CONFERENCE PROGRAM

（Draft Version, Sep.18）

Istanbul, Turkey | September 24-26, 2025

Co-sponsored by

IEEE Turkey Section

Gazi Üniversitesi 1926

Azərbaycan memarlıq və inşaat universiteti

Table of Contents

Welcome Message

We are delighted to welcome you 2025 12th International Conference on Electrical and Electronics Engineering (ICEEE 2025) held in Istanbul, Turkey from September 24 to 26, 2025. This milestone edition brings together leading researchers, engineers, industry experts, and practitioners to explore the latest advancements, challenges, and opportunities in electrical and electronics engineering, and their transformative applications.

ICEEE 2025 serves as a premier forum for sharing cutting-edge research, innovative solutions, and emerging technologies shaping the future of data-driven computing. Over three days, the conference will feature keynote speeches, technical sessions, workshops, and presentations covering a wide spectrum of topics, such as Power Electronics, Control Systems, Signal Processing, Communication Systems, and many more.

As a key component of ICEEE 2025, we are proud to host and its workshop 2025 4th International Conference on Computer Engineering, Technologies and Applications (CETA 2025), dedicated to advancing research in software and information engineering, computer theory and technology, computer science and engineering, and many more.

Our program this year includes an impressive array of keynote speeches, invited speeches, technical sessions, and workshops, designed to provide valuable insights and inspire new approaches to education. We are honored to feature prominent speakers who will share their expertise on various topics, including the latest advancements in online education, innovative teaching methods, and the role of technology in shaping learning experiences.

We appreciate the dedication of all authors, reviewers, and participants who contribute to the intellectual vitality of ICEEE & CETA. Your engagement fuels progress in these critical fields. May this conference inspire meaningful discussions, foster collaborations, and accelerate innovations that address global challenges.

Welcome to Istanbul, and enjoy ICEEE & CETA 2025!

ICEEE & CETA Organizing Committee
September, 2025

Onsite Conference Information

Conference Venue

Ottoman's Life Hotel Deluxe
Address: Molla Gürani Mah. Molla Gürani Cad. No: 8/16 Fatih 34093 İstanbul / Türkiye
Room Booking Link:
https://www.ottomanslifedeluxe.com/
RESERVATION CODE NAME: ICEEE & CETA

Single Superior Room Rate € 127,40
Double Superior Room Rate € 140,40
Prices are inclusive of VAT, accommodation tax and open buffet breakfast

Emergency Call

- ✓ Comprehensive Emergency Service: **112**

Average Temperature During the Conference

16℃ - 25℃

Presentation Tips

- ✓ The duration of a presentation slot is 15 minutes. Please prepare your presentation for 12 minutes & 3 minutes for questions from the audience;
- ✓ An LCD projector & computer will be available in every session room for regular presentations;
- ✓ Presentations MUST be uploaded at the computer at least 15 minutes before the session start.

Dress Code

- ✓ All participants are kindly requested to dress formally, as casual wear is discouraged.
- ✓ National formal dress is welcome.

Attention Please

- ✓ Please ensure the safety of your belongings in public areas. For personal and property security, delegates are advised to wear their identification badges during the conference and refrain from lending them to unauthorized individuals. The conference cannot be held responsible for the loss of personal items.

Online Conference Information

ZOOM Platform
Download Link: https://zoom.us/download

ZOOM INFORMATION Passcode: 2426	
ROOM A	https://us02web.zoom.us/j/85438342652
ROOM B	https://us02web.zoom.us/j/86002257904

Time Zone
- ✓ **İstanbul Standard Time, UTC/GMT +3**
- ✓ Please make sure that both the clock and the time zone on your computer are set to the correct standard time.

Sign In and Join
- ✓ Join a meeting without signing in: A Zoom account is not required if you join a meeting as a participant, but you cannot change the virtual background or edit the profile picture.
- ✓ Sign in with a Zoom account: All the functions are available.

Additional Suggestions
- ✓ A computer with an internet connection (wired connection recommended)
- ✓ USB plug-in headset with a microphone (recommended for optimal audio quality)
- ✓ Webcam (optional): built-in or USB plug-in
- ✓ Stable internet connection
- ✓ Quiet environment
- ✓ Proper lighting

Presentation Tips
- ✓ Each presentation slot is 15 minutes. Please prepare to speak for around 12 minutes, allowing 3 minutes for audience questions.
- ✓ Join the meeting room at least 10 minutes before the session begins.

Zoom Test
- ✓ Prior to the formal conference, presenter shall join the test room to make sure everything is on the right track.
- ✓ For presenters, please rename Zoom Screen Name in “Paper ID - Name” format before entering meeting room.

Conference Recording

- ✓ The entire conference will be recorded. If any participant objects to being recorded during their presentation, they are requested to inform the organizers in advance.
- ✓ The recording will be paused accordingly during their segment. Attendees are expected to dress formally and maintain appropriate decorum throughout the event.
- ✓ The recording is intended solely for conference-related purposes and academic publications. It is strictly prohibited to distribute, use commercially, or utilize the recording for any illegal activities.

Event at a Glance

<table>
<tr><th>September 24
Wednesday</th><th>September 25
Thursday</th><th>September 26
Friday</th></tr>
<tr><td rowspan="2">09:00-12:00
Online
Zoom Test</td><td></td><td>09:00-09:05
Opening Ceremony</td><td rowspan="2">09:00-11:00
Onsite
Sessions
9 & 10</td><td rowspan="2">09:00-11:00
Online
Sessions
1 & 2</td></tr>
<tr><td rowspan="6">10:00-16:00
Sign in
&
Materials
Collection</td><td>09:05-11:50
Keynote Speeches</td></tr>
<tr><td>11:50-14:00
Lunch Break</td><td colspan="2">11:00-13:30
Break</td></tr>
<tr><td rowspan="4"></td><td>14:00-16:00
Onsite Sessions
1 & 2 & 3 & 4</td><td colspan="2">13:30-16:00
Online Sessions
4 & 5</td></tr>
<tr><td>16:00-16:30
Break</td><td colspan="2" rowspan="3"></td></tr>
<tr><td>16:30-18:30
Onsite Sessions
5 & 6 & 7 & 8</td></tr>
<tr><td></td><td>18:30-20:30
Dinner</td></tr>
</table>

Daily Schedule – September 24, Wednesday

For On-site Participants

10:00-16:00	**Sign in and Collect Conference Materials** Location: Lobby of Ottoman's Life Hotel Deluxe Molla Gürani Mah. Molla Gürani Cad. No: 8/16 Fatih 34093 İstanbul, Türkiye

For Online Participants - ZOOM Test

09:00-12:00	**ZOOM Test for Committees / Session Chairs** ROOM A https://us02web.zoom.us/j/85438342652 Passcode: 2426
09:00-12:00	**ZOOM Test for Authors** ROOM B https://us02web.zoom.us/j/86002257904 Passcode: 2426

Daily Schedule – September 25, Thursday

Venue: B1 Floor, Ballroom, Ottoman's Life Hotel Deluxe		
Host: **Mahir Dursun**, Gazi University, Turkey		
Opening Ceremony		
09:00-09:05	**Welcome Message** **Mahir Dursun,** Gazi University, Turkey	
Keynote Speeches		
09:05-09:50	**Keynote Speech I:** *Measuring with Artificial Intelligence: Opportunities, Challenges, and Future Perspectives* **Leopoldo Angrisani,** University of Napoli Federico II, Italy	
09:50-10:20	Group Photo & Coffee Break	
10:20-11:05	**Keynote Speech II:** *The Symbiotic Future of AI, Mechatronics, and Biomedical Innovation* **Hüseyin ÜVET**, Yildiz Technical University, Turkey	
11:05-11:50	**Keynote Speech III:** *Energy and Infrastructure for Sustainable Electrification* **Gokturk Poyrazoglu**, Ozyegin University, Turkey	
11:50-14:00	Lunch | Lobby Floor, Winter Garden	
Author Presentation		
14:00-16:00	**Onsite Session 1** **Power Electronics Equipment Design and Device Simulation** CE3196 CE1165 CE1168 CE1171 CE1108 CE1160 CE2232 CE2273	Ballroom B1

14:00-16:00	**Onsite Session 2** **Data computation and intelligent algorithms in digital information systems** CE1175 CE1005 CE3041 CE3042 CE3049 CE1011 CE1104-A CE2217	Maide Hall Lobby Floor
14:00-15:30	**Onsite Session 3** **AI-based Intelligent Systems and Innovative Applications** CE3194 CE2029 CE1016 CE2253 CE3045 CE3048	Fatih Room B1
14:00-16:00	**Onsite Session 4** **Control Models and Stable Operation in Power Systems** CE1164 CE1170 CE1149 CE1167 CE3008 CE2262 CE2195 CE2244	Divan Room B1
16:00-16:30	Coffee Break	
16:30-18:30	**Onsite Session 5** **Control Models and Structural Control in Complex Systems** CE2187 CE1146 CE1176 CE2001 CE1177 CE2026 CE2027 CE1136	Ballroom B1
16:30-18:30	**Onsite Session 6** **New Clean Energy Development and Energy Storage Technologies** CE2265 CE2241 CE1113 CE1141 CE3006-A CE1126 CE1134 CE3185	Maide Hall Lobby Floor
16:30-18:30	**Onsite Session 7** **Photovoltaic Panels and Power Generation Systems** CE3184 CE1125-A CE1133 CE1162-A CE1178 CE3176 CE2209 CE2257	Fatih Room B1

16:30-17:45	**Onsite Session 8** **Wireless Communication Systems and Security Analysis** CE3003 CE2249 CE3179 CE3180 CE3007	Divan Room B1
18:30-20:30	Dinner | Lobby Floor, Winter Garden	

Daily Schedule – September 26, Friday

Onsite Author Presentation		
Venue: Ottoman's Life Hotel Deluxe		
09:00- 10:45	**Onsite Session 9** **Electronic Device Design and Simulation Analysis** CE1110 CE1148 CE1158 CE1161 CE1145-A CE1172 CE2201	Maide Hall Lobby Floor
09:00- 10:45	**Onsite Session 10** **Fault Location and Safety Detection in Modern Intelligent Power Systems** CE2202 CE1147-A CE1107 CE2199 CE3004 CE2259 CE1144	Fatih Room B1
10:45- 11:00	Coffee Break	

Online Author Presentation		
Zoom ROOM A: https://us02web.zoom.us/j/85438342652 Zoom ROOM B: https://us02web.zoom.us/j/86002257904 Passcode: 2426		
09:00-11:30	**Online Session 1** **Electrical Equipment Fault Analysis and Reliability Prediction** CE1122 CE1109 CE1130 CE1138 CE1152 CE2211 CE1119 CE2248 CE2272 CE1008	Room A
09:00-11:15	**Online Session 2** **System Control and Optimal Configuration in Intelligent Electrical Systems** CE2254 CE1015 CE2190 CE2247 CE2267 CE2268 CE3195 CE3197 CE3193	Room B

11:30-13:30	Break Time	
13:30-16:15	**Online Session 3** **Performance Monitoring and Safety Detection in Communication Networks** CE1112 CE1007 CE1142 CE2188 CE2207 CE2213 CE1150 CE2240 CE3182 CE2022 CE2212	Room A
13:30-16:00	**Online Session 4** **Modern Image and Signal Processing Technologies** CE1132 CE2193 CE2194 CE3051 CE2028 CE3046 CE1009 CE2219 CE1163 CE2233	Room B

Keynote Speaker

Leopoldo Angrisani

IEEE Fellow
University of Napoli Federico II, Italy
MedITech Competence Center I4.0 - Technical-Scientific
Committee Coordinator

Speech Time: 09:05am-09:50am, September 25
Location: B1 Floor, Ballroom

Leopoldo Angrisani is Full Professor of Electrical and Electronic Measurements with the Department of Information Technology and Electrical Engineering of the University of Naples Federico II, Italy. He is also Chair of the Board of the Ph.D. Program ICTH - Information and Communication Technology for Health of the University of Naples Federico II.

His research activity has always been focused on topics related to electrical and electronic measurements. He currently pays attention to the role of measurement in the IoT field and, more generally, in the Industry 4.0 and Health 4.0 fields, cyber-physical measurement systems, measurement of ICT systems sustainability and sustainability of measurements, sensors, sensor networks, and measurement methods in precision agriculture and livestock farming, operation and performance assessment of communication systems, equipment, and networks, measurement uncertainty, impact of quantum technologies on measurements, metrological characterization of advanced human-to-machine interfaces.

He was and is currently involved in many industrial research projects, in cooperation with small, medium, and great enterprises, for which he played and is currently playing the role of scientific coordinator. He is currently the Coordinator of the Technical/Scientific Committee of MedITech – one of the eight Italian Competence Centers on I4.0 enabling technologies.

He is Fellow Member of the IEEE Instrumentation and Measurement and Communications Societies. He was Honorary Chairman of the first (M&N 2019) and second (M&N 2022) edition of the IEEE International Symposium on Measurements & Networking, General Chairman of the second edition (MetroInd4.0&IoT 2019) of the IEEE International Workshop on Metrology for Industry 4.0 and IoT, and General Chairman of the first edition (IEEE MeAVeAS 2023) of the IEEE International Workshop on Measurements and Applications in Veterinary and Animal Sciences. He is vice-chair of the Italian Association “GMEE-Electrical and Electronic Measurements Group”, and corresponding member of the Accademia Pontaniana in Naples, the oldest Italian academy, with almost 600 years of history, which has always brought together renowned Neapolitan scholars.

In 2009, he was awarded the IET Communications Premium for the paper entitled “Performance measurement of IEEE 802.11b-based networks affected by narrowband interference through cross-layer measurements” (published in IET Communications, vol. 2, No. 1, January 2008).

The IEEE Instrumentation & Measurement Society Italy Chapter, which he has been

chairing since 2015, was awarded in 2016 the prestigious recognition “I&M Society Best Chapter Award” by the IEEE Instrumentation & Measurement Society, in 2017 the prestigious recognition “Most Improved Membership Chapter for 2016” by the IEEE Italy Section, in 2018 the prestigious recognition “Most Innovative Chapter 2018” by the IEEE Italy Section, and in 2021 the prestigious recognition "Chapter of the Year 2021" by the IEEE Region 8 (Europe, Middle Est, Africa).
In 2021, he was awarded the prestigious recognition “2021 IEEE Instrumentation and Measurement Society Technical Award” with the following citation “For contributions in the advancement of innovative methods and techniques for communication systems test and measurement”.

Measuring with Artificial Intelligence: Opportunities, Challenges, and Future Perspectives

Abstract: Artificial Intelligence (AI) is becoming increasingly relevant in many areas of engineering, ranging from electronics and telecommunications to robotics and biomedical engineering, among others. Metrology is not extempt form this trend. As a matter of fact, AI models are also starting to play a significant role in measurement tasks, especially when direct measurement of a physical quantity is complex, expensive, or not feasible. For instance, AI models can be used to estimate temperature, pressure, or displacement by processing signals or images that are easier to acquire. In simple terms, an AI model can be seen as a system that learns how to relate input quantities (usually called predictors) to output quantities (what we want to measure). Unlike traditional measurement framework, however, AI models do not follow deterministic physical laws, but rather learn their behavior from training data. This introduces an additional source of uncertainty as the model’s performance depends on the quality of the training data, the model structure, and the way it was configured. These aspects affect the trustworthiness in the output provided, and need to be considered alongside the established uncertainty contributions related to input data acquisition.
In this talk, a practical approach is presented to identify and evaluate the uncertainty introduced by the adoption of an AI model. Strategies are also outlined to reduce this uncertainty, allowing AI-based outputs to be considered as fully-fledged measurement results. This perspective opens the door to tangible benefits for our society, increasingly shaped by data-driven technologies and AI.

Keynote Speaker

Hüseyin ÜVET

Yildiz Technical University, Turkey

Speech Time: 10:20am-11:05am, September 25
Location: B1 Floor, Ballroom

Dr. Huseyin Uvet is an Associate Professor in the Department of Mechatronics Engineering at Yildiz Technical University. He holds a Bachelor of Science in Computer Engineering and pursued his graduate studies at Osaka University in Japan, where he earned both a Master of Science and a Ph.D. in System Innovation, supported by the prestigious Japanese Government (Monbukagakusho) Scholarship. Following his doctoral studies, he was awarded the Japan Society for the Promotion of Science (JSPS) Fellowship to conduct post-doctoral research at Nagoya University's Micro-Nano Mechatronics Center. With over 15 years of experience, Dr. Uvet has established himself as an expert in healthcare robotics, AI-driven medical technologies, and sports engineering. His research focuses on micro-nano robotics, holographic imaging, AI-based diagnostics, and autonomous systems. He has a proven record of leading large-scale R&D projects, securing over $10 million in research funding from institutions such as the European Union and The Scientific and Technological Research Council of Turkey (TÜBİTAK). Dr. Uvet has successfully bridged the gap between engineering and medicine by developing groundbreaking solutions, including robotic surgical systems and AI-powered diagnostic tools. His expertise is highly sought after, and he has provided senior consultancy services to numerous prominent organizations. His consulting portfolio includes collaborations with TURKCELL on IoT 4.0 integration and digital health technologies, Turkish Airlines on a VR Flight Simulator Program, DHL Logistics on warehouse automation systems, and the Antalya Muratpaşa Municipality on Smart Cities programs and EU projects. As an entrepreneur for two R&D startup companies and a leader in academic and administrative roles, Dr. Uvet has consistently driven innovation. His work is documented in numerous patents and high-impact publications, reflecting his significant contributions to mechatronics, and biomedical and sports technologies.

The Symbiotic Future of AI, Mechatronics, and Biomedical Innovation

Abstract: Today's toughest engineering problems call for answers that go beyond old-school boundaries. The fusion of smart computing with cutting-edge mechanical systems is opening doors, especially in medicine. This talk dives into how these fields work together, showing how clever algorithms and intricate machine designs are steering the future of tech.

We'll look at this blend from different angles. On the big-picture side, we'll talk about how sharp, efficient algorithms are transforming medical diagnostics with top-notch image

analysis. On the smaller scale, we'll dig into how smart control systems and high-precision vision tech allow tiny robots to move with pinpoint accuracy and spark new devices using effects like fluid dynamics. Pulling from a range of projects—like cancer detection powered by intelligent systems or guiding miniature robots without wires—this speech will shine a light on the vital role of engineers who bridge disciplines to turn complex ideas into real-world solutions that make a difference.

Keynote Speaker

Gokturk Poyrazoglu

Senior Member, IEEE
Department Head, Electrical & Electronics Engineering
Director, Grid Operations and Planning Laboratory
Ozyegin University, Istanbul, Türkiye

Speech Time: 11:05am-11:50am, September 25
Location: B1 Floor, Ballroom

Dr. Gokturk Poyrazoglu is an Electrical Engineer and Assistant Professor at Ozyegin University, Istanbul, where he leads the Electrical & Electronics Engineering Department and directs the Grid Operations and Planning Laboratory. He also serves as the Standards Coordinator for IEEE Türkiye.

He earned his M.Sc. (2013) and Ph.D. (2015) in Electrical Engineering from the State University of New York at Buffalo, USA. Before joining academia, Dr. Poyrazoglu gained industry experience in the USA as a Scientist at Mitsubishi Electric Research Laboratories (MERL, Boston), a Power Systems Consultant at Alevo Analytics (Charlotte, NC), and a Grid Operations and Planning Scientist at EPRI (Electric Power Research Institute). Since 2017, he has been a faculty member at Ozyegin University.

Dr. Poyrazoglu is recognized for his leadership in university–industry collaboration. He was awarded the “University-Business World Cooperation Award” at the 2022 YÖK Outstanding Achievement Awards for his ‘Harvesting Energy Efficiency in the Electric Distribution Sector’ project (TRAFORM), conducted in partnership with eight electric distribution companies and ELDER, with support from EPDK.

He also won the “Best Paper Award” at IYCE’24 in France for his co-authored study on the spatio-temporal impacts of EV charging loads on locational marginal prices, a key contribution to sustainable energy markets and EV infrastructure planning.

His research portfolio includes over 50 international peer-reviewed journal and conference publications, with active contributions to recent works in areas such as economic dispatch with physics-informed learning, EV charging hosting capacity, overvoltage mitigation in PV-rich networks, and sustainable nanogrid techno-economic assessments.

Dr. Poyrazoglu’s core research interests lie in energy economics, operations research in energy systems, renewable energy integration, smart grid applications, and power system monitoring and control, particularly focusing on power grid resilience, efficiency, and e-mobility integration.

Energy and Infrastructure for Sustainable Electrification

Abstract: The global energy landscape is undergoing a rapid transformation driven by decarbonization, decentralization, and digitalization. At the center of this transformation lies sustainable electrification, which requires the integration of renewable energy resources

and the development of flexible, resilient, and intelligent infrastructures.
This keynote will address electrification's technical, economic, and regulatory dimensions, with a particular emphasis on distribution networks, energy storage systems, and e-mobility integration. The talk will showcase pioneering initiatives such as the country's first battery implementation at the distribution level, the first sustainable EV charging pricing model, and university–industry partnerships that have set new energy efficiency and digitalization standards.
Special attention will be given to grid flexibility, forecasting, and optimization frameworks, where artificial intelligence and operations research play an increasing role in managing uncertainty and ensuring efficiency. The keynote will also discuss the evolving role of distribution system operators and highlight how regulatory mechanisms, market design, and innovative business models can accelerate sustainable electrification.

Onsite Session 1

Power Electronics Equipment Design and Device Simulation

- **Session Chair**: Ioana-Gabriela Sirbu, University of Craiova, Romania
- **Time**: 14:00-16:00, September 25
- **Meeting Room**: Ballroom, B1
- **Papers**: CE3196 CE1165 CE1168 CE1171 CE1108 CE1160 CE2232 CE2273

CE3196 14:00-14:15	Discrete Model Technique for Analyzing Inductive Power Transfer Circuits in Dynamic Regimes Author: Ioana-Gabriela Sirbu Presenter: Ioana-Gabriela Sirbu, University of Craiova, Romania Abstract: In the context of the increased interest in the development and optimization of wireless power transfer systems, as well as the inclusion of static converters in these systems, this research aims to make a contribution regarding the analysis techniques of these systems in dynamic regimes. The paper presents the method of obtaining a discretized equivalent resistive model of such a system. Each circuit element - resistor, magnetically coupled or uncoupled coils, capacitor - was replaced by a discrete equivalent resistive model. Thus, the differential equations that describe the functioning of the system are replaced by algebraic equations, much easier to solve. Using a numerical integration algorithm, regardless of the form of variation in time of the supply voltage, the variations in time of the currents and voltages in the circuit can be easily obtained. The method was verified for two cases: periodic sinusoidal supply voltage and pulse type supply voltage. The results were interpreted, and in the case of sinusoidal supply voltage, even compared with the analytical solution, the conclusions being positive. The results proved the viability of the method and its usefulness in the analysis of dynamic regimes of any kind, being adaptable to other topologies of inductive power transfer circuits.
CE1165 14:15-14:30	A Simple Digital Control System for Three-Phase Controlled Rectifier Using Microcontroller Authors: Simum Hasan Fuad, Md. Shahadat Hossain, Imam Shakir Hridoy, Tapan Kumar Chakraborty Presenter: Tapan Kumar Chakraborty, University of Asia Pacific, Bangladesh Abstract: The research demonstrates how a microcontroller triggers a three-phase controlled rectifier through SCRs with an implemented design. The system operates to control the firing angle precisely, which leads to better voltage regulation and efficiency under dynamic load conditions. The Arduino Mega 2560 microcontroller applies synchronized gate pulses derived from zero-crossing point detection in real time for accurate thyristor conduction. The experimental configuration, consisting of voltage comparators, optocouplers, and monostable multivibrators, undergoes successful testing through simulated results from Proteus and physical

	implementation tests. Real-world disturbances such as noise and transformer distortion do not limit the successful operation of the 6-pulse rectifier circuit, which implements programmable phase angle control. This method provides greater rectifier efficiency and acts as groundwork for combining with industrial IoT systems and renewable energy systems in the future.
CE1168 14:30-14:45	Analysis and Design of a Broadband Antipodal Finline Structure for Coaxial Waveguide to Microstrip Transition Authors: Senanur Kekeç, Volkan Açikel, Serkan Şimşek Presenter: Senanur Kekeç, Istanbul Technical University, Turkey Abstract: In solid-state power amplifiers, high power levels are achieved through power combining. Spatial power combining is one of the N-way combining techniques that utilizes waveguides. The transition from waveguide to microstrip can be accomplished using an antipodal transition. In this paper, the design of an antipodal finline transition in a coaxial waveguide medium is examined in terms of the main parameters that affect its per formance. An optimized design is proposed, offering broadband performance from 2 to 18 GHz with low insertion loss.
CE1171 14:45-15:00	Designing and Testing Protective Overcurrent Relay Using Real-Time Digital Simulation (RTDS) Authors: Rashed Abdullah Al-Odienat, Amneh Mbaideen. Presenter: Rashed Abdullah Al-Odienat, Korea Southern Power Co., Ltd./ Jordan L.L.C., Korea Abstract: This paper presents the design and testing of a protective overcurrent relay using Real-Time Digital Simulation (RTDS). The core objective of this research is to explore RTDS technology for the development and verification of a reliable overcurrent protection scheme. The study integrates standard coordination protocols and investigates the impact of renewable energy sources on relay behavior within a microgrid environment. A testbed was developed using RTDS and a real SEL relay under Hardware-in-the-Loop (HIL) configuration. The outcomes highlight the potential of real-time simulation to enhance protection system accuracy, reliability, and adaptability in modern power networks.
CE1108 15:00-15:15	Artificial Neural Networks Predictive Maintenance for Isolated Power DC-DC converters Authors: Titus Fihavango, Kanat Manatov, Mehmet Timur Aydemir Presenter: Titus Fihavango, Kadir Has University, Turkey Abstract: Given the increasing dependence of different industries on power electronic systems, particularly isolated power DC-DC converters, efficient predictive maintenance strategies have been developed to guarantee the reliable and efficient operation of these systems. Because of their complexity and dynamic nature, these converters are difficult to maintain using conventional methods like timebased or condition-based processes. Artificial neural networks (ANNs) are a useful tool for increasing the accuracy and efficacy of predictive maintenance for isolated power DC-DC converters. The model predictive, which serves as an expert in this work, provides the data used to train the suggested ANNs. Once tuned, the ANNs are used directly to predict faults in isolated DC-DC power converters.

	LTspice and MATLAB simulations are used to validate the performance of the proposed artificial neural networks. The results of the simulation demonstrate that the performance of the ANNs-based isolated power DC-DC converter is improved when a trained ANNs model is used. Consequently, the F1 score of the artificial neural network is 99.34%, the accuracy score is 89.83%, the precision score is 94.64%, and the recall score is 95.83%. Based on the scores results, we suggest that artificial neural networks (ANNs) could be useful for predicting isolated power DCDC converters.
CE1160 15:15-15:30	Life Cycle Assessment of Medium Voltage SF6-Free Switchgears: A Comparative Analysis Authors: Ali Togay, Hidir Duzkaya, Battal Dogan Presenter: Ali Togay, Gazi University, Eaton Abstract: The environmental impacts of medium voltage (MV) switchgear have become a central concern due to regulatory changes and the urgent need for sustainable energy infrastructure. This study presents a comprehensive life cycle assessment (LCA) of the CCF and CCV blocks, an SF_6-free and vacuum-interrupted medium voltage switchgear designed by different brands. The evaluation follows ISO 14040 and ISO 14044 standards. It covers the entire product life cycle, including manufacturing, distribution, use, and end-of-life stages, using the PEF EF 3.0 methodology and the EIME v6.1.1 software for Xiria 630 CCF. The results emphasize the environmental advantages of AIR/vacuum technologies and highlight areas for further improvement, such as increased use of recycled materials and renewable energy. This study reinforces the critical role of ecodesign strategies in advancing sustainable MV switchgear solutions.
CE2232 15:30-15:45	Loss Analysis and Load Dependent Efficiency Assessment of GaN-Based Frequency Converters Authors: Mohammad Sadegh Golsorkhi, Mohammad Sadegh Eslahi and Thomas Ebel Presenter: Mohammad Sadegh Eslahi, University of Southern Denmark, Denmark Abstract: Recent advances in wide bandgap semiconductors have positioned Gallium Nitride devices as a compelling alternative to conventional silicon and silicon carbide technologies in high-efficiency power conversion. This paper presents a detailed investigation into the power loss characteristics of GaN-based DC-AC inverters for motor drive applications. The study includes circuit-level simulations and thermal-electrical co-modeling. Switching behavior is analyzed using detailed waveform modeling, and the impact of gate drive parameters, parasitics. Furthermore, a system level loss analysis based on thermos-electrical models is carried out for the entire frequency converter. The variations of the loss components (rectifier, inverter and passives) with respect to the motor load and speed changes are investigated and the impact of cooling on conduction losses is highlighted. The results show that GaN devices significantly reduce total power losses compared to silicon-based solutions, particularly under light-load conditions where switching losses dominate. These findings establish GaN-based inverters as an efficient and scalable solution for next-generation motor drive applications.

CE2273 15:45-16:00	A High-Duty-Cycle AC–DC PFC Converter with Passive Voltage Division and Reduced Current Stress Loss Analysis and Load Dependent Efficiency Assessment of GaN-Based Frequency Converters Authors: Utku Çeliker and Hamza Makhamreh Presenter: Utku Çeliker, Özyegin University, Türkiye Abstract: This paper presents the design, analysis, and verification of a novel single--stage single--switch (s^4) AC--DC Power Factor Correction (PFC) converter topology. The proposed converter integrates a buck--boost preregulator and a forward converter with a voltage doubler by a single power switch. By utilizing passive diode switching and voltage division on the DC link at the input side, the proposed topology can operate at the high duty cycle. It provides superior output voltage regulation and current stress reduction. The converter is designed to operate in Discontinuous Conduction Mode (DCM) to obtain high power factor (PF). Finally, a 120 W prototype is built and experimental results demonstrated.

Onsite Session 2

Data Computation and Intelligent Algorithms in Digital Information Systems

- **Session Chair**: Sambeet Mishra, University of South-Eastern Norway, Norway
- **Time**: 14:00-16:00, September 25
- **Meeting Room**: Maide Hall, Lobby Floor
- **Papers**: CE1175 CE1005 CE3041 CE3042 CE3049 CE1011 CE1104-A CE2217

CE1175 14:00-14:15	Simplicity Wins: Lightweight Vision Transformer Heads for Presentation Attack Detection Authors: Jan König, Pedram Khatamino, Deniz Kumlu, Hossein Fereidooni Presenter: Deniz Kumlu, Kobil Teknoloji A.Ş., Germany Abstract: The growing reliance on digital services has amplified the need for secure and seamless identity verification, particularly in regulation-sensitive domains such as online banking. Facial recognition-based Know Your Customer (KYC) procedures are increasingly targeted by presentation attacks (PAs), including printed photographs, video replays, and 3D masks. To mitigate these threats, Presentation Attack Detection (PAD) systems are critical components of robust authentication pipelines. While recent advances have centered around deep and complex neural network architectures to enhance PAD performance, these models often exhibit limitations when faced with out-of-distribution samples and scarce training data. In this study, we explore a data-centric approach to PAD by leveraging a pre-trained Vision Transformer (DINOv2) as a fixed feature extractor, coupled with a lightweight classification head. We hypothesize that, given access to sufficiently diverse training data, such a simplified architecture can match or exceed the performance of more intricate models. Experimental results across multiple attack scenarios validate our hypothesis, demonstrating competitive accuracy and improved generalizability. These findings emphasize the efficacy of scalable, data-driven methodologies over architectural complexity in PAD system design.
CE1005 14:15-14:30	Probing Bioacoustic Soundscapes: An Empirical Study of Few-Shot Sound Event Detection Authors: Zhor Diffallah, Ykhlef Hadjer, Bouarfa Hafida Presenter: Zhor Diffallah, University of Blida 1, Algeria Abstract: Few-Shot Learning (FSL) has recently emerged as a promising approach for sound event detection in scenarios where labeled data is scarce. In this study, we investigate the effectiveness of a transfer learning-based FSL pipeline for detecting animal vocalizations. Building on the groundwork laid by previous contributions, our approach leverages pre-training and transfer learning to equip a sound event detector with rich, discriminative features. A classifier is then trained on support-query samples to perform few-shot classification, with experiments conducted under different fine-tuning settings. Through extensive evaluations on the

	DCASE2022 Task 5 dataset, we explore the impact of key design choices, including temperature scaling in contrastive loss and the trade-offs of fine-tuning. Our findings provide insights into the applicability and limitations of SCL-driven FSL for bioacoustic event detection, highlighting its potential for deployment in low-resource settings.
CE3041 14:30-14:45	Proposed Best Machine Learning-Based Satellite Collision Risk Prediction Model to Prevent Satellite Space Collision Using Recurrent Neural Network Authors: Mohammed Abdullah Alnatheer, Basil Albesher, Ibrahim Alrayes, Saad Owain Presenter: Ibrahim Alrayes, King Abdulaziz City for Science and Technology, Saudi Arabia Abstract: The aim of this paper is to review the best possible machine learning satellite collision risk prediction model to avoid satellite space collision using Recurrent Neural Networks (RNNs). First, in this paper, we shall review some key definitions of space debris, the scale of the problem, background information, classification, and sources. Additionally, other important related information, including space debris problems such as collision risk, Kessler syndrome, and economic impact, will be reviewed in this section. Next, the current status of space debris, including collision avoidance, would be analyzed. Then, we will review the various RNN methods currently available followed by concluding and the discussion of the future work in the foreseeable future. In our research, we will utilize the European Space Agency (ESA) dataset to develop AI models that can automatically assess collision threats. The European Space Agency (ESA) tracks possible collisions through Conjunction Data Messages (CDMs), which give orbital and environmental information over time for each conjunction.
CE3042 14:45-15:00	An Optimized Tasks Orchestration Algorithm for Cooperative Edge-Fog Environments Authors: Leila Kheroua, Zouina Doukha, Mohamed Guerroumi Presenter: Leila Kheroua, USTHB, Algeria Abstract: In today's digital era, the rapid growth of data and the number of connected devices makes tasks orchestration challenging, further complicated by mobility, heterogeneity of IoT objects, and user expectations in service placement. This paper revisits a fuzzy logic–based task orchestration algorithm, enhancing offloading with reinforcement learning to optimize performance in multi-tier IoT–Edge–Fog–Cloud systems through better load balancing across all layers, bandwidth management, and energy efficiency. We evaluated the solution in PureEdgeSim, showing modest service-time gains but up to 3% fewer request failures, high performance scalability, balanced use of all layers, and gradual energy consumption that preserves WAN bandwidth. Keywords— Internet of Things, Cloud, Fog and Edge Computing, Orchestrator, latency, Energy consumption, Reinforcement learning, PureEdgeSim.
CE3049 15:00-15:15	A Framework for Normalizing and Evaluating Data Relationships in Document-Oriented Database Author: Shady Hamouda Presenter: Shady Hamouda, Liwa University, United Arab Emirates

	Abstract: In the modern era, big data has emerged as a pivotal technology, numerous studies have documented the limitations of relational databases in effectively handling massive, heterogeneous datasets, particularly when flexibility and scalability are critical. These constraints have led to the widespread adoption of NoSQL databases, especially document-oriented databases which offer schema-less or schema-flexible data models and are well-suited for semi- structured data formats. Despite their advantages, document- oriented databases present two significant challenges. First, there is no standardized methodology for defining schemas or enforcing consistency across documents, leading to potential data integrity issues. Second, developers face a lack of systematic approaches for modeling entity relationships specifically, deciding when to normalize data (by referencing external documents) versus de-normalizing it (by embedding related data within a single document). This study proposes a structured methodology for managing data relationships in document-oriented databases. The approach focuses on applying principles of normalization and denormalization through the use of referenced and embedded document models, respectively. Furthermore, the methodology includes a performance evaluation framework to analyze the tradeoffs associated with each modeling strategy, enabling informed decisions based on specific use cases and system requirement.
CE1011 15:15-15:30	A Compression Suite for Compressed Files Author: Bekir Tevfik Akgün Presenter: Bekir Tevfik Akgün, Yeditepe University, Turkey Abstract: We published different approaches on the recompressing compressed files. Two of them, which are recursive recompression program and incremental recompression program, are based on our skip second word (SSW) compression algorithm. An off-the-shelf compression application is used for the third one, which is heuristic recompression program. We defined a hierarchical partitioning schema for segmenting an input file data into fixed-sized pages, and we used it in all three works. SSW compression algorithm starts to find two identical words placed on the same page. We keep the first word, and compressing is accomplished by skipping the second word with adding extra space cost for encoded addressing information (EAI) which is necessary for restoring the second word during decompression. Due to hierarchical partitioning in the heuristic recompression, we save pages containing identical words in a different sub-file, and then we compress this sub-file. We have seen that the SSW programs had better performance on smaller sized files and different type files while the non-SSW one had better performance on bigger sized compressed files. In this paper, we introduce three contributions. These are two more recompressing programs, which are Iterative Recompression based on SSW algorithm and Sequence Recompression derived from heuristic recompression. The third contribution is to apply a post-processing stage. We also compress output files of non-SSW programs using incremental recompression in the post-processing phase. We combine our programs, which are successful on different types and sized files, within a compression suit application. An input file is compressed by applying SSW and non-SSW programs of the suite in parallel. The Suite selects the best result among all results as an output file. In this work, the reason for

	developing the SSW iterative recompression is that the byte order processing in incremental recompression had been chosen for time efficiency. However, if we choice bit order processing with a different methodology then we may get better results than other SSW programs while consuming much time. The SSW programs are successful on less sized files compared to non-SSW heuristic and sequence applications, which are successful on bigger compressed files. Therefore, iterative recompression will be a good choice for our suite. While we have heuristic recompressing, the reason for the development of the sequence recompression can be explained similarly. We obtain one sub-file in heuristic recompression with related EAI and compress this sub-file. Whereas, the rest-files of almost all input file examples could not be compressed, so we left them as they were. However, if we use a pre-determined sequence for separating an input file into sub-files then there will be no cost for EAI, and, more than one or all sub-files may be compressed in this time. We developed the proposed suite application including the OpenMP library for parallel program execution. We obtained space saving rates on some compressed file examples, which are up to 0.01%, and which are better than 1% for bigger files.
CE1104-A 15:30-15:45	Ultra-Low-Power, Reconfigurable Mixed-Analog Radial Basis Function Artificial Neural Network Based-Classifier Author: Ahmed Reda Mohamed Presenter: Ahmed Reda Mohamed, KFUPM, Saudi Arabia Abstract: In this paper, an innovative mixed-analog m-n/x-1 radial basis function artificial neural network (RBF-ANN) for non-linear classification applications is presented, along with its microarchitectural design. The charge accumulation mechanism using time-division multiplexing and linear integrator time-to-voltage converters is essential to the network's operation. This reduces the amount of inter-neuron communication in large-scale neural networks by enabling the reuse of a single neuron. The proposed architecture also uses aided digital circuitry with analog processing to improve power and area efficiency. The analog circuitry used in constructing of the network's hidden layer neuron operates in the subthreshold range, providing faster processing than its digital counterpart while consuming less power and silicon area. Whereas the digital circuit offers a finite-state machine that generates a pre-defined series of states in chronological order and organizes the uploading of the network's parameters to the weight's storage unit. Additionally, a hybrid learning approach-based MATLAB-based assistance software has been created to further train and model the proposed network. A generic method is introduced to achieve an adaptable architecture, enable programmability, and enable network scalability reconfiguration. The proposed micro-architectural design is used to create 2-2/2-1 and 2-10/10-1 networks in XFAB 180 nm CMOS technology for the classification of XOR patterns to evaluate system performance. The post-layout simulation data reveal that the power efficiencies reach more than 137X and 385X improvements compared with the recently earlier designs at a frequency of 25 kHz and a voltage supply of 1 V and 1.5 V for mixed-analog and digital circuits, respectively. The silicon areas for the 2-2/2-1 and 2-10/10-1 networks are 1.01 mm2 and 1.136 mm2, respectively. Lastly, the functionality, classifier, cost, and gain performances of the proposed micro-

	architecture are examined.
CE2217 15:45-16:00	A Comparative Evaluation of Capacitive Coupling and Radiomyography in Contactless Electromyography for Muscle Activity Assessment Authors: Hajer Gammoudi, Laura Serra Marin, Luis A. Leiva, Luc Nijs and Inès Chihi Presenter: Hajer GAMMOUDI, Inès Chihi, University of Luxembourg, Luxembourg Abstract: Observing muscle activity is essential in different applications, including clinical assessment, rehabilitation, prosthetics, wearable health monitoring, sports performance, musical skill acquisition and more. Conventional electromyography (EMG) systems require direct skin contact, which may be uncomfortable and challenging to maintain for extended durations. Emerging contactless EMG technologies, encompassing capacitive EMG (cEMG) and radiomyography (RMG), offer noninvasive alternatives. This paper provides a comparative literature-based analysis of two contactless EMG measurement technologies, cEMG and RMG. It focuses on analyzing their underlying operational principles, signal quality, noise robustness, response time, user comfort, and suitability across various application domains. Additionally, the paper highlights the respective advantages, limitations, and existing knowledge gaps associated with each method. The findings indicate that RMG offers superior response times and more accurate gesture detection, while cEMG excels in textile compatibility and user comfort. Each method has its own set of strengths and limitations, rendering them suitable for varying applications. Ultimately, the paper proposes future avenues for experimental validation and potential strategies for hybrid integration.

Onsite Session 3

AI-based Intelligent Systems and Innovative Applications

- **Session Chair**: Murad Al-Omary, German Jordanian University, Jordan
- **Time**: 14:00-15:30, September 25
- **Meeting Room**: Fatih Room, B1
- **Papers**: CE3194 CE2029 CE1016 CE2253 CE3045 CE3048

CE3194 14:00-14:15	Interoperable connection of robots and camera systems with machines Authors: Abdallah Zaqout, Tobias Riethmüller, Bashar Hammad Presenter: Bashar Hammad, German Jordanian University, Jordan Abstract: This work introduces an Open Platform Communication Unified Architecture (OPC UA)-based framework that enables interoperable communication between machines, camera systems, and robots in an automated industrial environment. OPC UA Companion specifications are used to develop custom information models to represent the real-life interactions of each device. Three communication methods; Client/Server, Subscription, and Publisher/Subscriber, are evaluated and compared in the context of several aspects, such as real-time performance and scalability. A simulation for deploying the models is carried out utilizing Docker Container, and another one is performed for toggling the variables and transmitting them between different devices. The initial results of this ongoing work show that the proposed framework provides a secure, scalable, and interoperable solution for Industry 4.0 integration.
CE2029 14:15-14:30	AI-Powered Code Completion with LSTM Networks Authors: Hani Bani-Salameh, Yazan Fattoum, Fatima Abu Hjeela Presenter: Hani Bani-Salameh, The Hashemite University, Jordan Abstract: This work introduces an AI-powered code completion tool, called YJCC, that uses a Long Short-Term Memory (LSTM) network to predict the next token given to the input sequence of Java code. It proposes a model that was trained on a large corpus of files collected from GitHub repositories. To prepare the data for supervised learning, a complete preparation process was implemented — including code cleaning, tokenization, and sequence generation. Unlike recent models evaluated on standard benchmarks such as HumanEval or CodeXGLUE, the proposed approach focuses on Java and leverages real-world open-source projects to reflect practical usage. While benchmark-based evaluation is planned for future work, this version emphasizes a lightweight, accessible deployment for Java environments. The model showed a promising performance in generating appropriate Java code completions, which shows its practical applicability in programming environments. Results include a Top-1 accuracy of 73.5% on the test datasetb and a perplexity score of 3.1, indicating the possibility of integration into stateof-the-art IDEs.
CE1016 14:30-14:45	Recursive AI Machine Learning Model with Fully Homomorphic Encryption Support

	Authors: Swayamveer Singh, Ayushmaan Ajay Amit, Ebru Celikel Cankaya Presenter: Swayamveer Singh, University of Texas at Dallas, United States Abstract: With the steady proliferation of AI integration into daily life, this research aims to explore the impacts of integrating the AI technology into computational systems concerning privacy and security. We focus on the very use of AI to investigate and mitigate the adverse effects of AI use in systems, hence introducing the term recursive AI as we define it in this con- text. We also present ML use as an instrument of defense against AI-based security risks and its collaboration with homomorphic encryption to alleviate such risks. For this purpose, we introduce the novel Recursive Encrypted Artificial Learning (REAL) model that uses recursive AI in collaboration with Fully Homomorphic Encryption (FHE) to train ML data more safely against threat attacks.
CE2253 14:45-15:00	Development of An IMM Filter For Tracking Agile Drone Targets Authors: Muhammed Faruk Yilmaz, Hakan Ataman, Haluk Gozde, Muslum Cengiz Taplamacioglu and Mahir Dursun Presenter: Hakan Ataman, Muhammed Faruk Yilmaz, Gazi University, Turkey Abstract: In this study, an Interacting Multiple Model (IMM) filter algorithm is developed for tracking highly maneuverable targets such as FPV drones. Constant Velocity (CV), Coordinated Turn (CT), and Constant Acceleration (CA) motion models of targets are created in MATLAB simulation environment, and performance analyses are conducted towards classic Kalman filter, using measurements corrupted by noise. It is observed that the Kalman filter is particularly inadequate for this type of targets in the CT and CA scenarios, causing prediction deviations. To improve this situation, an IMM filter, capable of switching between different motion dynamics, is integrated into the algorithm. Comparative test results revealed that the IMMbased approach delivers superior performance with low Root Mean Square Error (RMSE) values and high tracking accuracy against highly maneuverable drones. In the next study, the developed IMM filter will be optimized and implemented for the real applications.
CE3045 15:00-15:15	An Open-Source Platform for Integrated Visualization, Analysis of Vehicle Dynamics and Driving style Authors: Jon Ander Ruiz Colmenares, Estibaliz Asua Uriarte, Óscar Mata-Carballeira Presenter: Jon Ander Ruiz Colmenares, University of the Basque Country (UPV/EHU), Spain Abstract: Analysis of modern Advanced Driver-Assistance Systems (ADAS) data is often inefficient, split across separate tools for mapping, signal plotting, and statistics. This fragmentation prevents a cohesive view of vehicle dynamics and driving style. To address this gap, this paper presents a unified, interactive dashboard in Python that unifies these critical analytical tasks. Its intuitive design makes sophisticated analysis accessible without the steep learning curve often associated with

	specialized engineering software. This open-source platform visualizes telemetry on a map for geospatial context, offers detailed time-series inspection, assesses motion sickness using the ISO 2631 standard, and scores driver performance on comfortability, safety, and fuel efficiency. The central innovation is a workflow that directly connects these performance scores to their specific root causes in time and location. This integrated design removes common analytical bottlenecks and shortens the path from raw data to meaningful insight, making it a powerful tool for research and development in the automotive field.
CE3048 15:15-15:30	Design and Implementation of a Customer-Interactive Cargo Delivery System: A Case Study from Türkiye Authors: Ali Osman Kabil, Sefa Sarı, Ümit Köse, Seda Aslan Bengül, Mustafa E. Kamaşak Presenter: Ali Osman Kabil, Yurtiçi Kargo Servisi A.Ş., Türkiye Abstract: The rapid growth of Türkiye's e-commerce sector has created a pressing need for more flexible, customer-centric, and operationally efficient last-mile delivery solutions. In response, a national logistics provider implemented an Interactive Cargo Delivery System, enabling recipients to manage their deliveries through a web-based platform accessible via short messaging system (SMS). Core functionalities include address confirmation, delivery rescheduling, and alternate drop-off options, all integrated with real-time courier tracking and geo-fenced delivery verification. Following its deployment, the system achieved a measurable 1.8\% increase in same-day delivery success and contributed to a reduction in branch return rates from 14.2\% to 11.6\%, representing an 18\% relative improvement. In 2024, over 2 million satisfaction surveys were collected, with 89.7\% of respondents reporting a positive experience. Furthermore, the system has been utilized in over 42 million shipments, with data indicating a strong preference for unattended delivery and flexible redirection options. These findings underscore the system's potential to enhance delivery performance, elevate customer satisfaction, and provide a foundation for future AI-driven personalization and optimization in logistics operations.

Onsite Session 4

Control Models and Stable Operation in Power Systems

- **Session Chair**: Mudarmeen Munlin, Mahanakorn University of Technology, Thailand
- **Time**: 14:00-16:00, September 25
- **Meeting Room**: Divan Room, B1
- **Papers**: CE1164 CE1170 CE1149 CE1167 CE3008 CE2262 CE2195 CE2244

CE1164 14:00-14:15	Trajectory Visualization in Five-Axis Machining Author: Mudarmeen Munlin Presenter: Mudarmeen Munlin, Mahanakorn University of Technology, Thailand Abstract: When the tool of a five-axis milling machine travels across the singularity position, the rotation angles jump considerably causing unexpected deviations from the prescribed trajectories. The inverse kinematics of five-axis milling machines produces large errors near singularity. The error is verified by visualizing the tool trajectories and computing the kinematic errors before and after applying several toolpath optimization techniques. It has been shown that the regions near singularities make the tool trajectories travel in a circular direction or loop which may destroy the workpiece or the tool itself. Visualizing tool trajectories prior to actual machining can significantly reduce resource consumption in five-axis operations.
CE1170 14:15-14:30	Analysis of the Operation of a Starter Generator Integrated into an Aircraft Engine Authors: Mikhail Okhotnikov, Viacheslav Vavilov and Flyur Ismagilov Presenter: Flyur Ismagilov, Federal State Budgetary Educational Institution of Higher Education, Ufa University of Science and Technology, Russian Federation Abstract: The paper analyzes the operating conditions of the integrated starter generator. Calculations are being made and the possibility of practical installation of an integrated starter generator in an aircraft engine is being considered. The minimum power level required by the integrated starter generator is determined. Using the example of the Rolls Royce integrated generator concept, the designs of an integrated starter generator and an integrated generator for placement in an aircraft engine are presented. The main conditions of its operation and the criteria determining the features of operation inside a gas turbine engine are determined. The mechanical losses and the moment created in the integrated starter generator in the presence of oil in it are considered
CE1149 14:30-14:45	Smart Microgrid Management based on Predictive Control and Demand Forecasting Authors: Danny Ochoa-Correa, Dario Benavides, Paul Arévalo, Alberto Ríos and Leonardo Torres

	Presenter: Danny Ochoa-Correa, University of Cuenca, Ecuador Abstract: Efficient management of microgrids in modern electrical systems allows for optimized use of energy resources and improved integration into the electrical system. This study presents an approach that combines predictive control with demand forecasting to anticipate variations in consumption and generation based on renewable resources such as solar, wind, and hydrokinetic energy. The predictive control model incorporates robust control based on the H∞ theory combined with the Wide Neural Network (WNN) model for demand prediction. This design provides robust SOC regulation of the storage system and accurate power balancing with disturbances in the range of ±7 kW. Data acquisition reflects its application in real-world environments in generation and demand, enabling improved adaptation in smart, operational, and adaptive microgrids. Demand prediction results were evaluated using RMSE, S-Square, MSE, and MAPE indicators. The WNN model stands out for the database studied at the research focus, with an RMSE of 0.68045 and a MAPE of 6.4%. Finally, it offers a substantial improvement in energy balance, mitigates battery strain, and ensures resilient operation for the next generation of smart grids.
CE1167 14:45-15:00	Structural Health Monitoring System and Providing Data to Control of Inteligent Building's Power Systems Authors: Yaşar Nuri Sevgen, Azer Kasimzade, Furkan Günday, Magsad Novruzov, Emin Nematli and Berna Tunc Presenter: Yaşar Nuri Sevgen, Baskent University, Turkey Abstract: Structural Health Monitoring is a process that involves the use of various sensing technologies to assess the condition of structures such as buildings and other infrastructures. The primary aim of Structural Health Monitoring is to detect changes in the performance of these structures over time and to provide data that can help ensure their safety and integrity. This study is mainly proposed six subsystem.The first subsystem consists of a structure of sensors, placed at selected points of the structure. Secondly, there is a data acquisition system to collect data from sensors. Third one is data transmission network. The fourth subcomponent is the data processing and analysis center, which is used to obtain meaningful information about the current state of the structure. Fifth, there is a decision support system designed to utilize analysis results to determine the necessary maintenance or intervention for the structure. And finally, there is a user interface that allows users to access the system, view reports, and monitor analysis results. This study also aims to send information to the structure’s electrical power system when it detects critical values from a structural stability perspective, triggering the power system to enter an emergency mode. Index Terms—structral healt monitoring, damage detection, vibration analysis, Force Balance Accelerometer, triggering the power system to enter an emergency mode.
CE3008 15:00-15:15	A Comparative Analysis of Boosting-Based Ensemble Learning Models and Stacking Ensemble Approach for Electricity Generation Forecasting in Thermal Power Plants Authors: Mahir Dursun, Betül Ersöz, Saadin Oyucu, Ahmet Aksöz Presenter: Ahmet Aksöz, Sivas Cumhuriyet University, Türkiye

	Abstract: This study was conducted to predict a thermal power plant's energy output accurately. To this end, the performance of several machine learning-based boosting algorithms was systematically evaluated. The algorithms considered include Gradient Boosting Regressor (GBR), eXtreme Gradient Boosting (XGBoost), Categorical Boosting (CatBoost), and Light Gradient Boosting Machine (LightGBM). An overarching objective was to enhance model efficacy by integrating these individual models within a stacking-based ensemble framework. According to the results obtained, LightGBM demonstrated the superior predictive performance among the individual models. However, the Stacking Ensemble method, which learned from the outputs of all constituent models, emerged as the most successful approach, exhibiting the lowest Root Mean Squared Error (RMSE: 3.3424) and the highest coefficient of determination (R^2: 0.9615). These findings suggest that integrating diverse boosting-based methodologies yields significant performance gains in time series problems, such as energy prediction.
CE2262 15:15-15:30	Reproducing Synthetic Waveforms for Metrological Studies Authors: Tezgül Coşkun Öztürk, Alexander Gallarreta, Yljon Seferi, Mehedin Arifoviç, David de La Vega, Adem Gedik, Handan Sakarya and Heiko Füser Presenter: Tezgül Coşkun Öztürk, Tübitak Ume, National Metrology Institude of Turkey, Turkey Abstract: This study presents the methodology and scripts developed to reproduce synthetic waveforms for characterization of data converters under realistic conditions. Firstly, frequency content of synthetic waveforms is extracted. Waveforms synthesized from the extracted frequency content and the predefined synthetic waveform are compared. The root mean square (RMS) of difference is presented as a metric of equality of the two waveforms. The results of this study provide information on the required sampling frequency and spectral purity of a waveform generator, when the waveforms are intended to be reproduced. The achieved results emphasize the need of using Josephson Arbitrary Waveform Synthesizer (JAWS) which is as a quantum based waveform generator. Then, the synthesized waveforms are pulse modulated to be reproduced by JAWS. The scripts are validated by biasing the JAWS system operated in a cryocooler. Power grid representative synthetic waveforms are selected for this study. Measurement setup and results presented prove that the scripts are working as intended. Achieved results map the needs of measurement equipment and clarify the methods of using Josephson Voltage standards that may be more suitable for reproducing power grid representative synthetic waveforms, and are discussed in the conclusion section.
CE2195 15:30-15:45	Novel Rotor Structure for Electric Motor Applied to Transportation Equipment Authors: Zhi Wang, Ryoichi Takahata, Junnosuke Nakatsugawa, Ryo Ueta, Sota Kimura, Yosuke Ueki Presenter: Zhi Wang, Hitachi, Ltd., Japan Abstract: Electrification of transportation equipment is growing rapidly to

	realize carbon-free society. For improving the performance of the electrified transportation equipment, an increase of the power density of the electric motors is required. One of the effective ways to increase the power density is to increase the rotation speed of the motor. However, as the rotation speed increases, ensuring centrifugal force resistance of a rotor structure becomes a critical issue. Thus, the purpose of this research is to develop a centrifugal force-resistant rotor which leads to high rotation speed. We developed a novel rotor design with a distributed fitting structure between the rotor core and the core holder, for improving centrifugal force resistance. The developed rotor was confirmed to have 10-years lifespan under the maximum rotation speed of 12000 rpm (safety factor 1.5 for the required rotation speed 8000 rpm) by applying FEM (Finite Element Method) simulation and modified Goodman curve. Furthermore, we constructed a full-scale prototype of the rotor and evaluated its strength reliability by a spin test, which revealed that no plastic deformation occurred in the test at the maximum rotation speed. Also, comparison of the strain on the surface of the rotor between the experimental and simulation results proved the prediction accuracy of the simulation model.
CE2244 15:45-16:00	Adaptive Modeling and Modular Control of Asymmetric Twelve-Phase (4×3) PMSG Authors: Ahad Fatahi, Mohamed Fouad Benkhoris, Djamel Ziane, Mohamed-Assaad Hamida Presenter: Ahad Fatahi, Nantes University, France Abstract: Multiphase machines have emerged as a promising alternative to conventional three-phase systems in high-reliability and high-performance applications, including electric propulsion and renewable energy systems. This paper presents an advanced modeling approach for twelve-phase permanent magnet synchronous generators (PMSGs) that addresses the heavy cross-coupling limitations in conventional multi-star methods. The approach extends multi-three-phase PMSM modeling to a twelve-phase (4×3-phase) configuration with sinusoidal EMF, demonstrating effective DC voltage regulation in PWM rectifier-fed DC networks. A key contribution is the seamless fault tolerance capability, where the system maintains stability under open-phase faults by dynamically reconfiguring the transformation matrix from twelve-phase to nine-phase (3×3-phase) operation through isolation of the defective winding module. The approach preserves modular control advantages using conventional three-phase converter structures while ensuring continuous operation under fault conditions, making it suitable for critical applications requiring high reliability.

Onsite Session 5

Control Models and Structural Control in Complex Systems

- **Session Chair**: Hassan Benariba, University of Tlemcen, Algeria
- **Time**: 16:30-18:15, September 25
- **Meeting Room**: Ballroom, B1
- **Papers**: CE2187 CE1146 CE1176 CE2001 CE1177 CE2026 CE2027

CE2187 16:30-16:45	Design of Adaptive Fuzzy PID Controller for Electric Vehicle System Authors: Hassan Benariba Abdelmadjid Boumediene Presenter: Hassan Benariba, University of Tlemcen, Algeria Abstract: This work is devoted to the modelling and control of an electric vehicle. A simulation model has been selected that use the PMSM motor coupled to the rear wheels propelling the vehicle via a fixed ratio gearbox. For the independent control of torque and flux, field oriented-control (FOC) is used to drive the PMSM. The Adaptive Fuzzy PID control was applied to optimize the parameters of the speed vehicle conventional PID regulator. A comparative study between conventional PID and Fuzzy PID control strategies for electric vehicles (EVs) reveals that adaptive PID controller generally offer superior performance, especially under varying operating conditions
CE1146 16:45-17:00	Enhancement of Tracking Control of a Nonlinear PD Controller for Robot Manipulators by a Neural Network Authors: Farid Ferguene and Adel Mohamed Outayeb Presenter: Farid Ferguene, U.S.T.H.B University BP n°32, Algeria Abstract: In this paper, a neural network control technique is proposed to improve the tracking performance of a robot manipulator controlled by the Nonlinear Proportional Derivative (NPD) controller in a non-model-based framework. The NPD controller is used to compensate for strong coupling effects and external disturbances by updating the proportional and derivative gains using position and velocity error measurements. Since the appropriate adaptive gain values are not sufficient to achieve high-precision trajectory tracking in the NPD mode control framework, a neural network compensator is introduced as an auxiliary controller at the trajectory level to help the gain adaptation process handle performance requirements more intelligently. Simulation studies of the Cartesian trajectory tracking of a PUMA 560 manipulator robot for its first three rotational links are carried out to confirm the control improvement by the neural network, as well as the robustness of the proposed approach in the presence of disturbances.
CE1176 17:00-17:15	Simulation and Control for Bilateral Tele Operation based on Software PSIM Authors: Hocine Khati, Hand Talem, Rabah Mellah and Mohand Achour Touat Presenter: Rabah Mellah, University of Tizi Ouzou, Algeria Abstract: The work presented in this paper was interested in the neuro-Fuzzy control of a system master - slave with feedback of force. From the

	architecture of control proposed by Lawrence, we synthesized two structures about control of tele operation position-force whose only position of the master devise is transmitted to the slave devise. Conversely, the slave devise transmits to the operator only the effort that it applies to the environment. The first structure is equipped with two controllers PI. The first controller is used in order to control the effort of the master devise and the second to control the position on the level of the slave devise. In the second structure, we replaced regulators PI of the first structure by two controllers neuro-fuzzy of structure ANFIS. A co-simulation is carried out combining Matlab/Simulink and PSIM environments in order to validate the control algorithms for the proposed tele operation system, through numerical simulation that show the performances and the robustness of the controllers proposed.
CE2001 17:15-17:30	Adaptive Sliding Mode Controller based Full Iterative Learning RBFNN for a Nonlinear Aeroelastic Model. Authors: Smain Dilmi, Tahar Rezoug, Mohand Lagha Presenter: Smain Dilmi, Blida 1 University Aeronautical Sciences Laboratory Blida, Algeria Abstract: This work presents the study of a Sliding Mode Controller combined with a Full Iterative Learning Radial Basic Function Neural Network (SMC-FILRBFNN) to mitigate flutter and limit cycle oscillations (LCOs) instabilities and foster the flight speed margin of an aeroelastic wing-section model. The model of interest describes the pitch and plunge motions actuated by leading and trailing edge control surfaces (LEC and TEC), while accounting for quasi-steady aerodynamic lift and structural stiffness nonlinearities. The strategy of the designed controller seeks to rapidly remove the instabilities and extend the flight speed range. Furthermore, the proposed method enables accurate estimation of the model's dynamics based on a gradient descent algorithm for RBFNN training. Numerical simulations demonstrate the controller's effectiveness in mitigating flutter and LCOs and greatly enhance the wing's flight motion.
CE1177 17:30-17:45	Adaptive Cooperative Fuzzy Output Feedback Control of a Quadrotor Based on Artificial Potential Field in the Presence of Obstacles Authors: Sepideh Faramarzijouya, Mehmet Berke Gür Presenter: Sepideh Faramarzijouya, Bahçeşehir University, Turkey Abstract: In this study, an adaptive fuzzy output feedback controller is applied to four quadrotors to achieve coordinated flight in environments populated with dynamic and static obsta- cles. Such coordinated flight control has significant applications, for example, in a smart manufacturing plant where autonomous drones are used for internal cargo transportation across complex layouts filled with moving machinery and static equipment. In these settings, real-time obstacle avoidance and trajectory tracking are critical for operational safety and efficiency. The proposed controller is capable of handling general nonlinear, non- affine system dynamics, and employs an adaptive fuzzy observer to estimate unmeasurable states. Furthermore, a prescribed performance function ensures that tracking errors remain within predefined bounds. One quadrotor acts as the leader following a reference trajectory, while the other three adapt their paths accordingly, all while avoiding static obstacles, moving obstacles (e.g.,

	factory workers), and each other via the artificial potential field method. Simulation results demonstrate the effectiveness of the proposed method for cooperative multi-quadrotor control in such complex, obstacle-rich environments.
CE2026 17:45-18:00	Numerical Simulation of a Fractional Timoshenko Beam Model Using High-Order Finite Difference Schemes Authors: Iqbal M. Batiha, Beghou Zineb, Dounia Belakroum, Jamal Oudetallah, Adel Ouannas, Shaher Momani Presenter: Iqbal M. Batiha, Al Zaytoonah University of Jordan, Jordan Abstract: In this paper, we present a fourth-order compact finite difference (CFD) method for numerically solving a fourth-order parabolic partial differential equation describing the transverse vibration of a fractional Timoshenko beam. A fourth-order compact scheme is employed for the spatial discretization, while a second-order Crank–Nicolson method is used for time integration. The proposed approach accurately satisfies the boundary conditions without requiring additional approximations at the boundaries and is easy to implement. The method achieves fourth-order spatial accuracy and second-order temporal accuracy using a single compact stencil. Two numerical examples are considered to assess the performance of the scheme, and the computed results are compared with available reference solutions, confirming the reliability and accuracy of the method.
CE2027 18:00-18:15	On Global Stability of Fractional Discrete-Time Degn-Harrison System Authors: Jamal Oudetallah, Amel Hioual, Adel Ouannas, Issam Bendib, Iqbal M. Batiha, Shaher Momani Presenter: Iqbal M. Batiha, Al Zaytoonah University of Jordan, Jordan Abstract: This paper investigates the fractional discrete-time Degn-Harrison reaction-diffusion model, a framework designed to study complex biochemical and ecological systems. By employing the Caputo h-difference operator, a novel discrete fractional-order formulation of the Degn-Harrison model is introduced, effectively capturing the dynamics of the original continuous system while incorporating memory-dependent interactions. The study provides a comprehensive analysis of local and global asymptotic stability, leveraging eigenvalue criteria and the Lyapunov method. Key stability conditions are derived for both diffusion-free and diffusion-inclusive scenarios, offering insights into the system's behavior under varying parameter configurations. Numerical simulations are performed to validate the theoretical findings, highlighting the significant impact of the fractional-order parameter on system stability and dynamics. These results emphasize the potential of fractional-order systems in modeling real-world processes, bridging a critical gap in the literature. The work concludes by outlining future directions, including higher-dimensional extensions and optimal control strategies, demonstrating the versatility and applicability of the proposed model.

Onsite Session 6

New Clean Energy Development and Energy Storage Technologies

- **Session Chair**: Yashasvi Bansal, IIT Delhi, India
- **Time**: 16:30-18:30, September 25
- **Meeting Room**: Maide Hall, Lobby Floor
- **Papers**: CE2265 CE2241 CE1113 CE1141 CE3006-A CE1126 CE1134 CE3185

CE2265 16:30-16:45	Enhancing DG Hosting in Renewable-Integrated Distribution Networks using Dynamic Reconfiguration Authors: Y. V. S. R. Kamal, Yashasvi Bansal and Nipun Bansal Presenter: Yashasvi Bansal, IIT Delhi, India Abstract: he increasing integration of distributed generation (DG) sources, such as solar and wind energy, into distribution net- works introduces significant operational challenges due to voltage stability, thermal limits, and radiality constraints. These chal- lenges restrict the maximum hosting capacity (MHC), defined as the maximum amount of DG that can be integrated into a power distribution network without violating operational constraints. This paper proposes a particle swarm optimization (PSO)-based framework that combines dynamic network reconfiguration and demand response (DR) to maximize MHC. The problem is formulated as a mixed integer non-linear programming (MINLP) model, accounting for non-linear voltage-dependent loads, power flows, and discrete switching actions. The stochastic nature of re- newable generation and load profiles is addressed by dynamically generating a load profile that reflects the diurnal patterns and variability. The proposed method is tested on a modified IEEE 34-bus system integrated with renewables. The results highlight improvement in MHC for high penetration scenarios. In addition to this, dynamic DR reduces peak loads through sector-specific scaling, while adaptive voltage control ensures stability through reactive power modulation. The framework offers utilities a scalable solution for renewable integration, bridging gaps in real- time DR-network coordination.
CE2241 16:45-17:00	Enhanced RBAθ Method for Uncertainty Quantification in Time Varying Dataset Authors: Purbak Sengupta and Sambeet Mishra Presenter: Sambeet Mishra, University of South-Eastern Norway, Norway Abstract: The high velocity and variability of wind power data introduce challenges in reliably detecting ramp events and quantifying uncertainty. To address this, we propose the enhanced Ramping Behavior Analysis (RBAθ) framework, which extends the original RBAθ method by introducing two adaptive thresholding strategies: a statistical inference-based threshold and a Random Forest–based Markov Chain Monte Carlo (RF–MCMC) threshold. These replace static thresholds with data-driven, uncertainty-aware mechanisms. Empirical evaluation on wind capacity factor datasets

	shows that the enhanced RBAθ -Traditional (statistical thresholding) achieves an overall performance score of 0.82, with perfect robustness (1.00) and strong balance (0.94). Compared to existing approaches, it improves consistency by 20.7% over Sliding Window Ramp Threshold (SWRT) and balance by 88.8% over Cumulative Sum (CUSUM), while enabling reliable detection of both significant and stationary ramp events. Comparative analysis further indicates that while adaptive SWRT attains the highest overall score (0.86), the enhanced RBAθ -Traditional offers greater robustness and stability, making it a more reliable solution for wind ramp event detection.
CE1113 17:00-17:15	Precision Assessment of MPP-Calculating Neural Networks Depending on Different Weather Factors Authors: Murad Al-Omary, Rashed Bani-Issa, Rafat Aljarrah, Wasseem Al-Rousan Presenter: Murad Al-Omary, German Jordanian University, Jordan Abstract: The Maximum Power Point Tracker (MPPT) is essential to collect as much solar energy as possible from solar systems of different scales. This tracker would not perform its role effectively without an acceptable calculation for the maximum power point (MPP) as its main task. The neural network technique has been trending recently for this kind of calculation. Different models for the MPP-calculating neural networks were created by changing the type and number of inputs. The level of calculations' precision would differ according to this change from one model to another. This work assesses the precision level for different MPP-calculating neural networks that specifically use weather factors as inputs for Irbid City in Jordan. The results showed that the neural network with the (Air Temperature) only as input is the network with the lowest precision, according to the 0.458 found for the correlation coefficient. In contrast, the neural network that owns the Global Irradiance (GI), Diffuse Irradiance (DI), and Zenith Angle (θ_z) as three combined inputs is the most precise one, with 0.9998 registered for a correlation coefficient.
CE1141 17:15-17:30	Impact of Electrolyte Thickness and Ionic Conductivity on the Electrochemical Performance of Solid-State Lithium Batteries: A 1D Modeling Study Authors: Ahmad Rahhal, Abdallah Berrouk, Ahmed Al Hajaj, Dirar Al Homouz Presenter: Ahmad Rahhal, Khalifa University of science and technology, UAE Abstract: Solid-state lithium batteries (SSLBs) are a promising next-generation energy storage solution due to their enhanced safety and potential for high energy density. However, the electrolyte thickness critically affects the electrochemical performance of these batteries, especially under high-rate operation. In this study, a one-dimensional, isothermal model was developed to investigate the impact of electrolyte thickness variations (5 μm, 25 μm, 45 μm, 65 μm, and 85 μm) on discharge behavior across different C-rates (1C and 2C) and ionic conductivities (0.02 S/m and 1 S/m). Simulation results demonstrate that increased electrolyte thickness leads to higher ohmic polarization, faster voltage decay, and reduced delivered capacity, particularly under fast discharge conditions.

	Furthermore, higher ionic conductivity effectively mitigates these losses, enabling thicker designs without severe performance penalties. These results provide important insights into the design optimization of solid-state battery architectures, highlighting the trade-off between mechanical robustness and electrochemical efficiency.
CE3006-A 17:30-17:45	Evaluation of Electroluminescence Performance of LEEC Based on Carbazole Derivative Authors: Sohrab Nasiri, Juozas Padgurskas, Raimundas Rukuiza Presenter: Sohrab Nasiri, Vytautas Magnus University, Lithuania Abstract: This study reports the design and synthesis of a carbazole-based molecular donor–acceptor–phenyl–donor′ (D–A–Ph–D’) architecture tailored for application in light-emitting electrochemical cells (LEECs). A thermally activated delayed fluorescence (TADF) emitter, derived from a carbazole scaffold was obtained by a coupling strategy. A reduced singlet–triplet energy gap (ΔEST = 0.07 eV), allowing efficient reverse intersystem crossing (RISC). The integration of this luminophore into LEEC devices resulted in a responsive electroluminescence (EL) behavior, in which the EL spectra exhibited green color, accompanied by an increase in external quantum efficiency (EQE) to 2.07%. Moreover, the incorporation of the ionic iridium complex Bis[2-(4-tert-butylphenyl) quinolinato-N, C]iridium(III) [4-(3,5-dimethyl-1H-pyrazol-1-yl) pyridine] hexafluorophosphate [Ir(buoppy)2(dmapzpy)] PF6 as a ionic host significantly improved the device performance, leading to a remarkable increase in luminosity. These results emphasize the synergistic role of TADF emitters and iridium-based hosts in improving the efficiency and adaptability of LEEC technology.
CE1126 17:45-18:00	Modelling of a Solid Oxide Electrolyzer Cell and Its Balance of Plant System Authors: Cemil Şen, Emir Oğuz, Levent Yüksel Presenter: Levent Yüksel, AVL, Turkey Abstract: The global demand for energy is steadily increasing, and achieving net-zero emissions by 2050 to limit the rise in global temperatures to 1.5°C is a major challenge for the energy sector. Transitioning to renewable energy sources is essential to meet this goal. While electrification is expected to grow significantly, the challenge of electricity storage has become more critical. Moreover, industries such as steel, cement, chemicals, and fertilizers will be particularly difficult to electrify. For applications requiring large amounts of energy, batteries alone may not be sufficient for storage and transportation. Heavy-duty transport, shipping, and aviation, in particular, need fuels in liquid or gaseous forms, as the weight of batteries makes them impractical for these uses. Given these challenges, hydrogen emerges as a crucial solution with the potential to substantially reduce emissions and facilitate the shift towards cleaner energy systems. Furthermore, it is essential to produce hydrogen in a sustainable manner. Among the various methods for generating green hydrogen using renewable energy, water electrolysis is proving to be the most effective and is gaining considerable market attention. Various water electrolysis technologies have been developed over the years, but Solid Oxide Electrolyzer Cell (SOEC) stands out as particularly well-suited for advancing this technology due to its exceptional energy efficiency. This paper focuses on modelling of a SOEC system and its balance of plant components,

	employing mathematical equations to specifically address the air, fuel, and electrical aspects. Keywords— clean energy, hydrogen, solid oxide electrolyzer cell, modelling
CE1134 18:00-18:15	A Study on Optimal Hydrogen Supply for Combined Cycle Power Plants through an Expert Survey Authors: Da Hee Kim, Min Chul Lee Presenter: Da Hee Kim, Incheon National University, Republic of Korea Abstract: This study analyzed four hydrogen transportation methods from supply sources to combined cycle power plants and conducted a comparative analysis through expert surveys. The results showed supplying hydrogen through gas pipelines at a pressure exceeding the gas turbine requirements (Case 2) as the most advantageous approach in terms of stability of supply, economic effectiveness (long-term use), convenience of administrative control, and space occupancy. Although this method has the drawback of high initial investment costs, it demonstrates the potential to offset these through long-term operational efficiency and reliability. Furthermore, for the successful implementation of Case 2, additional measures such as technical standard, comprehensive safety, and public acceptance are required. Adopting this approach is expected to enable the establishment of a stable and sustainable hydrogen energy supply chain.
CE3185 18:15-18:30	Evaluating Gravity Energy Storage Potential in Çoruh Valley and Recommendation for Future Applications Authors: A. O. Kucuk, M. C. Taplamacioglu, M. Dursun Presenter: Ali Osman KUCUK, Artvin Coruh University, Türkiye Abstract: In this study, the major dams in the Çoruh Valley one of Turkey's key hydropower production regions (Deriner, Borçka, Muratlı) are analyzed from a multidimensional perspective in terms of gravity-based energy storage (GES) integration. The dams' topographical features, surrounding land use, existing transportation and energy infrastructure, and geotechnical suitability are examined. As part of the modeling process, potential energy calculations are conducted for each dam, and energy storage capacity scenarios are developed based on varying mass module weights, lifting heights, and system installation densities. The analysis results indicate that Deriner Dam is the most suitable pilot site for a GES system, owing to its significant elevation difference (249 m), expansive and suitably sloped surrounding terrain, and well-established road connections. In contrast, Borçka and Muratlı Dams offer lower potential capacity due to their limited elevation differences and terrain slope. The obtained results demonstrate that gravity-based energy storage systems are technically feasible in the Çoruh Valley and can provide a cost-effective solution in the long term. In this context, the study offers a pioneering assessment for the deployment of gravity-based energy storage technologies in Turkey, contributing strategically to integrated renewable energy systems and flexible grid solutions.

Onsite Session 7

Photovoltaic Panels and Power Generation Systems

- **Session Chair**: Sameer Al-Dahidi, German Jordanian University Amman, Jordan
- **Time**: 16:30-18:30, September 25
- **Meeting Room**: Fatih Room, B1
- **Papers**: CE3184 CE1125-A CE1133 CE1162-A CE1178 CE3176 CE2209 CE2257

CE3184 16:30-16:45	Sensitivity Analysis in Predicting Photovoltaic Systems Performance Utilizing Random Forest Authors: Sameer Al-Dahidi, Bashar Hammad and Mohammad Al-Abed Presenter: Sameer Al-Dahidi, German Jordanian University Amman, Jordan Abstract: This study systematically investigates the sensitivity of the Random Forest (RF) model to training dataset size in predicting photovoltaic (PV) system performance, a critical factor for smart grid stability and reliability. Using comprehensive operational data, including dust accumulation and ambient temperature, from a 7.98 kW grid-connected PV system in Jordan, the impact of varying training fractions on model accuracy, Coefficient of Determination (R2), Adjusted R2, and Mean Square Error (MSE) is assessed rigorously. Through Bayesian Optimization for hyperparameter tuning and multiple replicates, the findings consistently demonstrate that larger training datasets yield superior predictive performance and enhanced model stability. An optimal training fraction of 70% was identified, achieving high R2 and low MSE in addition to minimum computational time. While the prediction accuracy exhibited remarkable robustness even with reduced data, significant degradation in other metrics and increased variability were observed with training fractions below 30%. This research underscores the paramount importance of judicious training data selection for developing robust and reliable RF-based PV forecasting models, thereby facilitating more effective renewable energy integration.
CE1125-A 16:45-17:00	Optimizing Operational Conditions for Hybrid Photovoltaic-Thermal Systems: A Novel MEPT Approach Authors: Mehdi Ouada, Nadir Benamira, Chouaib Rahli and Nabil Talbi, Presenter: Mehdi OUADA, Annaba University, Algeria Abstract: This paper introduces a novel control concept for hybrid photovoltaic-thermal (PV/T) systems: the Maximum Exergy Point Tracker (MEPT). The MEPT optimizes the operational conditions of PV/T systems by evaluating their exergetic and energetic performance to determine the maximum photovoltaic cell temperature that ensures at least the same exergy output as standalone photovoltaic systems. This approach is critical for the efficient design and operation of cogeneration plants, particularly in applications such as cooling, desalination, and heating, where thermal

	energy utilization is essential. The study investigates two scenarios—operation without solar concentration and with low solar concentration—using numerical simulations to analyze the effects of reference efficiency, temperature coefficients, and solar irradiance on system performance. Results reveal that operation with concentration significantly enhances both energetic and exergetic efficiencies while increasing the maximum operating temperature of the photovoltaic cell. For applications like adsorption cooling or membrane distillation, optimal cell parameters are identified based on reference efficiency and temperature coefficients. The findings demonstrate that low-efficiency cells with minimal temperature sensitivity are better suited for hybrid systems operating within the 60–90°C range. Furthermore, high-concentration systems enable higher operating temperatures but require careful selection of cell characteristics to avoid performance degradation. This study provides actionable insights into selecting appropriate photovoltaic cells for specific applications, advancing the optimization of hybrid PV/T systems for sustainable energy solutions
CE1133 17:00-17:15	MATLAB Simulink Dynamic Photovoltaic Model Interface Development Authors: Emre Sahin, Yaprak Yalcin, Gulcihan Ozdemir Presenter: Emre Sahin, Istanbul Technical University, Turkey Abstract: Photovoltaic systems are generally modeled with a single diode circuit model. However, the single diode circuit model cannot give correct results under dynamic operating conditions due to the capacitance element in the photovoltaic cell and dynamic effects such as connection cables that may cause inductive effects. In literature, for dynamic operating conditions, single diode models including dynamic effects developed by modeling the system with circuit equations or by modeling the system with circuit elements found in readymade programs such as MATLAB. Models established with circuit equations often fail to integrate successfully with readymade circuit elements, such as resistance, capacitance, and diodes, found in simulation programs like MATLAB. Using only circuit equations in modeling does not allow us to benefit from the functions of a powerful modeling program, such as MATLAB. In this study, both readymade circuit elements and a newly developed photovoltaic cell model are used and simulated together as a whole by solving the circuit equations simultaneously. The parasitic junction and diffusion capacitance elements in the cell were modeled using the variable capacitance element in the MATLAB Simulink environment and simulated with the help of physical solvers. The instantaneous capacitance values of the capacitance element were determined by solving the model equations and given as input to the variable capacitance element. Thus, both the system can be analyzed dynamically with all its aspects using the model equations and ease of use is provided with the available circuit interfaces.
CE1162-A 17:15-17:30	Dynamic Photovoltaic Array Reconfiguration under Partial Shading Conditions: A Reinforcement Learning Approach Authors: Suthida Namueangrak, Rongrit Chatthaworn Presenter: Suthida Namueangrak, Khon Kaen University, Thailand Abstract: Partial Shading Conditions (PSCs) are a significant issue in Photovoltaic (PV) Array systems that can greatly reduce power output. To address PSCs, PV modules can be dynamically reconfigured using

	switches controlled by stateof-the-art algorithms, such as metaheuristic algorithms. However, metaheuristic algorithms often struggle to provide optimal reconfiguration solutions under real-time variations in solar irradiance due to their re-optimization requirements and high computational time. To this end, this study proposes a novel dynamic Photovoltaic Array Reconfiguration strategy optimized by an intelligent approach based on Deep Reinforcement Learning (DRL). Leveraging the adaptability of DRL, the proposed method can provide optimal reconfiguration solutions in real-time to maximize power output, overcoming the limitations of traditional algorithms that require higher computational time. A 2×2 PV array structure (4 panels) with 14 switches is designed as an environment for training and testing the DRL agent. The performance of the proposed DRLbased reconfiguration is compared with conventional static configurations including Series, Parallel, and Series-Parallel (SP). This strategy will be able to enhance PV system intelligence and flexibility, contributing to more efficient and sustainable renewable energy solutions.
CE1178 17:30-17:45	Low-Cost Sun Vector Estimation-Least Squares Optimization in Polyhedral Photodiode Arrays Authors: Sabire Betül Çınar, Ramazan Yeniçeri Presenter: Sabire Betül Çınar, Istanbul Technical University, Aerospace Research Center (ARC), Turkey Abstract: Accurate and robust estimation of the Sun's direction is a critical requirement for attitude determination systems in small-scale aerospace platforms such as UAVs and CubeSats. This paper presents a low-cost Sun sensor design based on discrete photodiodes arranged over symmetric polyhedral geometries—specifically, the icosahedron and the truncated icosahedron. A simulation framework has been developed in MATLAB to evaluate Sun vector estimation using a least-squares method, incorporating realistic photodiode characteristics and system noise. Two sensor configurations, using 12 and 20 photodiodes respectively, are tested and compared in terms of accuracy, coverage, and a proposed optimization metric that quantifies performance per sensor. Monte Carlo simulations revealed that while the icosahedron configuration offers marginally higher efficiency, it suffers from larger worst-case errors. In contrast, the truncated icosahedron maintains bounded errors below 2°, providing more reliable performance across the entire field of view. The results highlight a practical trade-off between average efficiency and robustness in geometric sensor deployment for Sun sensing applications.
CE3176 17:45-18:00	Passive cooling of PV panels using thermal radiation Authors: Salah-Eddine Bensalem, Nasreddine Belhaouas, Hichem Hafdaoui and Linda Hassaine Presenter: Salah-Eddine Bensalem, CDER, Algeria Abstract: The paper discusses a promising solution to address the harmful impact of rising temperature on photovoltaic (PV) devices. The approach consists to use selective materials that strongly emit thermal radiation within the transparency windows of the Earth's atmosphere (electromagnetic wavelengths of 8-13 µm and 16-26 µm) as cooling layers. By integrating these radiative coolers appropriately into solar cells, one can get a suitable design for a passive cooling process. Relying on an elaborated numerical

	model of the system, the scheme is examined under Algerian climatic conditions. The obtained results show the remarkable influence of radiative cooling on the energy performance of silicon-based solar cells. Especially, the radiative layer significantly contributes to lowering the operating temperature and enhancing the output power of the device.
CE2209 18:00-18:15	Study of a 100 kW Photovoltaic System Using the Sandia Array Performance Model (SAPM): Experimental Validation and Results Analysis Authors: Hemza MEDOUKALI, Farid Hadjrioua, Antar Beddar, Djelloul Djafer, Khelifi Reski Presenter: MEDOUKALI Hemza, Université de Ghardaia Laboratoire d'Etudes et Développement des Matériaux Semi-Conducteurs et diélectriques, Algérie Abstract: This paper presents a comprehensive modeling and simulation study of a 100 kW photovoltaic (PV) system using the Sandia Array Performance Model (SAPM). The simulation incorporates real-world data, including solar irradiance, ambient temperature, and measured DC/AC electrical quantities. SAPM, an empirical model developed for predicting PV array output, is employed to estimate DC power as a function of environmental variables. The simulation results are evaluated against experimental field measurements to assess the model's predictive accuracy. The study demonstrates a strong correlation between measured and simulated outputs, with a mean power error of just 42.12 W. Further statistical validation using RMSE and MAPE confirms the reliability of the SAPM under real-world operating conditions, particularly for high-power PV systems deployed in harsh climates. These results provide critical insights into performance modeling and highlight environmental and system-level factors influencing energy yield. Ultimately, the findings contribute to the broader effort of optimizing large-scale PV systems through robust empirical modeling.
CE2257 18:15-18:30	Energy Management in Hybrid Solar PV Systems Using Artificial Neural Network-Based Controllers Authors: Amira Albarsha, Mohamed Almaktar, Ibrahim Seah, Zakariya Rajab Presenter: Zakariya Rajab, Benghazi University, Libya Abstract: Due to persistent electricity shortages and frequent outages in Libya, this research investigates the integration of a hybrid solar photovoltaic (PV) and grid-connected power solution for the Venice Dental Clinic (VDC), a healthcare facility located in Benghazi. The primary objective is to ensure a reliable energy supply, reduce reliance on fossil fuels, and promote sustainability. PVsyst software is used for precise solar system design and sizing, while MATLAB/Simulink is employed to implement and simulate an Artificial Neural Network (ANN)-based energy management controller. Results show that activation function selection significantly influences model accuracy. Using the Tanh function, the optimal network configuration involves two hidden layers with three neurons each, achieving a Mean Squared Error (MSE) of 0.5718. By contrast, the ReLU function improves model performance, with a three-layer configuration (10, 8, and 5 neurons) producing a lower MSE of 0.3937. These findings demonstrate the effectiveness of ANN in making real-time

	energy distribution decisions under variable operating conditions. The optimized system is capable of meeting up to 85% of the clinic's energy demand, reducing annual electricity costs by approximately 40%, and lowering carbon emissions substantially. This work not only validates the feasibility of intelligent hybrid systems in healthcare but also establishes VDC as a replicable case study model for wider application across both public and private institutions in Libya and b

Onsite Session 8

Wireless Communication Systems and Security Analysis

- **Session Chair**: Ahmet Aksöz, Sivas Cumhuriyet University, Türkiye
- **Time**: 16:30-17:45, September 25
- **Meeting Room**: Divan Room, B1
- **Papers**: CE3007 CE3003 CE2249 CE3179 CE3180

CE3007 16:30-16:45	Wireless Communication Technologies for Microgrid Applications: A Case Study in a Rural Village Authors: Mahir Dursun, Ahmet Aksöz, Alper Görgün Presenter: Ahmet Aksöz, Sivas Cumhuriyet University, Türkiye Abstract: In today's rapidly evolving world, wireless communication technologies have quickly adapted to emerging innovations and become an indispensable part of our daily lives. These technologies—thanks to their mobility, flexibility, and accessibility—continue to revolutionize many aspects of both personal and professional domains by enhancing efficiency, simplifying communication, and unlocking new opportunities. Their growing importance is undeniable. In the context of smart grids and microgrids, the integration of wireless communication technologies plays a vital role in enabling secure and reliable data exchange—both in centralized and distributed energy management strategies. In microgrid systems, wireless technologies facilitate seamless coordination between energy generation, storage, and consumption units, thereby ensuring efficient control and stable operation. This study presents a comparative analysis of the wireless communication technologies used in microgrids, highlighting their areas of application. In addition, a case study is conducted for a microgrid designed specifically for a rural village, providing practical insight into real-world implementation.
CE3003 16:45-17:00	Rule-Based Route Cause Analysis of Site Outages in Mobile Networks: A Deterministic Approach for Alarm Correlation Authors: Serkan Karadag, Aydin Duruoz, Mehmet Balci, Melih Bilir, Koray Uygun, Ayse Guvez, Eda Konakyeri Arici, Arzu Kuru Sahin Presenter: M. Cengiz Taplamacıoğlu, Turkcell Communication Services Inc., Turkey Abstract: In telecommunication networks, the prompt identification of outage causes at sites significantly improves the efficiency of site operations and enhances service continuity. This paper presents a rule-based system designed to determine root causes of site outages by evaluating historical and real-time network alarms. Developed and deployed in a national mobile operator's environment, the system eliminates redundant site visits, improves repair efficiency, and enables faster response by directing the right site team with the necessary equipment. Unlike machine learning methods, the approach leverages deterministic logic derived from expert defined rules, ensuring traceability and rapid deployment. Site implementation results demonstrate reduced Mean Time to Repair (MTTR),

	increased operational accuracy, and a measurable improvement in customer satisfaction.
CE2249 17:00-17:15	Multi-Constellation GNSS Receiver Design and Implementation with Simulink Authors: Mehmet Aytaç Arıkan, Ramazan Yeniçeri Presenter: Mehmet Aytaç Arıkan, Istanbul Technical University Aerospace Research Center, Turkey Abstract: This paper presents a Simulink-based GNSS receiver that extends the GPS L1 C/A processing capabilities of the SoftGNSS MATLAB code by integrating support for both GPS L1 C/A and Galileo E1 signals. Unlike script-based MATLAB receivers such as FGI-GSRx, the proposed design is modular, highly configurable, and optimized for future hardware implementation through High-Level Synthesis and HDL code generation. By combining signals from multiple constellations, the receiver enhances navigation accuracy and provides position, velocity, and time solutions. The Simulink environment enables intuitive visual prototyping and simplifies customization, making this platform suitable for GNSS research and embedded system development.
CE3179 17:15-17:30	RedCap for Rural Areas: Olive Tree Agriculture Use Case Authors: Mehmet İzzet Sağlam, Muzaffer Kerem Savran, İlker Bilik Presenter: İlker Bilik, Turkcell Teknoloji, Turkey Abstract: The 5th generation (5G) wireless technology has primarily been developed to support three key pillars of use cases: enhanced mobile broadband, ultra-reliable low-latency commu- nication, and massive machine-type communication. These three 5G pillars have significantly different requirements regarding data rate, latency, connection density, and energy consumption. Implementing a use case within one of these pillars can be challenging, especially in rural areas. Fulfilling the need for con- tinuous service and adaptive response capabilities for sustainable agriculture falls between these three pillars. The 3rd generation partnership project has developed a mid-range use case with a new device type, enabling reduced capability (RedCap) new radio (NR) devices that target lower costs and complexity, smaller physical size, and longer battery life compared to regular 5G NR devices. This paper represents one of the first contributions to the simultaneous deployment of 5G RedCap NR and enhanced machine-type communication networks in rural areas.
CE3180 17:30-17:45	An Enhanced Paging Method for Store-and-Forward Internet of Things Non-Terrestrial Networks Author: Mehmet İzzet Sağlam Presenter: Mehmet İzzet Sağlam, Turkcell Teknoloji, Turkey Abstract: The Internet of Things Non-Terrestrial Network (IoT-NTN) has been specified since the 3rd Generation Partner- ship Project (3GPP) Release 17. IoT-NTN covers NarrowBand IoT (NB-IoT) and enhanced Machine Type Communication (eMTC), also named Long Term Evaluation for Machines (LTE- M) technologies. IoT-NTN has been further optimized in Release 18, and commercial deployments of Release 17 are ongoing. Based on the real deployment or deployment plans, IoT-NTN services can be provided to areas visited by the satellites without needing NTN gateway

	infrastructure. Delay-tolerant and non-real-time IoT-NTN services are given by sparse Low Earth Orbit (LEO) constellations and reduced ground segment infrastructure for cost-effective reasons. Store and Forward (S&F) can address all these challenges and increase the reliability and efficiency of communication networks in IoT-NTN Release 19 scenarios. This paper investigates the impact of the S&F-enabled radio access network on the paging and its potential solutions for 3GPP Release 19.

Onsite Session 9

Electronic Device Design and Simulation Analysis

- **Session Chair**: Ahmed Reda Mohamed, KFUPM, Saudi Arabia
- **Time**: 09:00- 10:45, September 26
- **Meeting Room**: Maide Hall, Lobby Floor
- **Papers**: CE1110 CE1148 CE1158 CE1161 CE1145-A CE1172 CE2201

CE1110 09:00-09:15	A Review on Design, Analysis, and Application of Conformal Antennas for Capsule Endoscope Authors: Lida Kouhalvandi, Ladislau Matekovits, Sercan Aygun, Ildiko Peter, Serdar Ozoguz, Saeid Karamzadeh Presenter: Lida Kouhalvandi, Dogus University, Turkey Abstract: For human healthcare applications, radio frequency sensors that can be used inside the body are developing day by day. In this kind of sensor, an implantable antenna in a capsule endoscopy system is executed leading to communication with external equipment. For this case, these implantable circuits are growing famous in the biotelemetry field for which large bandwidth, and high gain, with compact configurations, are required in the lossy human tissue. This work presents the various state-of-the-art conformal antennas for capsule endoscopes, with a focus on introducing structures and outcomes achieved from the simulation/measurement process. As this paper is reporting the recent developments in the domain of capsule endoscopy, anyone reading this work will get general and up-to-date views regarding this concept.
CE1148 09:15-09:30	Effects of Anodization Parameters and RTP Conditions on the Band Gap and Photoluminescence Performance of Porous Silicon Authors: Safiye Karaçam, Melike Çalık, İlyas Aktaş, Meltem Gör Bölen, Tevhit Karacalı Presenter: Safiye Karaçam, Erzurum Technical University, Turkey Abstract: This study explores the influence of anodization and rapid thermal processing (RTP) parameters on band gap and optical properties of porous silicon (PSi). PSi samples were produced by electrochemical anodization of p-type boron-doped silicon wafers at different current densities (2,3 and 4 mA/cm²) and for various durations (20– 30 min). Then, RTP was performed at different temperatures (400 °C and 600 °C) for 1 min in an oxygen atmosphere. The photoluminescence (PL) performance of the samples was evaluated between 1.95 and 2.09 eV. These findings align with literature reports and demonstrate the critical role of controlled anodization and RTP conditions in tailoring PSi properties for optoelectronic applications.
CE1158 09:30-09:45	EEG Band Power Feature Based Electrode Combination Analysis for Epilepsy Detection Authors: Serhat İsmet Sargın, Aysa Jafarifarmand Presenter: Serhat İsmet Sargın, Istanbul University, Turkey

	Abstract: Epilepsy is a chronic neurological disorder characterised by seizures caused by abnormal electrical activity in the brain. Today, the diagnosis of epilepsy is largely based on the analysis of electroencephalogram (EEG) signals. However, the nonlinear and chaotic nature of EEG signals makes visual inspection a time-consuming, labour-intensive, and specialised process. In this context, this study proposes a computer-aided diagnostic method that aims to analyse EEG signals more efficiently. Within the scope of the study, power values belonging to different frequency bands were obtained from EEG signals collected from 121 participants through 35 electrodes. In determining the electrode combinations, the individual classification performance of each electrode was analysed, the electrode with the highest performance was selected and combined with the other electrodes in the vector space, thus creating effective electrode combinations. The resulting feature vectors were presented as input to the decision tree classifier, and the model's performance was evaluated with metrics such as accuracy, F1 score, sensitivity, and specificity.
CE1161 09:45-10:00	Development of a wearable and Embedded Multi-Sensor Solution for Real-Time Surface Electromyography and Motion Signal Acquisition Authors: Stefano Marocco, Giulio Saroglia, Shasa Nicoloso, Hajer Gammoudi, Inès Chihi, Igor Stefanini Presenter: Stefano Marocco, University of Applied Sciences and Arts of Southern Switzerland, Switzerland Abstract: The precise monitoring of human movements has become essential in different fields such as biomechanics, rehabilitation and sports sciences. In this field Surface Electromyography (sEMG) and Inertial Measurement Units (IMUs) offers comprehensive insights into neuromuscular activity and body kinematics, providing objective data for theese applications. This paper propose the design and development of a wearable hardware platform that allows to acquire sEMG and kinetic signals. The system is based on a custom-designed Printed Circuit Board (PCB) allowing real time data acquisition from single channel sEMG and IMU sensors, including accelerometers, gyroscopes and magnetometers on three axis. Experimental validation confirmed system reliability in capturing muscle activity and motion data, with high signal fidelity and low error in comparison with literature studies and commercial references.
CE1145-A 10:00-10:15	Design of an Efficient SRAM Bit Cell for In-Memory Computing Authors: Changki Hong and Jeongbeom Kim Presenter: Jeong Beom Kim, Kangwon National University, South Korea Abstract: SRAM-based in-memory computing is a promising solution to overcome the limitations of the von Neumann architecture. Efficient SRAM bit cell design is crucial for effective implementation. This paper introduces a novel 8+T SRAM design for low-power differential sensing, enhancing circuit performance and reducing power consumption. The proposed 8+T SRAM bit cells enable parallel logic operations, such as ripple-carry adders and content-addressable memory (CAM) functions. Compared to previous research, our design offers a 21.25% power consumption reduction for the 8+T SRAM-based ripple carry adder, despite a 10.98% increase in propagation delay. Moreover, the power-

	delay product (PDP) for this adder is reduced by 12.63%. For CAM, our approach decreases energy consumption by 7.06% compared to previous work. The feasibility of the proposed circuit was validated through SPECTRE simulations using the TSMC 65nm CMOS process.
CE1172 10:15-10:30	Exploring Fault-Tolerance in RISC-V Architectures Authors: Mustafa Ensar Iskin, Berna Ors Yalcin, Ayse Yılmazer Presenter: Mustafa Ensar Iskin, Istanbul Technical University, Turkey Abstract: Fault tolerance is a critical aspect of modern electronic systems, particularly in environments like space, aviation, and automotive, where reliability is paramount. This paper examines the fault tolerance approaches in RISC-V architectures. Techniques such as spatial, temporal, and information redundancy are reviewed, with a focus on their integration into RISC-V-based systems. Comparative analysis of single-core and multi-core redundancy, including modular and heterogeneous approaches, demonstrates their impact on performance, energy efficiency, and cost. Testing methods ranging from simulation to real-world radiation exposure are evaluated. Finally, insights into future research opportunities are presented to guide the development of more robust and efficient fault-tolerant systems.
CE2201 10:30-10:45	Design of Transpose Convolution Layer on FPGA Authors: Jong Youn Lee, Jeong Yun Seo, Harim Lee, Yong Hwan Lee Presenter: Jong Youn Lee, Kumoh National University of Technology, South Korea Abstract: With the rapid development of deep learning, transposed convolution has become important for tasks like image generation and resolution enhancement. However, it is hard to implement in hardware because one input affects multiple outputs, often with overlaps, and the kernel moves in a reverse direction compared to standard convolution. In this study, we designed a transposed convolution module using Verilog HDL, built with a modular and parallel structure. We implemented it on an FPGA and used advanced extensible interface to connect the Processing System and Programmable Logic. The hard-ware showed faster processing than software, especially as the clock frequency increased. This result shows the potential of hardware-based transposed convolution for building faster deep learning systems.

Onsite Session 10

Fault Location and Safety Detection in Modern Intelligent Power Systems

- **Session Chair**:
- **Time**: 09:00- 10:45, September 26
- **Meeting Room**: Fatih Room, B1
- **Papers**: CE2202 CE1147-A CE1107 CE2199 CE3004 CE2259 CE1144

CE2202 09:00-09:15	Optimization of Design Conditions of Crude Oil Transportation Systems through Pipelines Author: Ahmad Saleh Presenter: Ahmad Saleh, Zarqa University, Jordan Abstract: In this study, thermal analysis of crude oil transportation systems through pipelines was performed. This transportation method is the most widely used due to its low cost compared to other methods. This work aims to find the optimal design conditions that ensure minimum cost and allow continuous and steady flow conditions. Simulations were performed based on the capabilities of SIMSCAPE/MATLAB platform. It was found that it is possible to find the insulation layer thickness that makes the temperature change between the inlet and outlet of the pipeline minimal, not exceeding 0.001 K over a length of 1000 m. When three values of thermal conductivity were chosen for three insulating materials, namely 0.028, 0.039, and 0.045 W/m.K, the corresponding optimal thicknesses of the insulation layer were 10.1, 10.9, and 11.3 cm, respectively. It was also found that by making the inlet temperature take 323, 333, and 343 K values, the corresponding optimal values of the insulation layer thickness were 10, 10.8, and 11.2 cm, respectively. The optimum thickness of the insulation layer was almost unaffected by the depth of the pipeline below the ground. The results showed that SIMSCAPE/MATLAB platform is an effective simulation tool that allows a comprehensive analysis of oil pipeline transportation systems leading to the optimum design conditions.
CE1147-A 09:15-09:30	Diagnosis of Mechanical Unbalance in Induction Motors Using Stator Current DWT Analysis Authors: Nadir Benamira, Mehdi Ouada, Azzeddine Dekhane, Samir Kerfali and Mounira Djemai Presenter: Nadir Benamira, Annaba University, Algeria Abstract: Many sectors use induction motors (IM) because of their dependability and efficiency. However, their consistent use can lead to different types of faults affecting many motor components. Among these faults is rotor mass unbalance, often caused by rotor wear, material deposition, or manufacturing flaws. This defect causes vibrations, reduces the motor's service life and accelerates bearing wear. By means of the Discrete Wavelet Transform (DWT), this paper aims primarily to detect rotor mass unbalance in induction motors through stator current signals.

	Previous laboratory test data form the basis of the investigation. Although historical, the data remain effective for evaluating signal processing methods. Examining the DWT and extracting pertinent features helps identify the problem. Under mass unbalance, a noticeable change in energy is observed compared to the normal state, allowing the distinction between faulty and normal operating circumstances.
CE1107 09:30-09:45	SPD Response to the Neutral-to-Earth Transient in Low Voltage System Authors: Aiza Abdul Adzis, Hamzah Ismail and Noor Azlinda Ahmad Presenter: Aiza Abdul Adzis, Public Works Department of Malaysia, Malaysia Abstract: This paper presents a study to analyze the response of a Surge Protective Device (SPD) under the presence of neutral-to-earth transient. The purpose of this study is to observe the characteristics and the capability of the SPD to divert impulses that occur in low voltage (LV) system. In contrast to the lightning transient that is usually of high magnitude impulses ranging from 6 kV and above, the neutral-to-earth transient is a low magnitude impulse with variety of voltages recorded at 2.17 V, 165.1 V, 183.54 V and 255 V. A study shows that voltage greater than 160 V can cause nuisance tripping of the Residual Current Device (RCD). On top of that it can cause malfunction towards sensitive load/equipment. Unlike lightning transient, that is a byproduct of the natural phenomena, neutral-to-earth transient can be generated internally and found to be contributed mainly by load switching activities. Yet, this kind of disturbance is less considered although the probability of the occurrence can be more frequent than the natural phenomena disturbances. In this study, a typical SPD circuit is constructed using Microcap software and simulated by applying 6 kV 1.2/50 µs lightning transient and 250 V 1.2/20 ms neutral-to-earth transient. The results indicated that the SPD shows no response to the neutral-to-earth transient where no transient is limited by the SPD. While for the lightning transient, the SPD response successfully by limiting the transient from 6 kV to 1 kV. The information in this paper can be used to decide suitable alternative mode of protection to implement when it comes to protecting highly sensitive equipment and when nuisance tripping cannot be acceptable.
CE2199 09:45-10:00	Improvement of Distribution Feeder Fault Locating in the Presence of Soft Open Point Authors: Seyedamin Hosseini, Ehsan Hajipour and Esmaeil Anani Presenter: Seyedamin Hosseini, Sharif University of Technology, Iran Abstract: Distribution networks (DNs) are usually designed in a ring configuration but operate radially. In a typical structure, normally open points (NOs) are used to create alternative paths and supply un-faulted loads after fault clearance. A soft open point (SOP) is a power electronic device that can enhance DN performance under normal and fault conditions. However, its impact on protection algorithms has been less considered in the literature. So far, a few methods have been suggested to detect fault type and estimate fault location in the presence of SOP; however, those methods have poor performance when fault resistance is not neglected and are not effective for ungrounded DNs as well. In this paper, a new method is proposed to overcome these obstacles that

	significantly improves fault locating and protection performance.
CE3004 10:00-10:15	External Alarm Definition Prediction and Automatic Correction: A Levenshtein Algorithm-Based Approach Authors: Buğra Berik, Aydın Çetin, Erdem Yıldız, Okan Gürüz, Arzu Kuru Şahin, Eda Konakyeri Arıcı, Sinan Yiğit Presenter: ARZU KURU ŞAHİN, Turkcell Communication Services Inc., Turkey Abstract: External alarms in mobile telecommunications networks play a critical role in operational efficiency and fault response coordination. However, when these alarms are manually defined using free-text input, they are prone to typographical errors and inconsistent naming conventions. Such discrepancies prevent proper integration with centralized fault management systems and can delay work order generation. This study proposes a deterministic, automated correction system using the Levenshtein distance algorithm to identify and rectify spelling inconsistencies in alarm labels. When a similarity threshold of 50% is met, the system corrects the alarm text, updates it via Network Management System (NMS) and ensures that the corrected alarm is visible in the management system without requiring manual intervention. The solution currently corrects an average of 132 alarms per month, significantly improving Mean Time to Repair (MTTR), alarm data integrity, and customer satisfaction.
CE2259 10:15-10:30	Proof-of-concept of a QKD-secured distributed measurement system Authors: Fabrizio Lo Regio, Matteo D'Ilorio, Leopoldo Angrisani, Ciro Bruscino, Pasquale Ercolano, Mauro D'Arco, Angelo Giuliana, Loredana Parlato, Martina Peluso, Giovanni Piero Pepe Presenter: Fabrizio Lo Regio, University of Naples Federico II, Italy Abstract: This paper presents the design, implementation, and validation of a distributed measurement system secured by Quantum Key Distribution (QKD). Based on a client-server architecture, the system allows a client, connected to a node of a network, to encrypt and send instructions to a remote server for controlling automatic test equipment. The proposed architecture was designed to ensure secure real-time data exchange by leveraging both quantum and classical communication channels. A key management architecture was proposed to allow flexibility and adaptability in a variety of scenarios. The developed system was implemented using the LabVIEW development environment, using as a case study the Quantum Key Distribution Platforms provided by ThinkQuantum S.r.l. As the research work is in its starting phase, attention has been paid to a single client-server link, establishing the foundational architecture and demonstrating feasibility. Experimental results show the possibility of applying QKD to secure distributed measurement systems, which can handle real-time data exchange with key retrieval times in the order of seconds. The system is designed to be adaptable to various QKD technologies, laying the groundwork for future real-world applications in secure distributed measurement systems.
CE1144 10:30-10:45	Design and Implementation of an IoT-Enabled Deep Learning-Based Fault Detection System for Solar Panels Authors: Sofian Saidi and Mayed Aljeneibi

	Presenter: Mayed Aljeneibi, Higher Colleges of Technology Abstract: This research presents a scalable and cost-effective IoT-enabled deep learning system designed for fault detection in photovoltaic (PV) panels, addressing the urgent need to optimize solar power efficiency in the UAE. The system employs Convolutional Neural Network (CNN) architectures, including VGG-16, to analyze both thermal and regular imagery, accurately identifying six major fault types: hotspots, shading, dust accumulation, physical damage, inverter malfunction, and degradation through AI-based classification techniques. To enable real-time monitoring and timely fault detection, IoT sensors measure critical electrical and environmental parameters such as voltage, current, heat, and solar irradiance, with this data processed by a Raspberry Pi and transmitted to a cloud-based dashboard that offers visualization and automated alerts. Additionally, the deployment of an unmanned aerial vehicle (UAV) equipped with thermal and normal cameras facilitates efficient inspection of large-scale solar farms, further enhancing fault detection coverage. By integrating advanced AI, IoT sensing, and UAV technology, the system significantly improves the reliability and maintenance of PV installations, making it applicable for both industrial and residential settings. Furthermore, this innovative solution aligns with the UAE's 2050 carbon emissions reduction goals, supporting the nation's sustainable energy transition and reinforcing the resilience of its solar power infrastructure.

Online Session 1

Electrical Equipment Fault Analysis and Reliability Prediction

- **Session Chair**:
- **Time**: 09:00-11:30, September 26
- **ZOOM ID**: 85438342652 (Room A)
- **Papers**: CE1122 CE1109 CE1130 CE1138 CE1152 CE2211 CE1119 CE2248 CE2272 CE1008

CE1122 09:00-09:15	Computer Simulation Study on Impact of Gas Channel Size on Frictional Losses and Current Density in PEMFC Authos: Mahmut Kaplan Presenter: Mahmut Kaplan, Gaziantep University, Turkey Abstract: Proton exchange membrane fuel cell (PEMFC) is an environmentally friendly technology that has a pivotal role in the augmentation of power output with cutting emissions. PEMFC contains various elements such as a membrane, bipolar plates with flow channels, gas diffusion and catalyst layers. The gas channel dimensions remarkably affect the performance features of PEMFC. In this work, a three-dimensional (3D) model is constructed using ANSYS Fluent PEMFC Module and SOLIDWORKS. The novel channel configurations are created to decrease pressure drop of the small cross-sectional size of channel (A = 0.04 mm2) for 0.4 and 0.6 V. The findings reveal that an increase in channel cross-section dimensions results in substantially diminishing pressure loss. The anode and cathode pressure drops of 27.2 kPa and 90.9 kPa are recorded for the new configuration with the section size of 4A compared to small size channel with those of 156.6 kPa and 451.6 kPa, respectively, at 0.4 V. This configuration only decreases the current density of 24% compared to the small size channel at the same voltage. Despite various studies on flow losses of PEMFC, an effective way to reduce fluid friction in the channel has remained elusive. Innovative configurations can be a good option to decrease pressure loss in the channels with small dimensions.
CE1109 09:15-09:30	Tropical Lightning Protection Decision using Two-Layered Ensemble Method Authors: Bryan Denov, Lenny Putri Yulianti Presenter: Bryan Denov, Institut Teknologi Bandung, Indonesia Abstract: Lightning poses significant risks to infrastructure and safety, especially in tropical regions with high humidity and frequent thunderstorms. This study examines lightning behavior in Indonesia, focusing on how high temperatures, humidity, and topography affect peak currents. We introduce a novel two-layered ensemble method tailored for tropical conditions: the first layer uses cluster-based techniques to manage complex data distributions, and the second layer employs ensemble methods for feature selection. A key finding is the substantial influence of the minimum current in negative polarity strikes on lightning protection decisions for transmission lines. This feature, which poses a major risk due to high peak currents, is crucial for designing

	effective protection strategies. The proposed method, which integrates diverse models to enhance feature selection and prediction accuracy, significantly outperforms conventional approaches. This research provides valuable insights for developing improved lightning protection systems for transmission line in tropical environments
CE1130 09:30-09:45	A SIL Complied Analysis of Failure Mode in A Railway Door Control System Accordance with IEC 61508 Authors: Kaan Ulusoy, Sezen Zeren, Fikri Elmas Presenter: Fikri Elmas, Desird Design R&D, Türkiye Abstract: This study presents a comprehensive analysis of reliability and safety assessments conducted on a critical system, focusing on the relationship between failure modes and Safety Integrity Level (SIL) compliance according to the IEC 61508 standard. The analysis is specifically applied to a Door Control Unit (DCU) used in platform screen door system (PSD) and metro/train body door to control the entrance door. 14 safety functional failure modes have been analyzed, determining their respective failure rate (λ) values for each hardware component. The results indicate compliance with SIL 2 requirements, while certain failure modes achieved SIL 3.
CE1138 09:45-10:00	Battery Cycle Life Prediction Before Degradation Using Various Linear Regression Methods Authors: Furkan Özkan, Ece Şekerciler, Nergiz Sermet Presenter: Furkan Özkan, AVL Türkiye Research and Engineering, Türkiye Abstract: Predicting battery cycle life before significant capacity loss can have a genuinely positive impact on battery performance, leading to longer-lasting Energy Storage Systems (ESS). This study develops predictive models based on various linear regression techniques to estimate battery cycle life prior to substantial capacity loss. The dataset comprises performance metrics from 124 commercial lithium iron phosphate/graphite cells (1.1 Ah nominal capacity, 3.3 V nominal voltage) subjected to diverse charge-discharge profiles. The data from 81 cells are used for model training, while the remaining 43 cells are reserved for testing. Early-cycle data are considered to predict the remaining cycle life, evaluating the models' early prediction capabilities. Key parameters, including discharge capacity, voltage, current, cell temperature, internal resistance, and charge time, are monitored during cycling. Predictors are derived from raw measurement data, and feature selection is performed using Shapley importance and F-tests to construct well-optimized models. Root Mean Square Error (RMSE) is employed as the primary performance metric, assessing and comparing the models based on the average magnitude of their prediction errors.
CE1152 10:00-10:15	Analysis of the sizing of a variable frequency drive and 400 kW squirrel-cage induction motor to increase the operational availability of an 8'x10' ball mill, used in the mining sector Authors: Ricardo Orlando Consolación Mishti and Gabriel Osiris Cairampoma Rodriguez Presenter: Ricardo Orlando Consolación, Universidad Continental, Peru Abstract: The objective of the research was to size the variable frequency drive and induction motor of 400 kW squirrel cage type, to increase the

	availability of 8x10 ball mills in the mining sector. The results obtained show that untimely shutdowns per month were significantly reduced from 2 to 0, at the same time availability was increased to 100% in the mill and maintenance service costs were reduced. In addition, energy consumption was reduced at the time of start-up of the equipment. All these results demonstrate the economic savings and additional income generated by these benefits, which shows that the investment executed was an adequate and profitable solution for this type of sizing of the drive and motor. Concluding that by carrying out the proper sizing and the acquisition of the frequency inverter and 400kw electric motor type squirrel cage, the availability increased from 98.98% to 100%, with this result the efficiency of the 8'x10' mill will be improved, in addition to reducing untimely stops of the mill.
CE2211 10:15-10:30	Data-Driven Battery Degradation Modeling for Electric Vehicles under Calendar and Cyclic Aging Conditions Authors: Berk Aşçıoğlu, Chiedozie Augustine Ike-Offiah, Nazif Hakan Yeniay, Canraş Batunlu Presenter: Canraş Batunlu, Middle East Technical University Northern Cyprus, Turkey Abstract: In recent years, the pollution produced by vehicle fuel consumption has been one of the main environmental contamination factors that could lead to further climate change and global warming. Recent science and technological advancements have shown that reducing fossil fuel consumption significantly mitigates environment degradation and is beneficial to public health. Using renewable energy to power electric vehicles (EVs) instead of gasoline is one strategy to reduce fuel use. One of the primary problems with electric vehicle batteries is that they deteriorate with time, making them unsafe to use. To reduce the threat caused by EV batteries, the evaluation and prediction of battery health has been a primary research objective. This paper introduces a data-driven battery degradation modeling based on a battery performance process followed by a very detailed testing protocol to extract important battery characteristics. For electric vehicle (EV) applications, this process offers a useful tool to maximize battery life and enhance safety.
CE1119 10:30-10:45	The Effect of Wind Turbine Distribution Transformers on Grid Stability Authors: Orhun Celil ÖZEN, Onur AKAR* Presenter: Orhun Celil ÖZEN, Marmara Universit, Türkiye Abstract: The widespread adoption of renewable energy sources has introduced new challenges in the management and stability of power grids. Among these sources, wind energy is one of the fastest-growing, standing out with its environmental benefits and limitless potential. However, the natural fluctuations in the energy generation characteristics of wind turbines can lead to stability issues in electrical grids. This paper examines the impact of wind turbine distribution transformers on grid stability. The irregularities in the output power of wind turbines can cause problems such as voltage regulation, reactive power balance, harmonic distortions, and frequency fluctuations during transmission to the grid. Distribution transformers play a critical role in mitigating these effects and ensuring grid stability. The study analyzes the control strategies and protection systems of distribution transformers in the context of wind energy systems' impact on the grid. Both

	theoretical and simulation-based analyses are presented, and the behavior of transformers under different scenarios is examined. Additionally, the potential use of energy storage systems and modern power electronics devices to enhance grid stability is discussed. In conclusion, the effective design and management of wind turbine distribution transformers are crucial for the successful integration of renewable energy and the development of sustainable energy systems. This study aims to serve as a guide for future research in the fields of energy engineering and grid stabilization.
CE2248 10:45-11:00	TriGuard: A CNN-BiLSTM-Attention Trinity for Robust IoMT Intrusion Detection Authors: Mohammad Arafah, Sabreen Alhariri, Mohammad Al-Habahbeh, Wael Hadi Presenter: Mohammad Arafah, University of Petra Amman, Jordan Abstract: The Internet of Medical Things (IoMT) has revolutionized healthcare by enabling continuous patient monitoring and remote medical services. Nevertheless, IoMT devices are under high cybersecurity threats, which may affect patient safety and data integrity. This paper presents a novel hybrid deep learning architecture that combines Convolutional Neural Networks (CNN), Bidirectional Long Short-Term Memory (BiLSTM), and Multi-Head Attention mechanisms for enhanced IoMT intrusion detection. Our method learns local patterns by CNN layer, learns temporal patterns by BiLSTM, and pays special attention to important features by attention. Our model performs with 85.1% accuracy and 89.8% F1-score evaluated on CICIoMT2024 and 72.3% accuracy and 69.3% F1-score on CIC-BCCC-NRC TabularIoTAttack-2024, proving to be superior across both metrics and demonstrating a strong generalizability and transferability even when cross-dataset-optimized.
CE2272 11:00-11:15	Online estimating of input fault based on the coupled ARX-Laguerre multimodel Authors: Hajer BENAMOR, Chakib BEN NJIMA, Marwa YOUSFI, Hassani MESSAOUD Presenter: Chakib Ben Njima, University of Sousse, Tunisia Abstract: In this paper, we focus on the diagnostic aspect by online identification of system input faults. In this framework, we propose the theoretical foundation of a new approach for estimating input faults based on the ARX-Laguerre multimodel by exploiting the online identification approach of its parameters on a sliding window. The proposed approach is based on updating the coupled ARX-Laguerre multimodel parameters (Laguerre poles, Fourier coefficients) on a sliding window at each incrementation step in time. This update is important for the proposed algorithm for input fault estimation.
CE1008 11:15-11:30	AI Buddy: An AI-Powered Learning Companion Developed Using Ollama Framework and Open WebUI Interface Authors: John Paul Q. Tomas, Ariel Kelly D. Balan, Mary Christine A. Tomas, Geldof B. Resuello, Gloren S. Fuentes, Cristina A. Pascua Presenter: John Paul Q. Tomas, Mapua University, Philippines Abstract: This study explores the development and usability of AI Buddy, an AI-Powered Learning Companion for the School of Information Technology, Mapúa University. AI Buddy was developed using Ollama framework and Open WebUI Interface. The Chatbot Usability Questionnaire (CUQ) was used

	to evaluate the usability of the chatbot, and the Net Promoter Score was calculated to measure the likelihood of the instructors to adopt the chatbot to their teaching. Out of the 36 instructors who evaluated, AI Buddy got a Net Promoter Score of 25 and a CUQ score of 69.2, which translates to a “Good” rating in the interpretation scale. This shows positive feedback on the adoption by the instructors of home-grown AI-Powered Learning Companion to their teaching.

Online Session 2

System Control and Optimal Configuration in Intelligent Electrical Systems

- **Session Chair**:
- **Time**: 09:00-11:15, September 26
- **ZOOM ID**: 86002257904 (Room B)
- **Papers**: CE2254 CE1015 CE2190 CE2247 CE2267 CE2268 CE3195 CE3197 CE3193

CE2254 09:00-09:15	Computational Analysis of the Energy Performance of a Solar Flat Collector Authors: Samira Akbarova, Gulchohra Mammadova, Nurmammad Mammadov and Reyhan Akbarli Presenter: Samira Akbarova, Azerbaijan University of Architecture and Construction, Azerbaijan Abstract: This study presents a computational method for evaluating and analysis the energy performance of a single-glazed solar flat collector (SFC) under the climatic conditions of the Absheron Peninsula in Azerbaijan. The region is characterized by frequent strong winds, which significantly affect the energy performance of solar thermal systems. A detailed heat transfer model was developed to account for convective, conductive, and radiative losses, incorporating wind speed as a key variable in the calculation of the convective heat transfer coefficient (HTC). The ASHRAE empirical equation provides the most balanced estimate of HTC for design applications in windy regions. At an average wind speed of 5.5 m/s and a specific solar radiation intensity of about 850 W/m², wind-induced heat losses reduce the collector's useful heat output by up to 22%, resulting in a 13% difference between the calculated efficiency (59%) and the manufacturer- declared efficiency (68%). Additionally, results show that the efficiency drops from 70% (in windless conditions) to 56% at a wind speed of 8 m/s. The reduction in useful heat output relative to windless conditions is Δ= 22%, and the decrease in energy efficiency is Z = 20%. These findings highlight the importance of incorporating wind effects into energy performance assessments.
CE1015 09:15-09:30	A Modular LLM-Backed Framework for Adaptive Linux Proficiency Assessment Authors: Teodor Petrović, Petar Kresoja, Aleksa Vidaković, Nikola Savanović, Saša Adamović Presenter: Teodor Petrovic, Singidunum University, Serbia Abstract: We present the design and implementation of a browser-based adaptive testing platform for Linux system administration that captures every student action—terminal commands, file operations, and navigation events—in real-time and evaluates them against structured JSON-based validation schemas. Each question is annotated with rich metadata (difficulty, topic, skill area) to drive a Python microservice that invokes Google's Gemini LLM to

	interpret multimodal performance logs, diagnose conceptual or syntactic errors, and generate structured specifications for follow-up tests. The platform's modular architecture leverages Docker-isolated environments for secure, reproducible assessments and integrates seamlessly with diverse educational systems
CE2190 09:30-09:45	Multi-Criteria Site Selection for Offshore Wind Energy Deployment in Southern Thailand Using HOMER Simulation Authors: Alp Karadeniz, Sumate Naetiladdanon, Anawach Sangswang, and Mongkol Konghirun Presenter: Alp Karadeniz, Balikesir University, Turkey Abstract: This paper conducts a multi-criteria analysis to identify the most suitable site for offshore wind turbine deployment in southern Thailand, utilizing the Siemens Gamesa SG 14-222 DD model. The HOMER software was employed to simulate wind performance across nine coastal regions. Key metrics—such as capacity factor, average wind speed, and annual energy production—were analyzed and compared. In addition, environmental, geological, and socio-economic considerations, including tourism sensitivity and grid accessibility, were integrated to support a comprehensive site selection framework. The findings suggest that Phang Nga provides the most balanced profile in terms of technical viability and minimal tourism disruption, positioning it as the optimal candidate for development.
CE2247 09:45-10:00	Research on VSG Improved Control Strategy of Optical Storage Grid-Connected System Under Asymmetric Fault Authors: Dan Zhang, Haitao Wu Presenter: Dan Zhang, Inner Mongolia University of Technology, China Abstract: Aiming at the problem of power double-frequency pulsation and three-phase current imbalance under asymmetric faults, the existing solutions mostly adopt the idea of positive and negative sequence dual-channel control. However, by adjusting the weight coefficient of negative sequence current, it is impossible to achieve simultaneous suppression of current imbalance and power double-frequency pulsation. Therefore, this paper takes the optical storage grid-connected system as the research object, and proposes an improved VSG control strategy that does not rely on positive and negative sequence current dual control channels. The negative sequence voltage compensation link considering the negative sequence current is added to the current inner loop of the conventional VSG control to improve the current imbalance, and the power double frequency component in the negative sequence voltage compensation link is controlled based on the Q-PR controller. The effectiveness and correctness of the proposed VSG improved control strategy are verified by PSCAD/EMTDC simulation software.
CE2267 10:00-10:15	Design and Verification of A Single-Cycle RISC-V Core Using MATLAB Simulink Authors: Atakan Beyen, Sezer Memiş, Ramazan Yeniçeri Presenter: Atakan Beyen, Istanbul Technical University, Turkey Abstract: Model-based hardware design approaches have gained traction due to their efficiency in prototyping and verification. This paper presents the

	design and verification of a single-cycle RISC-V core developed using a model-based design approach in the MATLAB Simulink environment. The core implements a fundamental subset of the RV32I instruction set and is converted into SystemVerilog code using HDL Coder. The generated HDL code is synthesized and tested on the Cora Z7 board, which features a Xilinx Zynq XC7Z010-1CLG400C FPGA. Verification is performed using HDL co-simulation and FPGA-in-the-Loop techniques through HDL Verifier. Test programs written in RISC-V assembly are executed, and the results are compared against the Simulink reference model, confirming functional accuracy across all stages. This work introduces a novel and fully integrated model-based methodology for RISC-V core design and hardware verification, which is not previously reported in the literature.
CE2268 10:15-10:30	Spiking Neural Network Circuit Implementations: Comparative Study Authors: Mohamed Mohamed Saied Tolba Elhadad, Youssef Amr Mohamed Reda Abdel Aziz, Yassin Sherif Mohamed Maamoun, Eman Ahmed Hamdy Azab Presenter: Mohamed Mohamed Saied Tolba Elhadad, German University in Cairo, Egypt Abstract: This paper presents a comparative study between two competitive circuit implementations of Spiking Neural Networks (SNNs). The first one is Mihalas-Niebur (MN) neuron based on mixed signal. Second, the Accelerated Leaky integrate-and-fire (ALIF) neuron based on mixed signal. The study shows that MN can effectively realize the LIF firing pattern under some constraints, depending on a simple circuit realization and operating principle, meanwhile, utilizing higher power 17.4 μW. While ALIF neuron is utilizing complex building blocks and consumes larger area, however, it consumes less power 11.5 μW.
CE3195 10:30-10:45	Hybrid Metaheuristic Path Planning for Military UAV Swarms in Simulated Environments Authors: Mohamed A. Ba Yazid and Yaşar Becerikli Presenter: Mohamed ABDULQADER MOHAMED BA YAZID, Kocaeli university, Turkey Abstract: Unmanned Aerial Vehicle (UAV) has become pivotal in military operations for tasks such as surveillance, reconnaissance, and target acquisition domains. Many of these objectives, such as distance, energy, threat avoidance, maneuverability, or coverage, are often diverging, which poses significant challenges to effective path planning in such contexts. This paper presents a hybrid algorithm for military UAV swarm coordination, developed using the Gazebo environment with two autonomous drones. This work gives a solution for the multi-objective path planning with balanced compromise among attitude angles, length of trajectory and the risk of collision while moving in dynamic and constrained environments, which combines Genetic Algorithm (GA) and Particle Swarm Optimization (PSO) into a hybrid metaheuristic, while the path is further smoothened locally using A* algorithm taking obstacle-aware information. The GA part allows for various explorations in the solution field, PSO then drives fast towards the optimal paths, while A∗ does the accurate fine-tuning around obstacles and no-go zones. The framework measures performance according to several key metrics, including path length, mission time, energy consumption, threat

	avoidance, and area coverage. This ensures the basis of future work and research towards robust, adaptive and mission aware path planning algorithms for real world applications in military UAV swarms. A refined GA–PSO hybrid with lightweight A* path repair and results on DTLZ1–DTLZ7 and a mission-level fitness is presented, demonstrating consistent improvements over MOGA, MOPSO, and MOEA/D.
CE3197 10:45-11:00	Silicon-Proven Chaos-Based Random Number Generator Using the Sky130 PDK Authors: Onur Karataş, Sezen Bal and Hayriye Korkmaz Presenter: Onur Karataş, Marmara University, Türkiye Abstract: A digitally implemented chaos-based random num ber generator (RNG) is presented, designed, fabricated, and validated via the Efabless Open Multi-Project Wafer (MPW) shuttle program using the Sky130 Process Design Kit (PDK). The proposed design utilizes a discretized chaotic attractor to produce inherently unpredictable bitstreams. Using a fixed-point digital model, the design is fully synthesizable and compatible with standard ASIC and FPGA design flows. The silicon-proven implementation was integrated into the Caravel SoC platform and successfully manufactured through the Open MPW program. Post-silicon validation was performed by reading data from the RNG block using a RISC-V processor. The results demonstrate a low-cost, fully realized solution for embedding chaos-based entropy sources into secure hardware systems.
CE3193 11:00-11:15	A Feedforward Control Method for Second Harmonic Ripple Reduction in Single-Stage LLC AC-DC Converter Authors: Rashid Kazemi, Alireza Ramezan Ghanbari, Fabian Ammann Presenter: Rashid Kazemi, V-Research, Dornbirn, Austria Abstract: A feedforward control method is proposed to suppress the second harmonic ripple in a single-stage AC-DC converter. The control method is implemented on a single-stage topology where AC-side coupled inductors, which provide inherent power factor correction, are combined with an LLC resonant converter. Conventional frequency modulation is employed to regulate output, while the ripple component of the bus voltage is fed forward to the controller to suppress the ripple. The proposed control method is implemented in a low-cost digital controller, ensuring practical feasibility. Experimental results confirm that the second harmonic ripple is effectively reduced, while enhanced closed-loop stability is achieved.

Online Session 3

Performance Monitoring and Safety Detection in Communication Networks

- **Session Chair**: Saif ur Rahman, Xi'an Jaiotong Liverpool University China, China
- **Time**: 13:30-16:15, September 26
- **ZOOM ID**: 85438342652 (Room A)
- **Papers**: CE1112 CE1007 CE1142 CE2188 CE2207 CE2213 CE1150 CE2240 CE3182 CE2022 CE2212

CE1112 13:30-13:45	Performance Evaluation of a Scalable and High-Performance LMS Cluster Author: Ali Sebetci Presenter: Ali Sebetci, OSTIM Technical University, Turkey Abstract: As the demand for scalable and reliable learning management systems (LMS) continues to grow, ensuring robust performance under high user concurrency has become a critical priority for educational institutions. This study presents a comprehensive performance evaluation of a distributed Moodle LMS cluster implemented at OSTIM Technical University. Leveraging a multi-server architecture with Nginx load balancing and Redis caching, the system's scalability, responsiveness, and resource efficiency were analyzed under varying workloads. Results demonstrate that increasing the number of web servers significantly reduces response times and error rates, with the three-server cluster reliably supporting up to approximately 1,600 concurrent users while maintaining error rates below 25 percent—substantially exceeding the 1,000–1,500 user ceiling reported in prior clustered Moodle deployments. Although performance targets such as response time and error rate are challenged under extreme loads, the adoption of distributed storage, adaptive scaling, and advanced caching ensures improved stability and throughput compared to previous approaches. These findings provide actionable benchmarks and design recommendations for LMS administrators and system architects seeking to optimize e-learning platforms for large and dynamic user populations. Future work will explore predictive, AI-driven resource scaling and further optimizations in database query execution to meet the evolving needs of large-scale digital education environments.
CE1007 13:45-14:00	Blockchain and AI-Integrated Security Framework for Wireless Ad Hoc Networks using Support Vector Machine (SVM) Authors: Mohammad Arifin Rahman Khan, Abdur Rahman Sarker, Mohammad Shorfuzzaman, Md Mahfuzur Rahman, Md. Sohel Rana, Md. Moneruzzaman Presenter: Mohammad Arifin Rahman Khan, Bangladesh University, Bangladesh Abstract: In this study, we aim to propose a Blockchain and AI-Integrated Security Framework for Wireless Ad Hoc Networks that utilizes machine

	learning classifiers like Support Vectors Machine (SVM) in order to provide an evolving cyber threats-resistant network. By virtue of the blockchain mechanism, the framework is able to create a security architecture with decentralized and tamper-resistant features, which lead to aspects like safe authentication, data integrity, and trust management among network nodes. Besides, SVM, as an efficient algorithm for anomaly detection and classification, helps to spot the presence of harmful activities within the network. The consensus mechanism combines the advantage of the blockchain with the higher effectiveness, that is transaction verification and the speed of the process without involving the security in jeopardy. The feature selection technique is exploited to make error detection more precise by cleaning the data set before the classification takes place. In addition, the dynamic trust model rating biases the objective of the network, evaluates the behavior of the node, and limits the performance of the insider threat. The linkage of Blockchain with SVM-based intrusion detection is the one offering most positive results as it equips wireless ad hoc networks with real-time threat detection thus reducing false alarms and enhancing the decision-making process. The proposed framework is configured to function in dynamic network environments and still consume a low level of processing resources which allows it to work on the devices with fewer resources. The system can be implemented in this way to help by reducing the number of failures and by providing secure and efficient communication in wireless ad hoc networks.
CE1142 14:00-14:15	Optimizing Wireless Coverage Through Intelligent Router Height and Location Adjustment Author: Ahmed Saad Hussein Presenter: Ahmed Saad Hussein, University of Information Technology and Communications, Iraq Abstract: Achieving maximum wireless coverage inside buildings is an ongoing issue, especially in compound building layouts such as modern houses and offices with varying wall types and structural obstructions. This paper proposes an intelligent optimization framework for achieving maximum Wi-Fi coverage using Particle Swarm Optimization (PSO) to determine optimal router location and altitude, as well as the directed placement of signal boosters. The proposed model mimics real-world 2D architectural layouts accounting for 3D propagation effects using adjustable antenna height and material-based wall attenuation. The system is simulated for two indoor environments—a home and an office space with partitioned areas—to evaluate the performance of the system. Simulation results show dramatic coverage improvements, with dead zones reduced by over 75\% in cases of optimized settings. Heatmaps, convergence curves, and comparative analysis between manual and AI-optimized placements are provided to demonstrate the efficiency and flexibility of the model. This work offers a flexible and accurate smart network planning tool for different indoor environments.
CE2188 14:15-14:30	Reduced Training Time for Multi-Class IoT Intrusion Detection using Hybrid Deep Learning Model Authors: Saddaf Rubab, Syeda Jamila Guftar, Muazzam A. Khan, Safi Ullah Presenter: Saddaf Rubab, University of Sharjah, United Arab Emirates

	Abstract: Due to the interconnected nature of IoT devices, the systems are more prone to vulnerabilities and security attacks. An intruder may attack the devices, hosts, servers, and gateways in a network. Several security solutions are available to protect IoT networks such as intelligent IDS which works on network traffic to train themselves to recognize any intrusion using ML/DL techniques. However, the DL techniques are most suited to train themselves on huge data size of IoT network and requires considerable training time. This study presents a DL technique for malicious attack detection in IoT networks with reduced training time. The proposed model has a GRU layer which is followed by two dense layers. The proposed model is evaluated for multi-class classification using with different optimizers such as ADAM, and ADAMAX and batch sizes 32, 64, and 128. The model has achieved up to 99% precision, recall, F1-score, and accuracy with the reduction in training time using MQTT-IoT-IDS2020 dataset.
CE2207 14:30-14:45	A Novel Heuristic Algorithm for Scalable and High-Performance Automated Single-Line Diagram Generation in Electrical Grids Authors: Oğuz Deniz, Süha Nur Arslan Presenter: Oğuz Deniz, Siemens A.Ş., Turkey Abstract: Automated generation of single line diagrams (SLDs) from power distribution network Geographic Information System (GIS) data remains a computational challenge requiring efficient algorithms that can handle networks of varying complexity. A novel smart bottom-up heuristic approach is developed to address these challenges through a comprehensive sevenphase methodology. The proposed pipeline addresses key challenges in existing SLD generation algorithms by implementing a comprehensive seven-phase methodology that efficiently handles networks of varying scales while maintaining superior computational performance. The algorithm integrates connectivity and topological network data through a systematic workflow beginning with data preprocessing and busbar subsystem extraction, followed by global network construction using shortest path analysis between busbar pairs weighted by Euclidean distances. A critical innovation lies in the component analysis phase, which identifies electrically isolated subnetworks to prevent impossible connection attempts, followed by a topology-based connection algorithm employing a Hybrid Multi-Criteria Approach that combines betweenness, closeness, and degree centrality metrics to optimize starting point selection. The pipeline's advanced crossing avoidance mechanism utilizes computational geometry techniques to generate clean orthogonal connections through sophisticated routing algorithms that systematically evaluate multiple path strategies including elbow-shaped and three-segment routes with strategic offsets. Missing line detection ensures comprehensive network representation by identifying secondary connections for redundant paths and backup routes, while the final visualization phase maintains professional electrical drafting standards through standardized symbols and consistent scaling. Index Terms—Automated Single-Line Diagram Generation, Power distribution networks, Computational Geometry, Geographic Information System (GIS)
CE2213 14:45-15:00	A Hybrid ASCON–Kyber Lightweight Framework Using MQTT Protocol for Constrained Devices Authors: Fadi Suleiman, Khalid Javeed Presenter: Khalid Javeed, University of Sharjah, United Arab Emirates

	Abstract: The cryptographic community is preparing security countermeasures against quantum computing and the principle of superposition. Rapid advances and breakthroughs in quantum computing will break conventional cipher schemes by halving brute-force attack durations. The low-end, resource-constrained sector of the IoT ecosystem, such as microcontrollers and single- board computers, requires the use of lightweight ciphers such as ASCON proposed by NIST to provide encryption. Ascon was the most promising candidate in NIST's 2023 compe- tition for lightweight ciphers. This work proposes a hybrid lightweight framework by integrating ASCON-128 and KYBER- 768 schemes. This hybrid model sends and receives messages using the MQTT protocol, a widely used communication protocol in IoT networks. The implementation results are demonstrated for varying payload sizes ranging from 8 to 1000 bytes. The benchmarking is done using Raspberry Pi and Orange Pi devices, and the implementation results are shown for key generation, key encapsulation/decapsulation, encryption, and decryption opera- tions. The results reveal that the proposed framework delivers an overall 90 % speed increase in comparison with the state- of-the-art. Thus, this model provides efficient quantum-resistant MQTT communication on constrained IoT platforms.
CE1150 15:00-15:15	Enhanced Fault Detection and Exclusion in GNSS/INS Integrated Navigation Systems via Robust Estimation Authors: Mehmet Gokberk Patan, Ilker Ustoglu Presenter: Mehmet Gokberk Patan, Istanbul Technical University, Turkey Abstract: A robust estimation-based fault detection and exclusion algorithm is proposed for GNSS/INS integrated navigation systems to mitigate the error tracking effect that limits traditional innovation monitoring methods. By adaptively adjusting the Kalman filter gain using the IGG-III weight function within a sliding window framework, the proposed approach enhances sensitivity to ramp faults and improves fault handling robustness. Simulation results demonstrate up to 34% faster detection in ramp fault scenarios and the successful isolation and exclusion of faults that remain undetected by traditional methods, underscoring its effectiveness in improving reliability and robustness in integrated navigation systems.
CE2240 15:15-15:30	Attention-Enhanced CNN with Wavelet Denoising for Wi-Fi Channel State Information Through-Wall Human Activity Recognition Authors: Dev Bhodia, Nuaim Habibi, Mohammed Taaha, Abeer Elkhouly, Mohd Fareq Abd Malek Presenter: Dev Bhodia, University of Wollongong in Dubai, Dubai Abstract: Wi-Fi Channel State Information (CSI) has gained traction for device-free human activity recognition (HAR) due to its privacy-preserving and passive sensing capabilities. However, multipath fading, noise, and through-wall signal attenuation hinder performance and model generalization. This paper proposes a robust sensing framework that combines discrete wavelet transform (DWT) denoising with an attention-enhanced convolutional neural network (A-CNN). The A-CNN integrates Convolutional Block Attention Modules (CBAM) to emphasize informative spatial and temporal features in CSI data while suppressing noise. DWT preprocessing enhances signal quality by removing high-frequency artifacts. Experiments on the

	DeepSense and Widar datasets, as well as simulated through-wall scenarios, show the proposed method achieves 95.3% accuracy on DeepSense and maintains 89.2% accuracy through 20 cm concrete walls. The framework is lightweight, scalable, and suitable for real-time HAR applications.
CE3182 15:30-15:45	A Compact Radial Line Slot Array Antenna Based on Partially Reflecting Surface Authors: Homeira Sheikhi-Jouybari, Keyvan Forooraghi, Zahra Atlasbaf Presenter: Homeira Sheikhi-jouybari, Tarbiat Modares University, Iran Abstract: A compact monopulse radial line slot array (RLSA) antenna, enhanced with a partially reflective surface (PRS), is proposed for X-band applications in this paper. The source RLSA antenna consists of a radial waveguide with six split-ring slots on the upper plate embedded in the ground plane. A dielectric-based PRS, formed by circular metallic patches printed on the underside of a Rogers RO4003C substrate, is positioned at an optimized height above the RLSA to form a Fabry–Perot cavity, resulting in a boresight pencil gain of 19.9 dBi at 9.7 GHz. The gain of the conical beams in both elevation and azimuth directions reaches approximately 15 dB. A 4×4 microstrip Butler matrix, designed on RT5880, is used to feed the antenna with appropriate phase combinations. The design achieves good performance in terms of axial ratio (< 0.9 dB), sidelobe level (SLL) of the sum beam (–32 dB), and difference beams (–21 dB), with a compact total radius of 89.7 mm. All simulations were performed using CST and validated with HFSS to ensure accuracy and reliability of the results.
CE2022 15:45-16:00	A Proposal Control Mechanism for Remotely Connected On-Board Weighing Equipment to Monitor Heavy Goods Vehicles: the Case of Senegal's Road Transport Corridors Authors: Abdourahime GAYE, Mamadou Makhtar MBAYE Presenter: Abdourahime GAYE, University Alioune DIOP of Bambey, Senegal Abstract: A connected and autonomous on-board weighing system that periodically monitors the weight of heavy vehicles, not just at weighing stations or on instrumented bridges, but wherever they are, helps to apply the brakes accidents, especially in developing countries where infrastructure is low. A number of laws and regulations have been put in place to take better care of roads and passengers, including law no. 2022-05 of 15-04-2022 on the Highway Code, which was published on Wednesday 27 April 2022 in the official journal of the Senegal Republic. According to investigations carried out at the weighing station, there are other real problems affecting the lifespan of our road infrastructure. Axles are weighed at the weighing area, but the axle overload is not taken into account [1,3,5]. It's in this perspective, we proposed to set up a remotely connected on-board weighing system to overcome some of the limitations of the LS-WIM (Low Speed Weight-In-Motion) systems currently installed of our roads and motorways. In order to carry out this work, we begin by reviewing existing weighing systems and proposing alternative solutions. Next, we propose an overall system architecture (organic vision) with the design of the associated platform. Finally, we simulate the system using electronic/electrotechnical software and carry out implementation tests.

CE2212 16:00-16:15	Development of a Smart Differential Relay Using IoT and Wireless Communication Technologies Authors: Saif Rahman, Manzoor Ellahi, Muhammad Faiq, Amber Tariq, Tajammal Hussain and Muhammad Nadir Presenter: Saif ur Rahman, Xi'an Jaiotong Liverpool University China, China Abstract: This paper presents an IoT-based pilot wireless differential relay for real-time monitoring of power system. The designed system will have a broader scope for the detection of faults with reduced installation cost and increased overall reliability using the latest in wireless communication technologies and integration with the IoT. Traditional differential relays, though quite efficient in detecting faults, are mostly of wired communications that are not only expensive but also less flexible. Wi-Fi, LoRaWAN, or cellular networks are used to establish wireless communication between the relays to perform the real-time monitoring, and fault detection. The system transmits the data to the cloud platform for further remote access, data storage and future analysis. The performance of the prototype is validated through the developed GUI and designed small-scale, laboratory-based hardware of wireless differential relay. The outcomes show that the developed system can help in improving the fault detection, enhance real-time monitoring and predictive maintenance in electrical grids.

Online Session 4

Modern Image and Signal Processing Technologies

- **Session Chair**:
- **Time**: 13:30-16:00, September 26
- **ZOOM ID**: 86002257904 (Room B)
- **Papers**: CE1132 CE2193 CE2194 CE3051 CE2028 CE3046 CE1009 CE2219 CE1163 CE2233

CE1132 13:30-13:45	HAUS: A Hybrid Attention-UNet framework for enhanced skin lesion Segmentation Authors: Nazish Yousaf, Wasi Haider Butt, Javeria Amin Presenter: Nazish Yousaf, NUST, Pakistan Abstract: Skin Cancer is one of the fastest spreading and fatal disease according to latest research of World Health Organization (WHO). Early and accurate detection of specific area affected by SC disease is crucial for effective treatment process. In this paper, we propose a Hybrid Attention-UNet Segmentation (HAUS) model for more accurate and precise identification of skin lesions. HAUS integrates an advanced Attention UNet model with EfficientNetB7 as backbone. EfficientNetB7 is in HAUS framework is responsible for extraction of multi-scale features at different resolutions which is further refined using the attention blocks with progressive filter sizes. Performance of proposed model is evaluated on various publicly available skin lesion segmentation datasets. After a rigorous experimentation process, HAUS achieved dice scores of 0.99,0.98,0.94,0.99 and 0.96 on PH2, ISIC 2016, ISIC 2017, ISIC 2018 and HAM10000 datasets, respectively. The results show that integration of attention mechanism with EfficientNetB7 significantly increases the model performance and leads to improved identification of effected area.
CE2193 13:45-14:00	Voice-Based Screening of Lung Cancer and COPD Using Combined Spectral, Cepstral, and Learned-Embedding Features Author: Haydar Ankışhan Presenter: Haydar Ankışhan, Ankara University, Turkey Abstract: Early, accessible detection of lung cancer and chronic obstructive pulmonary disease (COPD) remains challenging due to invasive and costly standard methods. Here, we explore a non-invasive, voice-based approach to distinguish healthy controls from lung cancer (Stages I–IV) and COPD (Stages I–III) patients. We collected speech recordings from 128 Turkish-speaking individuals (42 healthy, 50 lung cancer, 36 COPD) reading standardized paragraphs in a quiet setting. Recordings were down-mixed to mono, high-pass filtered, and segmented into 100 ms frames. From each frame, we extracted time-domain statistics (RMS, skewness, zero-crossing rate), frequency-domain descriptors (spectral centroid, bandwidth, flux), MFCCs 1–13, spectrogram and chroma features, and learned embeddings via a 64-dimensional autoencoder and PCA-reduced components.

	Dimensionality reduction and K-means clustering revealed that learned embeddings and select spectral features achieved clear grouping of healthy, COPD, and lung cancer samples. An XGBoost classifier leveraging all features, coupled with SHAP analysis, identified higher-order MFCCs (MFCC5–MFCC7), spectral bandwidth, skewness, and zero-crossing rate as most discriminative. Physiological interpretation suggests that COPD-induced airflow obstruction leads to breathiness and turbulence—reflected in elevated zero-crossing rates and amplitude irregularities—whereas lung cancer yields formant distortions and heavier spectral tails, captured by higher-order MFCCs and kurtosis. These findings underscore the promise of acoustic biomarkers for scalable, cost-effective respiratory disease screening.
CE2194 14:00-14:15	Enhanced Box Particle Filtering for SLAM: Accuracy, Consistency, and Robustness Analysis Author: Haydar Ankışhan Presenter: Haydar Ankışhan, Ankara University, Turkey Abstract: This paper presents a comparative evaluation of several particle filtering-based SLAM algorithms with a particular focus on accuracy and consistency. The methods assessed include standard Box Particle Filter (Box PF), Box PF with Central Difference Kalman Filter (CDKF) enhancements, Unscented FastSLAM, Central Difference FastSLAM, and Optimal Particle Filtering approaches. Extensive simulations were performed in two real-world building environments. The results demonstrate that the enhanced Box PF variants—especially the CDKF-T variants with and without resampling—consistently outperform traditional FastSLAM methods in terms of RMSE and normalized RMSE. Moreover, these variants maintain statistical consistency as shown by NEES values close to the theoretical expectation. In contrast, Unscented and Central Difference FastSLAM methods exhibit severe overconfidence, as indicated by excessively high NEES scores. Overall, the findings suggest that hybrid Box PF frameworks with structured resampling schemes offer a reliable balance between accuracy and robustness for real-time SLAM applications.
CE3051 14:15-14:30	Malaria detection using Deep Convolution Neural Network Authors: Sumit Kumar, Sarthak Kapoor, Harsh Vardhan, Sneha Priya, Ayush Kumar Presenter: Harsh Vardhan, Vanderbilt University, USA Abstract: According to the WHO World Malaria Report 2024, malaria cases rose to 263 million, with 597,000 deaths—most of them children under five in sub-Saharan Africa. Despite advances, progress in malaria control has slowed due to limited resources and dependence on manual microscopy for diagnosis. Artificial intelligence offers a promising path for rapid, low-cost screening. In this work, we present a lightweight convolutional neural network (CNN) optimized via Bayesian hyperparameter tuning for automated malaria detection from blood smear images. The proposed model achieves high accuracy in classifying parasitized versus uninfected cells. To support deployment in real-world settings, we developed a middleware framework for mobile inference. In addition, we integrate an Out-of-Distribution (OOD) detector based on RRRCF, which flags anomalous inputs responsible for rare CNN misclassifications. Together, the CNN and OOD components yield effective prediction accuracy, demonstrating that compact, mobile-compatible

	deep learning systems can significantly improve malaria diagnostics in resource-limited environments.
CE2028 14:30-14:45	Multiple-Choice Question Generation Adaptation in Bahasa Indonesia using Large Language Models: A Preliminary Research Authors: Halim Wildan Awalurahman, Indra Budi Presenter: Halim Wildan Awalurahman, Universitas Indonesia, Indonesia Abstract: Multiple-choice question (MCQ) generation is one of the research domains that has harnessed the ability of Large Language Model (LLM). However, its application is still limited to certain domains and languages. This study aims to adopt MCQ generation using LLM in unexplored languages. We used prompts from previous studies and adapted them in the new language. Our research found that adaptation worked. Llama 70B consistently produced the longest tokens for MCQs, with 236.69 tokens for the first prompt and 839.57 for the second prompt. We found several flaws in the generated MCQs, including incomplete responses, wrong language, and missing answer keys. The findings could be used as a base for future studies.
CE3046 14:45-15:00	Determining The Most Representative Subset of Software Metrics Using Dimensionality Reduction Authors: Iaroslav Kivaev, Navruza Tulkunova, Evgeniy Zuev Presenter: Iaroslav Kivaev, Innopolis University, Russia Abstract: Software metrics play a crucial role in evaluating code quality and predicting defects, but the overwhelming number of available metrics creates challenges for practitioners. This work addresses the problem of selecting optimal subsets of software metrics that preserve essential information while reducing com- putational overhead and complexity. We propose a novel ap- proach that combines dimensionality reduction techniques with heuristic optimization to identify the most representative metric subsets. Our methodology uses a UMAP-derived objective func- tion to measure information loss and employs Particle Swarm Optimization (PSO) to search for optimal combinations across different subset sizes. The experimental results demonstrate that small subsets of carefully selected metrics can effectively capture the structural properties of software projects. This research contributes to making software quality measurement more accessible and actionable for development teams.
CE1009 15:00-15:15	Exploring Sentiment Analysis and Classification on Amazon Alexa Reviews: A Comparative Evaluation of ANN, LSTM, and Large Language Models Authors: Sarah S.M Almuqati, Areej Alhothali Presenter: Sarah Salman Almuqati, King Abdulaziz University, Saudi Arabia Abstract: In recent years, e-commerce products have become increasingly diverse, leading consumers to make more informed purchasing decisions based on previous customer experiences. One of the primary sources for such insights is customer reviews on online platforms. However, manually analyzing these reviews is both time-consuming and labor-intensive. To address this challenge, sentiment analysis techniques have been applied to automatically analyze reviews written by customers who have purchased and used the products. These reviews are typically classified into positive, negative, or neutral sentiments, helping consumers make better choices.

	Several studies have investigated this problem using a variety of natural language processing NLP, machine learning, and deep learning techniques to automatically analyze customer reviews. However, these studies often rely on general-purpose datasets and traditional models that fall short in capturing contextualized information of user sentiments, especially in domain-specific scenarios. To address this gap, this paper presents a comprehensive analysis of several machine learning and deep learning models, including large language models (LLMs), applied to Amazon Alexa Reviews dataset. Specifically, we evaluate the performance of artificial neural networks (ANNs), long short-term memory networks (LSTMs), and LLMs such as generative pre-trained transformers (GPTs) and bidirectional encoder representations from transformers (BERTs). The models are compared based on precision, recall, F1 score, and accuracy. Among them, BERT achieved the best performance, with 99% accuracy and a loss of 0.03.
CE2219 15:15-15:30	Reasoning in Signals: A Survey of Large Language Models for Sensor Data Understanding Authors: Ngoc Tuong Vy Nguyen, Yunting Yin Presenter: Yunting Yin, Eastern Michigan University, USA Abstract: The application of Large Language Models (LLMs) to sensor data analysis is an emerging and impactful direction of research, which combines natural language reasoning with time-series and physical-world signals. This survey provides a comprehensive review of recent advances in applying LLMs to understand, reason about, and generate sensor data across domains such as health monitoring and Internet of Things (IoT). We categorize existing work by their input modalities, including raw signals, textual summaries, and visual prompts, as well as their application domains and technical strategies such as prompt engineering, sensor-text alignment, and hybrid frameworks. Despite encouraging results in low-dimensional and API-supported tasks, LLMs still struggle with complex signal processing and numerical reasoning, as well as multimodal sensor fusion. We also identify key challenges such as limited dataset availability, inadequate signal transformation, and the need for architectural adaptations. Future research directions are outlined to bridge these gaps. Our review emphasizes the potential of LLMs to serve as foundation models for analyzing sensor data, while also pointing out the importance of domain-specific knowledge and diverse modalities.
CE1163 15:30-15:45	Broadband Design of Microwave Absorber for Shielded Anechoic Chambers with Enhanced Performance Authors: Aya Raad Thanoon, and Khalil H. Sayidmarie Presenter: Khalil Hassan Sayidmarie, Ninevah University, Iraq Abstract: Shielded anechoic chambers are used to evaluate and test electronic devices and systems in civilian and military applications. The walls of the chambers are covered with metal plates to eliminate external interference, and they are lined with pyramidal absorbers made from materials that absorb the incident electromagnetic waves. This paper explores how the various design parameters of the pyramidal absorber impact its performance, aiming to identify optimal design values for enhanced efficiency. Factors such as permittivity, loss tangent, height of the pyramidal structure, and the thickness of the base all influence the absorber's

	performance. The pyramidal absorber supported by a 0.5 mm thick iron plate was investigated using the CST Microwave suite over the frequency range (1-10) GHz, where the reflection coefficient and power density distribution are studied. The study showed that lower permittivity or permeability leads to lower reflectivity, while lower loss still gives higher reflectivity. Increasing the pyramid's height and the base's thickness leads to lower reflection, but the first is more effective. The investigated pyramidal absorbers with a height of 16 cm, and equal values of permittivity and permeability, achieved a reflection coefficient lower than -70 dB across most of the 1 to 10 GHz frequency range.
CE2233 15:45-16:00	Enhanced Ensemble Learning with Vision Transformers for Alzheimer's Disease Classification Using MRI Imaging Authors: Wael Hadi, Mohammad Arafah and Mohammad Alauthman Presenter: Wael Hadi, University of Petra, Jordan Abstract: Alzheimer's Disease (AD) represents one of the most challenging neurodegenerative disorders affecting millions worldwide. Early and accurate detection through medical imaging is crucial for effective intervention and treatment planning. This paper presents an enhanced ensemble learning framework that combines Vision Transformers with traditional Convolutional Neural Networks (CNNs) for multi-class Alzheimer's disease classification using MRI scans. Our approach integrates ResNet50, InceptionV3, and Vision Transformer architectures through a weighted soft voting ensemble methodology. The proposed system addresses the significant class imbalance inherent in AD datasets through comprehensive data preprocessing and augmentation strategies. Experimental validation on a standard Kaggle AD dataset demonstrates superior performance, with our ensemble model achieving an AUC of 1.0, precision of 99.92\%, recall of 99.89\%, and F1-score of 99.91\%. The results significantly outperform individual architectures and existing state-of-the-art methods, establishing a new benchmark for automated AD classification systems.