLOv8n for real-time pothole detection and labeling. This automated classification expedites identification processes and enhances maintenance efficiency, facilitating timely interventions to rectify road defects and bolster safety measures. Through this research, we contribute to the discourse on road safety and infrastructure management, showcasing the transformative potential of AI- driven solutions to forge a safer and more resilient transportation network, one pothole at a time.

1.5. Predictive Modeling of Gamma Radiation Levels during Solar Eclipses: A Machine Learning Approach

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Predicting gamma radiation levels during solar eclipses can enhance our understanding of eclipse-related phenomena and improve monitoring capabilities. This study focuses on the development and evaluation of machine learning models to predict gamma radiation levels during solar eclipses. The dataset includes various parameters related to solar eclipses such as eclipse type, eclipse size, study

area, and temporal information. We examine the relationship between these parameters and gamma radiation levels to identify significant factors influencing the predictions. Regression tree and random forest regression models are trained and evaluated for their accuracy in predicting gamma radiation levels during eclipses. Additionally, visual techniques, including paired plots and correlation matrices, are employed to elucidate the relationships between different features and gamma radiation levels. This analysis provides valuable insights into the factors affecting gamma radiation and underscores the potential of machine learning in the prediction and monitoring of solar eclipse phenomena.

1.6. Method for Monitoring the Quality and Quantity of Consumed Electrical Energy in Real Time

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This article is part of a project related to implementing a "smart backup power supply." It proposes a method for monitoring the quality and quantity of consumed energy at the input and output of a backup power supply based on the use of Fast Fourier Transform (FFT). It presents some of the principle diagrams of the hardware modules used to implement the method, as well as the block diagram of the microcontroller's control program. The data obtained from the system's operation are presented graphically. The data are analyzed in real time, and if certain parameters exceed permissible norms, alarms are sent to the system owner.

1.7. Universal Interpersonal Communication Application (UICA) – File Transfer

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This paper explores interpersonal communication through file exchange, continuing previous work on the Universal Interpersonal Communication Application (UICA) architecture. An interface is proposed for the 'File Transfer' communication category. To test and validate the interface, two services were developed, implementing functionalities for receiving, sending, and downloading files via Telegram (MTProto) and Dropbox. These implementations demonstrate the interface's adaptability across different technologies for interpersonal communication through file exchange.

1.8. Blockchain-Enabled Dynamic Spectrum Usage Rights: A Framework for 5G/6G Spectrum Allocation and Pricing

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The advent of 5G and 6G networks demands more efficient spectrum allocation methods. This paper proposes a blockchain-based framework for dynamic spectrum usage rights, addressing limitations of traditional static allocations. We present a novel pricing model that incorporates multiple factors affecting spectrum value and demonstrate its implementation using DAML (Digital Asset Modeling Language) smart contract platform on the Canton ledger interoperability blockchain protocol. The proposed model offers increased efficiency, transparency, and flexibility in spectrum management, paving the way for optimized utilization in nextgeneration wireless networks.

2.1. Matrix Spectral Factorization for Alpert Multiwavelet Filter Bank

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Obtaining multifilters by using matrix spectral factorization (MSF) is still quite unknown in the signal processing community. There are a number of numerical approaches to MSF, but they usually cannot handle the singular matrix polynomials cases which are of greatest interest for applications in the construction of multiwavelets. Multiwavelets can be orthogonal, symmetric, smooth, and with short support, all at the same time. However, the design of multifilters with these properties remains a challenging problem.
In this paper we describe the design of simple orthogonal symmetric/antisymmetric multiscaling and multiwavelet functions with compact support [0,1]. We apply the proposed multifilter in the context of image denoising of gray images and compare with the orthogonal GHM and CL multifilters.

2.2. Advanced Methods for Development of Microwave Antennas for Integration in Space-based Radar Systems

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The aim of this paper is to contribute to the conceptual design of advanced antenna devices, such as Horn- fed offset Cassegrain reflector antennas for implementation in space-based millimeter-wave radars. The results obtained from the comparative analysis of the reflection coefficient and the gain of a linear waveguide slot array and a pyramidal horn antenna, based on diagrams presented in the Antenna Magus software, can significantly support the development of more efficient radar systems for space applications.

2.3. Colour Fluctuations in HDR Images

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This paper discusses the use of a method for collecting a high dynamic range image from intermediate images with contrast enhancement in different parts of the amplitude characteristic. Simultaneously, for each subrange, the chromaticity coordinates of a colour space with a large

coverage are recalculated. In the new color space, the dots shift slightly, but the nature of the shift depends on the color tone.

2.4. AtmoCell: Advanced Home Air-Quality Monitoring Using Low-Power Embedded Systems

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The indoor air quality significantly impacts human health, and monitoring it in real time is essential for ensuring safe living environments. This paper presents AtmoCell, an advanced, low-power air-quality monitoring node designed for home use. The system integrates a CCS811 gas sensor for detecting volatile organic compounds and CO2, a BME280 sensor for monitoring temperature, humidity, and pressure, and a ferroelectric random access memory based microcontroller for energy-efficient data logging. The device utilizes an ESP32 for wireless connectivity and real-time data transmission. With modularity in mind, and a focus on low- power operation and compact design, AtmoCell offers an affordable, scalable solution for continuous air quality monitoring in residential settings, aligning with current health and environmental standards.

2.5. Decentralized Identity and Verifiable Credentials – Trends and Advancement

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This paper explores the transformative potential of decentralized identity and verifiable credentials for digital identity management. It also emphasizes the need for digital identities, as a trusted abstraction model, to connect entities and manage their relationships. The decentralized identity is a trusted connector between data and services, enabling users to control their data and complete transactions. Verifiable credentials allow data issuers to issue cryptographically signed information to data holders, who can present it to data verifiers for independent validation. This model ensures better compliance with privacy regulations and improves security. This paper highlights the importance of neutrality, controllability, and interoperability in the ecosystem, with identity wallets playing a crucial role in managing identifiers and verifiable credentials.

2.6. Development of a System for Monitoring Hardware Metrics

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In this paper, a monitoring system that collects, stores and visualizes data from various sources has been developed. For this purpose, an infrastructure has been built using Vagrant for process automation and VirtualBox for virtualization hypervisor, Telegraf agents have been configured to collect hardware performance metrics such as CPU, memory, disk space and network bandwidth, InfluxDB has been installed and configured to store the collected from the hosts data and Grafana has been integrated as a visualization and analysis tool for dynamic data visualization.

2.7. Application of Analysis of Variance in Evaluating Skin Temperature Changes in the Throwing Hand of Female Handball Players During Training Using Thermal Imaging

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This study investigates the temperature changes in the throwing hand of female handball players during training sessions using thermal imaging technology. By applying Analysis of Variance (ANOVA), the study evaluates the significance of skin temperature variations across different hand surface areas over time. The aim is to identify any statistically significant differences in temperature changes due to the physical demands of handball training. The findings provide insights into how thermal stress affects specific areas of the throwing hand, potentially informing better training practices and injury prevention strategies.

2.8. Intelligibility Measurements in Wireless Voice Communication Relative to Distance, Indirect Visibility and Obstacles

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Measuring the intelligibility of speech in wireless communication systems is crucial for ensuring effective and reliable information exchange in diverse environments. The goal of this article is to measure the intelligibility of speech in wireless voice communication relative to distance, obstructions, and indirect line-of-sight. The analysis is conducted using Signal-to- Noise Ratio (SNR) as a key evaluation metric. Two distinct experimental setups were employed: one with a direct line-of- sight (LOS) between the transmitter and receiver, and another with an obstructed signal path caused by a physical barrier. The findings illustrate how the presence of obstacles and increased distance significantly affect the quality and clarity of the received speech signal, with notable degradation observed in SNR values as distance increases. These results provide critical insights into the performance limitations of wireless communication systems in varied environmental conditions, highlighting the challenges in maintaining speech intelligibility in scenarios where distance or obstructions are factors.

3.1. Forework: A Real-Time, Distributed Digital Forensic Analysis Framework

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The increasing volume of data in digital forensic investigations has outpaced the capabilities of existing forensic systems. Traditional systems such as The Sleuth Kit Hadoop, OCFA, and Hansken, though capable of handling large-scale data, fail to offer real-time analysis, which is crucial for prioritizing critical evidence in investigations. This paper addresses this gap by proposing a modern, real-time analysis approach and introducing Forework, a proof-of-concept implementation. Forework aims to deliver real-time, prioritized analysis of forensic artifacts, providing an interactive and scalable solution. It leverages parallel and distributed computing to manage large datasets efficiently, ensuring investigators can quickly focus on the most relevant evidence. This system represents a significant step forward in digital forensics, aligning with contemporary needs for swift and effective data analysis.

3.2. Predictive Optimization of Energy Consumption in Smart Building through AI_Gen Scenarios

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Today's increasing energy demand, particularly in developing regions, supports both economic growth and the improvement of living conditions. However, these regions experience power outages frequently, due to the high energy consumption of commercial buildings. This study examines energy usage in smart commercial buildings by analyzing data from in-building sensors, collected at ten-minute intervals for more than four months. The aim is to forecast the consumption of energy of these buildings while utilizing AI generated scenarios to generate simulations resembling real-life energy usage situations, thereby improving our model's predictions. In the era of smart buildings, accurate predicting energy usage does not only facilitate cost savings for businesses, but it also presents an opportunity for revenue generation, particularly through the surplus energy supplied back to the grid from renewable sources such as solar panels. Unlike conventional approaches, this research employs MLPRegressor, a sophisticated model, to analyze and predict intricate patterns of energy usage from the sensor data. This study is particularly significant for advancing energy management strategies in commercial sectors of developing countries, promoting energy independence and efficiency.

3.3. Penetration Tests on Linux Server

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In this article, we will look at various methods for testing and detecting vulnerabilities on Linux server operating systems. These are some of the very common attacks in our time, leading to serious consequences. This is precisely why it is important to detect vulnerabilities in a timely manner, enabling their implementation. It is also very important what measures are taken to mitigate and prevent them. In this article, we have also shown possible scenarios for mitigating it.

3.4. Trying to Develop and Assess Computational Thinking in Computer Science Unplugged Activities with Gamification

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Developing computational thinking through Computer Science Unplugged activities is a fantastic way to introduce students to the core concepts of computing without the need for programming tools. These activities are interactive, engaging, and help learners build problem-solving and logical reasoning skills. CT in CS Unplugged activities involves evaluating how well the activities promote the core components of CT, which are fundamental skills in algorithmic thinking and problem-solving. This paper tries to contribute to a better understanding of the related field.

3.5. Educational Remote Platform for Programming and Control of CNC 3D Printers

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The integration of digitalization and integrating computer technologies in manufacturing machinery demands the training of a growing number of specialists. This paper presents the development of a new software platform for remote programming of CNC machines, specifically focusing on standard FDM 3D printers. The aim is to create a system for affordable, easy, and accessible introductory training in ISO programming with G-codes. By utilizing a Raspberry PI platform as an intermediary device, the system allows students to efficiently manage and program CNC machines through a user-friendly web interface. This approach enhances educational outcomes by providing students with hands-on experience in CNC technology while simplifying the learning process.

3.6. Educational Remote Platform for Programming and Control of Unmanned Aerial Vehicles

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The integration of digitalization and computer technologies in drone systems requires the training of a new generation of specialists. This paper presents the development of a new system for remote programming of UAV drones, specifically focusing on DJI Tello drones. The aim is to create a system that provides affordable, easy, and accessible introductory training in drone programming using the DJI Tello SDK. By utilizing a Raspberry Pi platform as an intermediary device, the system allows students to efficiently manage and program drones through a user-friendly web interface. This approach enhances educational outcomes by providing students with hands-on experience in drone technology, simplifying the learning process.

3.7. An Interactive Application for the Analysis of Continuous Systems

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This paper presents an interactive application developed for the analysis of continuous systems that are used in many different areas of modern technology. For this reason, their analysis is crucial both for investigating the performance of systems and for synthesizing corrective algorithms to ensure their stability. The main goal of the developed application is to set up and automatically analyze continuous systems by applying an interactive approach. The application is implemented with a convenient interactive user interface, implemented in the Scilab programming environment and is particularly suitable for teaching students. It is programmed so that the continuous system can be defined by one of the two main mathematical descriptions - transfer function and zero-pole gain model. Functions have been implemented to obtain the basic time (step response and impulse response) and frequency characteristics for a system (amplitude-phase-frequency response and logarithmic amplitude and phase frequency response), pole-zero map, as well as automatic analysis, including determining the type of system - stable, critically stable or unstable; in the case of a stable system - its type according to the transient characteristic; parameters of the transient process in a stable system and of oscillations in a critically stable system. Tests have been made with many different system input parameters set in the two implemented ways, and the application shows stable operation.

3.8. Design and Implementation of a Prototype Web Platform to Enhance Student Motivation through Specific Functionalities

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The integration of digital tools in education provides opportunities to enhance student motivation and engagement. In this paper, a detailed design and implementation of a prototype web platform, developed to test specific motivational elements rather than functioning as a full- fledged Learning Management System (LMS), are presented. The platform focuses on integrating a credit system linked to assignment submissions, resource unlocking based on accumulated credits, and progress tracking. The technical architecture, technology choices, implementation of key functionalities, challenges encountered during development, and results from initial testing of the platform's impact on student engagement are discussed. The prototype serves as a foundation for understanding how specific functionalities can be utilized to enhance motivation in an educational environment

4.1. Design Considerations for Transition from MPLS to SD-WAN Solution

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In this paper design considerations for a network transition from Multiprotocol Label Switching (MPLS) to Software-Defined Wide Area Network (SD-WAN) are explored and analyzed, including key areas of impact and importance. Brief comparison of both technologies is included, together with a highlight of specific considerations that need to be addressed during the different phases of a global project to be able to ensure a smooth transition.

4.2. Performance Analysis of Docker Swarm on Raspberry Pi Clusters

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The novelties in this paper include the methods and the results of conducting load tests on top of the designed and implemented clusters of single-board computers. One of the designed clusters uses twenty boards of the latest generation of single-board computers - Raspberry Pi 5, and the other cluster uses twenty boards from the previous generation - Raspberry Pi 4. The main goal is to

compare the performance of the last two generations of Raspberry Pi computers when they are used for the runtime environment of containerized applications and services. Since the containerized environment uses the Linux kernel on the host system, it is important to explore the impact of the chosen distribution.

4.3. Design Consideration for Assembling of PV System for Small Enterprises

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This paper examines the key aspects and challenges related to the design and assembly of photovoltaic (PV) systems for small enterprises. The main technical and economic considerations are discussed, including the selection of appropriate components, optimization of system capacity according to the enterprises' needs, and compliance with regulatory requirements. Attention is also given to factors such as panel positioning, the efficiency of different inverter solutions, and the necessity for adequate maintenance and monitoring mechanisms. The paper provides guidelines for the sustainable integration of PV systems in small businesses, aiming to optimize energy costs and minimize dependence on traditional energy sources.

4.4. Study of the Influence of the Output Capacitor on the Operating Modes of a Buck DC-DC Converter

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This paper presents a comprehensive study on the impact of the output capacitor on the performance and operating modes of a Buck DC-DC converter. The output capacitor plays a critical role in stabilizing the output voltage and reducing voltage ripple, which directly influences the efficiency, response time, and overall stability of the converter. Through theoretical analysis and experimental validation, this study examines how variations in capacitance affect key performance metrics such as transient response, output ripple, and efficiency under different load conditions. The results provide insights into optimal capacitor selection, balancing output stability with size and cost, and highlight the capacitor's influence on transitioning between continuous and discontinuous conduction modes. These findings can guide designers in choosing appropriate capacitors to improve converter performance for specific applications.

4.5. Application of Digital Twins for Design and Operation of Power Electronic Devices

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In recent years, the concept of Digital Twins has gained significant popularity across various industries, including power electronics. This paper explores the application of Digital Twins in the design and operation of power electronic devices. Digital Twins are dynamic virtual replicas of physical systems that enable real-time simulations, optimization, and predictive control of the devices. The main objective of the study is to analyze how the integration of Digital Twins can enhance the design process as well as the operational performance of power electronic devices. By using digital models, engineers can optimize device parameters, predict potential failures, and minimize downtime through preventive maintenance.

4.6. Web-Based Management System for Network of Autonomous Smart Hydrogen Refueling Stations

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As technology advances and regulatory standards evolve, Autonomous Smart Hydrogen Refueling Stations (ASHRS) are poised to have a leading mission in the transition to a smart and sustainable transport network. Such an innovative concept necessitates the development of software that is specifically designed to meet its unique requirements. This paper describes the development of a web-based management system for a network of ASHRS.

4.7. Methodology in Intelligent Control in Expert System and Neural Networks

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In nowadays the new achievements in microelectronics and mechatronics and increase in the complexity of control issues and theirs size forced the creation of more complex control and automation systems. On the other hand the advances in digitization and artificial intelligence have allowed to be created systems to perform tasks that are typically associated with human activity. Namely the combination of the classical control theories and artificial intelligence is the basis task of intelligent control. In this article is shown classification of the concepts and methods of intelligent control with its definitions, characteristics and the advantages and disadvantages of each of them.

4.8. Matching Text from Start to Finish Against Multiple Regular Expressions

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As part of this research the problem of matching one string with multiple regular expressions (regex) will be reviewed with the only limitation being that the regex should match the whole string from start to finish. This task is implemented in the web servers where multiple routes are defined as regexes. The server tries to detect which response is appropriate for the currently requested URL by

looking for the regex that matches the URL and then getting the response related to this regex. This application motivated us to implement a more lightweight data structure and algorithm to solve this problem in a more efficient way. The current realization of the problem is done by going sequentially through all the regexes and testing them to match with the given URL. The algorithm presented in this research similarly to the Aho-Corasick algorithm is optimizing this process by using a modification of the structure trie (also known as prefix tree).

5.1. Directional 2D FIR Filters Synthesis Using Sigmoidal Function

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This paper proposes a class of two-dimensional (2D) filters named directional FIR filters. In the synthesis a sigmoidal function - Complementary integral Gaussian error function is used. 2D filters with straight and elliptical shapes are explored. A parameter changes the filters selectivity. As a result, smooth magnitude responses with extremely high selectivity are obtained. An image processing examples are proposed.

5.2. Improving Human-Computer Interaction with Generative Adversarial Networks by Covering ISO 9241 Standards in Interaction Design

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The paper explores the concept of integrating generative adversarial networks (GANs) into human-computer interaction (HCI) to conform to ISO 9241 standards. The creation of adaptive,

customizable and user-friendly interfaces can be supported and facilitated using GAN. The potential that GANs must improve usability, accessibility and ergonomic design is evidenced in the study, as well as the changing impact on interaction design and alignment with international ISO standards.

5.3. Development of Graphical User Interface for Creating Audio Effects in Music Production with Artificial Intelligence

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Abstract — Audio effects are integral in shaping the final sound of music production by enhancing, correcting, or adding creative elements to analog and digital audio signals. With the rise of artificial intelligence, intelligent adaptive digital audio effects became more common. They allow further expansion of the capabilities of traditional audio processing techniques, providing further precision control and creative freedom. This article presents the development of a graphical user interface (GUI) for applying audio effects with the use of artificial intelligence. The GUI and software application, are built using Spotify's Pedalboard Python library. The experimental results confirm that the GUI correctly applies audio effects, demonstrating its effectiveness and potential for further development.

5.4. YOLO Performance Comparison on Stock Images of Grocery Products

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This paper compares the classification performance of the YOLO models in the cases where the input data is limited or purely generated from stock images. For this purpose, YOLOv5n, YOLOv5s, YOLOv8n, and YOLOv8s were trained to classify stock images into 219 categories of grocery products.

5.5. AI Algorithms Enhancing Threat Detection and Reinforcement Data Protection

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Artificial intelligence is growing with an unparalleled pace which is impossible to ignore. As AI operates in numerous business sectors, the security of data becomes very important. Back in time, the data security was a concern of big businesses and their networks because of the amounts of sensitive information they posses., but now days its everyone's interest to protect its data, but now days its everyone's interest to protect its data. Protecting computer systems from malware is a critical cybersecurity priority for both individual users and businesses, as even a single attack can lead to data breaches and significant losses. The prevalence of severe losses and frequent attacks underscores the necessity for accurate and timely detection methods. Current static and dynamic detection approaches often fall short, particularly in addressing zero-day attacks. Therefore, employing machine learning techniques becomes essential. This paper examines the key aspects and challenges of machine learning-based malware detection, while also exploring optimal feature representation and classification methods for reinforcing data protection.

5.6. Increasing of the Vegetable Oils Purification Efficiency in an Electromagnetic Field

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This scientific research is about obtaining high quality vegetable oil using electromagnetic treatment. Conducted studies of the sunflower oil hydration process using electromagnetic processing let intensify the deposition of impurities, reduce energy costs and improve product

quality without the use of reagents that used in standard technological process. A basis of experimental data has been developed in the studies of the sunflower oil purification process. The technological parameters of the process of purifying sunflower oil were determined. The most significant results were an energy consumption reduction by 6% and a processing time reduction by 50%. During the process, the electromagnetic field strength averaged 155 kA/m, and the product temperature did not exceed 55°C. The design of the installation allows you to avoid areas of local overheating.

5.7. Investigation of Data Extraction Process with Anonymizations using Different Data Types

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Using data from a database of confidential information from professionals to analyse, share experiences and improve the method of learning from the experiences of others is a new generation challenge. The large volume of information that in different systems and the challenge of filtering and extracting useful information for future action is growing.

5.8. Reinforcement Learning for Key Management in Distributed Systems

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The ever-growing paradigms of IoT networks, cloud infrastructures, and blockchain platforms raise demands for adaptive cryptographic key management. Traditional ap¬proaches, such as Public Key Infrastructure and Shamir's Secret Sharing, are mostly ineffective in dynamic and scalable scenarios. Reinforcement Learning (RL)—a subfield of AI which possesses adaptation capabilities—can come forward as a promising solu¬tion by making the key management system time-efficient against any change or threat in a network. This review covers recent applications of RL in key management, where discussions are focused on Deep RL, Multi-Agent RL, and Federated RL with respect to strengths, use cases, and limitations. We underscore features about scalability, autonomous decision-making, and resilience against key compromise that can be brought forth by RL integration. Finally, we propose a hybrid adaptive framework combining the best aspects from each of these RL approaches for robust key management in dynamic distributed environments.

6.1. Comparing Azure Sentinel and ML-extended Solutions Applied to a Zero Trust Architecture

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This paper explores the efficacy of Azure Sentinel as a standalone solution versus an ML-extended implementation for predictive maintenance and failure prediction, advanced anomaly detection, and threat hunting within a Zero Trust Architecture. Azure Sentinel, a cloud-native SIEM (Security Information and Event Management) and SOAR (Security Orchestration, Automation, and Response) solution, is renowned for its robust security monitoring and threat detection capabilities. However, as cyber threats become more sophisticated, traditional methods may not suffice. Integrating Machine Learning (ML) with Azure Sentinel can significantly enhance its capabilities, providing more accurate and timely insights. This study evaluates the performance of various ML algorithms, including Random Forest and XGBoost for predictive maintenance, Logistic Regression and SVM for anomaly detection, and Isolation Forest and Autoencoders for threat hunting. The results indicate that the ML-extended solution significantly outperforms the standalone implementation across all key metrics, such as Precision, Recall, F1 Score, and False Positives. The findings underscore the potential of ML-enhanced security measures in fortifying defenses within a Zero Trust Architecture, offering a more proactive approach to cybersecurity.

6.2. Computer Vision Model for Semantic Segmentation of Electronic Components in 2D Space

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We develop a vision system, based on ENet deep convolution network, for recognition, classification, localization and boundary contouring of three types of electronic components. We acquire input images using a 6-axis industrial robot manipulator and a Raspberry Pi, ensuring appropriate communication between them. After pre¬processing, input data is augmented to increase their number 40 times. Annotation is carried by a semi-automatic tool to obtain dataset pairs. Transfer learning is conducted using pre¬trained ENet state and results are provided and analyzed.

6.3. Frequency Domain Measurements of Radio Channels in a Typical Agriculture Environment

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Wireless connectivity is a critical part of each Internet of Things (IoT)-based "smart" agriculture system, as it enables the real-time transmission of data collected by sensors in agricultural fields. In this work, the empirical data for the physical characteristics of radio channels in the frequency range of 0.8 GHz to 1 GHz are presented for a more effective node arrangement during the design and deployment of wireless networks for IoT-based smart agriculture. The results indicate that path loss increases with distance and all radio channels exhibit multipath behavior.

6.4. Specific Absorption Rate Induced in a Plant Leaf from a Wearable Antenna for Smart Agriculture

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Wearable plant sensors are expected to play an essential role in the future development of precision agriculture. Given that plant wearable antennas function on the leaves, the electromagnetic interaction between the antennas and the leaves needs to be studied. This work presents the results for specific absorption rate (SAR) in a ZZ plant leaf from a wearable antenna for "smart" agriculture which is very important for both potential applications and constraints for crop monitoring and management using this emerging technology. The results show that the overall average SAR values for the plant leaf at 2.4 GHz and 2.48 GHz are 1.106 W/kg and 1.1156 W/kg, respectively. SAR distributions, representative histograms and descriptive statistics in the different layers of the leaf at 2.4 GHz (Fig. 2) and 2.48 GHz are also presented.

6.5. Wearable Antennas: General Requirements for SAR Numerical Assessment

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This paper outlines the general requirements to compute the specific absorption rate (SAR) from wearable antennas. It also provides a flowchart detailing the proposed methodology for this assessment. To prove the proposed concept, a wearable antenna in the ISM 2.45 (2.4-2.48 GHz) band is designed, and SAR in a flat phantom is calculated.

7.1. A Nonlinear Control for the Path Tracking Problem of Autonomous Bi-Steerable Vehicles

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In this paper, a path tracking controller for a bi-steerable vehicle is presented. Based on a kinematic path tracking model of the car in error coordinates expressed in a coordinate system moving along the reference path, a nonlinear feedback control is designed using Lyapunov-based control design techniques, which yields asymptotic stability result. Simulation tests are presented. The results demonstrate that the problem of path tracking control of a bi-steerable vehicle is solved with fast convergence and good transient performance.

7.2. Integration of Generative AI for Intelligent Diagnostic of Vehicles

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The latest update on Generative AI, especially the OpenAI platform, confirms they are no longer single¬domain proficiency. It already has been adopted by a variety of applications, emphasizing speech, audio, vision, and multimodal interactions. GPT family of large language models (LLM) is evolving where GPT4o is a few times faster, way more intelligent, and at the same time much cheaper as a service compared to the previous version. Additional services such as "AI Assistant" make it possible to be utilized with fewer resources available in the embedded systems. The

advancement of semiconductor technology and microelectronics in the form of Wireless connected SoC in small sizes opens many fields for various IoT (Internet of Things) applications. The proposed solution in this paper will present a system that combines those two technologies in the form of a standalone embedded connected device, that can perform autonomously diagnostic of vehicle by identifying and prompting the owner or driver for troubles in the vehicle and efficiently suggesting for corrective actions. The results show how comprehensive troubleshooting of logged errors is with a standalone embedded system by the support only of GPT AI Assistant.

7.3. Automation Deployment in Azure Cloud with a Modular Terraform Approach

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Resource deployment in the cloud environment can be automated using infrastructure-as-code tools. By leveraging their capabilities, provisioning and managing cloud resources can be streamlined, ensuring consistency, repeatability and efficiency. The study demonstrates how automation tools facilitate the management of complex cloud infrastructures in a way that can be directly applied in a real environment. The findings highlight the benefits of a modular approach for automation in cloud operations, including reduced deployment times and improved scalability.

7.4. Cloud Practical analysis of Google Cloud Platform and Microsoft Azure

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Cloud computing is growing in importance for businesses of all sizes. Google Cloud and Microsoft Azure have emerged as two of the most popular platforms. This study compares their service offerings, pricing models, security features and performance. The findings highlight specific use cases to demonstrate how these platforms perform in real-world scenarios. Understanding these differences can help organizations align their cloud strategy with broader business objectives, maximizing performance and cost-efficiency.

7.5. Application of Reinforcement Learning in Autonomous Mobile Robots

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With the rapid rise of the deep reinforcement learning and progressive development of sensors for autonomous mobile robots it is feasible to teach robots to solve tasks of autonomous navigation in unknown environments. Reinforcement learning itself is a technique that solves this problem. In this work we discuss the reinforcement leaning approach, as well as the requirements needed for the mobile robots to use it. It also give example of modern autonomous mobile robot and its specification.

7.6. Investigating the Influence of the Environment on the Detection and Monitoring of Cattle with an Unmanned Aerial Vehicle using Infrared Radiometry

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In this study of ours, we tested the importance of height in detecting and tracking an object about the size of a cow using a drone-mounted infrared radiometer. We monitored how the heat flux from the environment reaching the thermal camera lens varied with changes in the distance between the radiometer and the object. The results indicate the appropriate distances for such monitoring and show the capabilities of infrared thermography for detecting and observing livestock from a height.

7.7. Thermal Infrared Imaging of Near-Freezing Objects with Unmanned Aerial Vehicles and the Influence of Observation Height in Real Conditions

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Thermal infrared imaging using unmanned aerial vehicles (UAVs) has become a vital tool for monitoring large objects with relatively constant temperatures. This study investigates how the height at which UAVs operate influences the thermal infrared measurements of such objects. Despite the objects maintaining a stable temperature, the results reveal significant variations in thermal readings at different altitudes. Analysis shows that these discrepancies are closely linked to specific components of the radiation transfer equation, particularly atmospheric attenuation, surface emissivity, and emission from atmospheric volume. Understanding these tendencies is crucial for optimizing UAV-based thermal imaging applications, ensuring accurate data collection, and improving the reliability of temperature assessments from varying heights. This research provides insights into the complex interaction between measurement altitude and thermal infrared imaging accuracy, offering guidance for future UAV thermal imaging missions.

7.8. Infrared Thermography Analysis of Temperature Changes and Performance in Active and Inactive Sportsmen across Multiple Laps

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This study investigates temperature changes and performance differences between active and inactive sportsmen using infrared thermography during a multi-lap exercise. Infrared thermography was employed to monitor the surface temperature of the participants throughout the activity. The experiment involved tracking temperature variations across multiple laps to identify patterns related to physical activity levels and performance. Results highlight the relationship between activity levels and thermal regulation, showing distinct differences in temperature response and physical performance between active and inactive individuals. These findings provide insights into the potential applications of infrared thermography in sports science and performance analysis.

8.1. Behavior of VoIP Traffic QoS Metrics in Loaded Networks

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The study and analysis of a VoIP system or a network designed for VoIP traffic transmission can be approached from various perspectives, each demonstrating the impact of different parameters on it. Ultimately, all these approaches converge on assessing to what extent the quality of service (QoS) requirements are met. The present research is no exception, as it focuses on the QoS of service in packet-based networks, particularly VoIP. To this end, the different types of QoS, methods of measurement and evaluation of results, key system-level factors affecting QoS, and how they influence the performance of the system will be defined. This study will examine VoIP traffic and QoS related parameters under adverse conditions, specifically heavy network congestion.

8.2. Exact Queuing Model of Heterogeneous Local Communication Network

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The object of the research in the article is a heterogeneous local communication network. In such network, a complex access protocol is used to access the channel and transmit messages. This protocol implements the principles of access control which are used in the controlled and token access protocols, synchronous random access. Proposes exact model of queues in the considered communication network. This model is developed in discrete time and takes into account the states of the buffer of considered communication station and allows to determine capacity of its buffer.

8.3. Windows or Linux – the Most Suitable Platform to Run the GNS3

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The purpose of this work is to verify the claim, circulating in specialized technology forums, that using GNS3 under Linux is more performant and achieves higher data rates in the modeled network. For the purpose of this study, two different IP network models have been made to study different scenarios. The two models run on two operating systems – Windows 11 and Ubuntu 24. Thus, it will be possible to compare the obtained results from the modelled networks and verify the claim that under Linux the exchange rates in the modelled networks in GNS3 are higher. For the purpose of the study, well-known tools for studying of IP networks have been used.

8.4. Mathematical Approach to Social Network Modelling

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Two approaches to studying social network (SN) models are considered: generalized and detailed descriptions. In first approach, the behavior of agents is considered "on average." In the second approach, the individual decisions are taken into account. A comparison of these two approaches is given using the example of a threshold model of collective behavior with a single relative threshold. The issues of identifying detailed and generalized characteristics of SN based on data from Facebook and "X" are considered. The results of relevant simulation are presented and compared.

8.5. University Parallel Computing Micro-Cluster Build with Second-Hand Computer Systems

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This article explores the innovative use of second-hand computers for parallel computing in physics simulations at New Bulgarian University. By repurposing older hardware, the initiative demonstrates how cost-effective, high-performance computing solutions can be achieved for educational purposes. It highlights how these refurbished systems provide substantial computational power for research at a fraction of the typical cost. The article delves into strategies for selecting, upgrading, and integrating these systems into existing infrastructures, while also addressing the benefits and potential challenges associated with such an approach.

8.6. Wireless Measurement Station using Arduino

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8.7. Microprocessor System for Studying the Operating Characteristics of the Photovoltaic Panels

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This publication presents a system for recording and analyzing the operating characteristics of photovoltaic panels. This system aims to provide a better idea of the key parameters - current, voltage, power, and others, which are the basis of the performance of photovoltaic panels. A microprocessor system has been developed to collect and process data in real-time, ensuring high accuracy and reliability of measurements. The software was used to visualize and analyze the obtained dynamic data, tracking the change of parameters under different climatic conditions. The microprocessor-based analysis system is specifically suitable for training engineering students. It provides them with theoretical and practical experience in photovoltaic technologies and the opportunity for a more in-depth study of key parameters affecting the provision of high efficiency.

8.8. Using ESP32 and Air Quality Sensor in Engineering Student Education

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This paper describes the use of an ESP32-based development platform to build a training model for teaching students in a course on sensors and sensing devices. The training model focuses on measuring air quality by considering the concentration of particulate matter ranging from 0.8 microns to 10 microns in size, the concentration of carbon monoxide (CO), methane (CH4), and propane (C3H8). It also measures temperature and relative humidity. The measured data is displayed on a display mounted on the training model and can also be viewed on a WEB page. The sequence algorithm for measurement, communication and data display is described and programmed using Micro Pithon. At the end of the paper, data from real measurements are presented.

8.9. In-Depth ECG Signal Processing with Hardware Modules and Python Programming for Enhanced Engineering Education

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This paper presents a new exercise for students about basic processing of ECG signals. In the first part of exercise, the students will assembly a hardware module to measure ECG signals from human body and transmit them to computer. In the second part they will write a code in python to receive the ECG signal from hardware module, to perform its initial signal processing, and visualize the original and processed ECG signals.

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