CONFERENCE PROGRAM

ICCTA 2026

2026 the 12th International Conference on COMPUTER TECHNOLOGY APPLICATIONS

ECCS 2026 the 6th European Conference on Communication Systems

2026 JUNE 17–19 Vienna Austria

Organized by

FH JOANNEUM
University of Applied Sciences

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Full Program

►Welcome Message

It is our great pleasure to welcome you to the 12th International Conference on Computer Technology Applications (ICCTA 2026) and its workshop, the 6th European Conference on Communication Systems (ECCS 2026) , to be held during June 17-19, 2026 in Vienna, Austria. Organized by FH JOANNEUM University of Applied Sciences.

In this era of global digital transformation, computer technology has emerged as a fundamental driving force behind social progress, profoundly reshaping human activities and lifestyles. This conference aims to establish a high-level platform for academic exchange, bringing together experts and scholars from around the world to explore cutting-edge applications and development trends in computer technologies across diverse domains.

The conference will feature in-depth discussions on key technologies including artificial intelligence, big data, cloud computing, and the Internet of Things, with a special focus on their innovative applications in smart manufacturing, smart cities, healthcare, financial services, and other vital sectors. We are honored to have invited renowned international experts to deliver keynote speeches. They are: Franz Haas from Graz University of Technology, Austria; Martin Tschandl from FH JOANNEUM University of Applied Sciences, Austria and Peter Peer from University of Ljubljana, Slovenia. These keynote addresses will be complemented by diverse parallel sessions and technical exchanges, promising attendees an intellectually stimulating academic event.

We anticipate this conference will facilitate dynamic exchanges of ideas, inspire innovation, and foster deeper collaboration between academia and industry in exploring new frontiers in computer technology development. Furthermore, we hope this gathering will serve as an excellent platform for participants to establish valuable connections and pursue potential collaborations.

We would like to express our sincere gratitude to the Program Committee members and reviewers for their dedicated efforts in evaluating submissions and ensuring the high quality of the technical program. Special thanks are extended to all authors for their valuable contributions that form the foundation of the conference. We also acknowledge the hard work of the Organizing Committee members who have worked tirelessly to make this event possible.

We sincerely appreciate the strong support and active participation of all experts and scholars. By working together, we can shape a smarter, more connected technological future!

ICCTA 2026 Organizing Committee,
Conference Chair,
Vitaliy Mezhuyev, FH JOANNEUM University of Applied Sciences, Austria

►Guideline

For Onsite Participants

Time Zone

- Vienna standard time: UTC+2

Conference Venue

- Hotel Mercure Wien Westbahnhof
  Address: Felberstraße 4, Rudolfsheim, Vienna, Austria
  Tel: 43 (0) +198111939
  Email: h5358@accor.com

Transportation

- Airport Express (CAT) + Metro/Walking (Fastest, ~30 min)
  a. Take the City Airport Train (CAT) from the airport to Wien Mitte station
  b. At Wien Mitte, transfer to U-Bahn U3 line (direction: Ottakring), ride 4 stops to Westbahnhof. Walk ~3 min to the hotel (located opposite the train station).
  Tip: CAT departs every 30 min; ideal for light luggage.
- S-Bahn Train + Metro (Budget-Friendly, ~35 min)
  a. Board S-Bahn S7 (direction: Floridsdorf) to Wien Mitte (~25 min).
  b. Switch to U3 line (Ottakring direction), alight at Westbahnhof. Walk 3 min to the hotel.
  Tip: S7 runs every 30 min; purchase tickets at airport machines.
- Taxi/Rideshare (Most Convenient, ~25 min)
  Route: Direct ride via A4 highway to Gürtel Boulevard.
  Options: Use Bolt, Uber, or airport taxi stands.
- Airport Bus (VAL-2) + Walking (~40 min)
  Take VAL-2 bus to Westbahnhof (30–35 min). Walk 5 min to the hotel.
  Schedule: Every 20–30 min.
  Best for: Direct service without transfers.

►Guideline

For Onsite Participants

For Presentation

- The duration of the oral presentation slot is 15 minutes (including 2-3 minutes Q&A).
- Your punctual arrival and active involvement in each session will be highly appreciated.
- Make sure your presentation is prepared and backed up in both PPT and PDF formats.
- The best presentation from each session will be selected and awarded a Best Presentation Certificate, which will be announced at the end of the session.

Attention

- For security and networking purposes, all participants are required to wear a name badge at all sessions. Entry to sessions is restricted to registered delegates only.
- For your personal safety and the security of your belongings, please take care of your possessions in public areas. The conference assumes no responsibility for any loss of personal items.

Emergency Numbers

Medical Emergency: 144	Police: 133	Fire: 122

Full Program

►Guideline

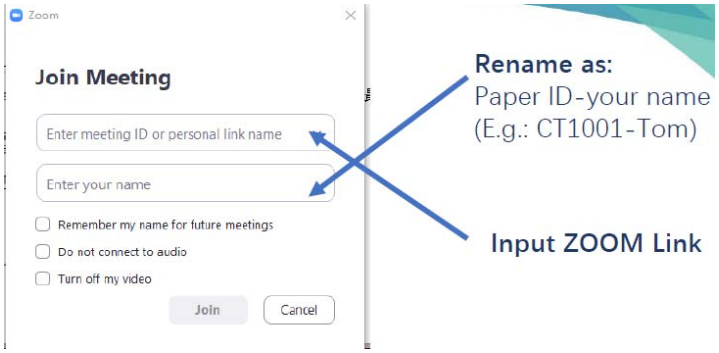
For Online Participants

Time Zone

- Vienna standard time: UTC+2

Platform: ZOOM

- For the users outside China, the link to Zoom Download: https://zoom.us/
- For authors in China: the link to Zoom Download: https://zoom.com.cn/download
- Please unmute your audio and turn on your video during your presentation.



- Set up your Name.
  Authors: Paper ID-Name / A1001-<*Jimmy Smith*>
  Listener: Listener- Name / Listener- <*Jimmy Smith*>
  Keynote Speaker: Keynote-Name / Keynote- <*Jimmy Smith*>
  Invited Speaker: Invited-Name / Invited- <*Jimmy Smith*>
  Committee Member: Committee-Name / Committee- <*Jimmy Smith*>

Conference Recording

- The online portion of the conference will be recorded. We kindly ask that you maintain appropriate behavior and appearance.

Full Program

►Conference Schedule Overview

June 17, 2026 / UTC+2

Time	Onsite Schedule	
13:30-17:00	**Onsite** Registration & Sign-in & Collecting Materials	Hotel Mercure Wien Westbahnhof Address: Felberstraße 4, Rudolfsheim, Vienna, Austria
Time	**Online Schedule**	
10:00-12:00	**Online** Test for Online Participants	**ZOOM link:** https://us02web.zoom.us/j/81187445500 Password: 061719
	Online Speakers & Online Session Chairs & Committee Members	
	Online Parallel Session Test AC3101, AC3125, AC3064, AC4162, AC2038, AC2042, AC7025, AC7027, AC3094 AC3113, AC3121, AC2051, T02, AC504, AC2058, AC4184, AC1011, AC3114 AC2039, AC3076, AC3072, AC4175, AC1014, AC1020, AC6017, AC7023, AC4164, AC3095 AC4165, AC1026, AC3097, AC4201, AC1016, AC3117, AC1022, AC3077, AC4154, AC3122	

Full Program

►Conference Schedule Overview

June 18, 2026 / UTC+2

Opening Ceremony & Onsite Schedule

Time	Onsite Schedule	
	Hotel Mercure Wien Westbahnhof Address: Felberstraße 4, Rudolfsheim, Vienna, Austria | Ground Floor	
8:00-9:00	**Onsite** Registration & Sign-in & Collecting Materials	Wien 1-2
Opening Ceremony **Host: Vitaliy Mezhuyev, FH JOANNEUM University of Applied Sciences, Austria**		Wien 1-2
9:00-9:10	**Opening Remarks** Vitaliy Mezhuyev, FH JOANNEUM University of Applied Sciences, Austria	
9:10-9:55	**Keynote Speaker I** **Franz Haas, Graz University of Technology, Austria** Speech Title: The Evolution of Humanoid Robots: Current Developments and Future Directions	
9:55-10:30	**Group Photo & Coffee Break**	
10:30-11:15	**Keynote Speaker II** **Martin Tschandl, FH JOANNEUM University of Applied Sciences, Austria** Speech Title: Bridging the Gap: AI and Digital Transformation in Manufacturing-Insights from the Smart Production Lab, FH Joanneum, Kapfenberg	
11:15-12:00	**Keynote Speaker III** **Peter Peer, University of Ljubljana, Slovenia** Speech Title: Generalized Face Morphing Attack Detection	
12:00-14:00	**Lunch & Break | Location: Restaurant**	

►Conference Schedule Overview

June 18, 2026 / UTC+2

Time	Onsite Schedule	
	Parallel Sessions	
14:00-15:45	**Session 1 - Biomedical Imaging and Healthcare AI** **Session Chair: Preetham Kumar, Manipal Institute of Technology Manipal Academy of Higher Education Manipal, India** AC1012, AC4188, AC2059, AC2032, AC1029, AC3116, AC4182	Wien 1
	Session 2 - Cybersecurity, Privacy and Information Assurance **Session Chair: Yan Bai, University of Washington Tacoma, USA** AC3104, AC4199, AC6013, AC1002, AC1017	Wien 2
	Session 3 - Emerging Technologies and Advanced Computing **Session Chair: Prabhat. K. Mahanti, University of New Brunswick, Canada** AC3109, AC4191, AC1023, AC7021, AC7026, AC7024, AC1018	Wien 3
15:45-16:20	**Coffee Break**	
16:20-18:05	**Session 4 - Enterprise Architecture and Digital Transformation** **Session Chair: Luigi Benedicenti, University of New Brunswick, Canada** AC3075, AC3065, AC3098-A, AC3136, AC4181, AC2037	Wien 1
	Session 5 - Industrial AI and Intelligent Automation **Session Chair: Vitaliy Mezhuyev, FH JOANNEUM University of Applied Sciences, Austria** AC3087, AC3102, AC4176, AC5011, AC506, AC507, AC6016	Wien 2
18:05-20:00	**Dinner | Location: Restaurant**	

Full Program

►Conference Schedule Overview

June 19, 2026 / UTC+2

Time	Online Schedule
	Parallel Sessions
10:00-12:15	**Session A - AI in Healthcare, Agriculture and Environmental Science** **Session Chair: Nik Azlina Nik Ahmad, Universiti Kuala Lumpur, Malaysia** ZOOM Link: https://us02web.zoom.us/j/81187445500 Password: 061719 AC3101, AC3125, AC3064, AC4162, AC2038, AC2042, AC7025, AC7027, AC3094
	Session B - Software Engineering, Digitalization, and Intelligent Systems Optimization **Session Chair: Sergi Batalla, FH Joanneum, Austria** ZOOM Link: https://us02web.zoom.us/launch/jc/85902467479 Password: 061719 AC3113, AC3121, AC2051, T02, AC504, AC2058, AC4184, AC1011, AC3114
12:15-13:30	**Break**
13:30-16:00	**Session C - Cybersecurity, Network Resilience, and Communication Infrastructures** **Session Chair: Mujeeb Ur Rehman, Montfort University, UK** ZOOM Link: https://us02web.zoom.us/j/81187445500 Password: 061719 AC2039, AC3076, AC3072, AC4175, AC1014, AC1020, AC6017, AC7023, AC4164, AC3095
	Session D - NLP, Agentic AI, and Intelligent Enterprise Applications **Session Chair: Jan Fesl, FIT CTU in Prague, Czech Republic** ZOOM Link: https://us02web.zoom.us/launch/jc/85902467479 Password: 061719 AC4165, AC1026, AC3097, AC4201, AC1016, AC3117, AC1022, AC3077, AC4154, AC3122

►Keynote Speakers

June 18, 2026 / UTC+2

9:10-9:55 | Location: Wien 1-2 - Ground Floor | Onsite Talk

Franz Haas
Graz University of Technology, Austria

Bio: Franz Haas took over his family's mechanical engineering business after graduating at Graz University of Technology and specialized it to precision manufacturing. At the same time, he was a lecturer and professor at the FH Campus 02 and FH Joanneum Universities of Applied Sciences. Since 2013, he has headed the Institute of Production Engineering at Graz University of Technology, which currently employs around 30 researchers in four main areas of work. The build-up of the Smart Factory as a centre for digital transformation is worth highlighting. He has been Dean of the Faculty of Mechanical Engineering and Economic Sciences since 2020 and was from 2018 to 2020 president of the ÖWGP, the Austrian Scientific Association for Production Engineering.

Speech Title: **The Evolution of Humanoid Robots: Current Developments and Future Directions**

Abstract: This presentation reviews the latest developments and emerging trends in humanoid robotics, with a focus on the interaction of mechanical design, motion control, and AI-driven decision-making. On the hardware side, improvements in lightweight structures, compact actuators, tactile sensing, and battery technology are enabling better mobility, dexterity, and energy efficiency. On the software side, advances in generative and physical AI are expanding the ability of humanoid robots to interpret instructions, learn from demonstration, and adapt to unstructured environments.

►Keynote Speakers

June 18, 2026 / UTC+2

10:30-11:15 | Location: Wien 1-2 - Ground Floor | Onsite Talk

Martin Tschandl
FH JOANNEUM University of Applied Sciences, Austria

Bio: PhD (Social and Economic Sciences), Karl-Franzens-Universität Graz, Austria, 1993. Research semester at NYU, USA. Held several finance and IT responsibilities in industrial and service companies from 1991–1998. Subsequently professor of Business Administration and Controlling, and since 2001 head of the Industrial Engineering Institute "Industrial Management" at FH JOANNEUM – University of Applied Sciences, Austria. Visiting professor at four international universities. Head of the Austria II working group of the International Controller Association (ICV); member of the International Group of Controlling (IGC); member of the board of the Logistics Network Association (VNL) and of the Austrian Association of Industrial Engineers. Author of more than 140 scientific publications and editor of the book series Industrial Management. Teaching and research focus: planning and control, strategic corporate development, management of logistics, and digital finance (forecasting, RPA). Involved in more than 70 research and industry projects on these topics.

Speech Title: **Bridging the Gap: AI and Digital Transformation in Manufacturing – Insights from the Smart Production Lab, FH Joanneum, Kapfenberg**

Abstract: As a leading hub for Industry 4.0, the Smart Production Lab at FH JOANNEUM Kapfenberg serves as a critical bridge between academic research and the evolving requirements of the Austrian industrial sector. This keynote explores the digital transformation journey through the lens of diverse industrial use cases developed in collaboration with top-tier manufacturing partners. The presentation examines the strategic deployment of Artificial Intelligence and Machine Learning to solve complex production challenges, specifically focusing on how predictive quality control and data-driven optimization enhance industrial efficiency.

►Keynote Speakers

June 18, 2026 / UTC+2

11:15-12:00 | Location: Wien 1-2 - Ground Floor | Onsite Talk

Peter Peer
University of Ljubljana, Slovenia

Bio: Peter Peer is a Full Professor at the Faculty of Computer and Information Science, University of Ljubljana (UL), Slovenia, where he heads the Computer Vision Laboratory, is a member of the Faculty senate, a member of the Faculty management board, and coordinates the double degree study program with the Kyungpook National University (KNU), South Korea. He received his PhD in computer science from UL in 2003. Within his post-doctorate he was an invited researcher at CEIT, San Sebastian, Spain. His research interests focus on biometrics and computer vision. He participated in several national and EU funded R&D projects and published over 150 research papers in leading international peer reviewed journals and conferences. He is a co-organizer of a number of competitions at top-tier biometrics conferences. He serves as an executive editor at ICT Express, as an associated editor of IET Biometrics and IEEE Access, and as a topical advisory panel member of MDPI Applied Sciences. He is a member of the EAB, IAPR, and IEEE. Each year he reviews for top-tier conferences. In the past he also served as a chairman of the Slovenian IEEE Computer chapter for four years and guest edited a number of special issues in different SCI journals. He was a guest professor at the North-Caucasus Federal University and KNU and served at the Faculty as a vice-dean for economic affairs for four years. At present he also serves as the chairman of the Slovenian Pattern Recognition Society.

Speech Title: **Generalized Face Morphing Attack Detection**

Abstract: Face morphing attacks pose a growing threat to biometric systems, exacerbated by the rapid emergence of powerful generative techniques that enable realistic and seamless facial image manipulations. Self-supervised learning has emerged as an effective paradigm for morphing attack detection, where simulated artefacts allow models to learn decision boundaries that are not tied to specific attack types. Experimental results across nine standard benchmark datasets confirm that such approach can substantially reduce detection errors, outperforming both traditional supervised and unsupervised baselines in cross-manipulation scenarios by large margins. Notably, such approach excels on modern, high-quality morphs generated by GAN and diffusion-based morphing methods, demonstrating its robustness and strong generalization capability. Findings underscore the importance of generalization-driven strategies in combating evolving threats posed by synthetic facial manipulations.

►Onsite Sessions

► Session 1: Biomedical Imaging and Healthcare AI

► Session Chair: Preetham Kumar, Manipal Institute of Technology Manipal Academy of Higher Education Manipal, India

► 14:00-15:45 | June 18, 2026 | Location: Wien 1, Ground Floor

► AC1012, AC4188, AC2059, AC2032, AC1029, AC3116, AC4182

AC1012 14:00-14:15	Brain Activity Classification through Privacy-Preserving and Distributed Explainable Convolutional Neural Network Author(s): Francesco Mercaldo, Hubert Scholnast, Oliver Eigner, Marta Petyx, Patrizia Agnello, Antonella Santone, Mario Cesarelli, Fabio Martinelli, Paul Tavolato Presenter: Francesco Mercaldo, University of Molise, Italy Abstract: Accurate classification of brain activity is essential for the early detection and management of neurological disorders, particularly epilepsy. Traditional manual analysis of electroencephalography recordings is time-consuming and prone to errors, motivating the need for automated, reliable, and explainable approaches. In this paper, we propose a privacy-preserving and explainable method for brain activity classification using convolutional neural networks by means of federated machine learning. Raw electroencephalography signals are preprocessed and transformed into continuous wavelet transform images, which serve as input for a classification model. The federated learning setup allows multiple decentralized clients to collaboratively train a global model without sharing sensitive electroencephalography data, by ensuring data privacy. To provide explainability, we employ the Gradient-weighted Class Activation Mapping to highlight the regions of continuous wavelet transform images most influential to model predictions. Experimental results on a real-world electroencephalography dataset demonstrate the effectiveness of the proposed method, achieving an accuracy of 0.761, maintaining stable performance across clients, showing that the proposed method can be suitable for real-world deployment in healthcare settings.
AC4188 14:15-14:30	A Novel Neuro-Focus Fusion Framework for Fully Focused Microscopic Imaging Author(s): Beyza Akturk, Ramazan Ozgur Dogan, Umit Uzun, Sena F. Sezen, Hulya Dogan Presenter: Hulya Dogan, Karadeniz Technical University, Turkey Abstract: A fundamental constraint in high-magnification mi- croscopy is the inherently restricted Depth of Field (DoF), which prevents cellular structures at various depths from being captured with comprehensive clarity in a single image. While traditional focus stacking and deep learning methods attempt to resolve this by merging sequential Z-stacks, they often in- troduce structural discontinuities, residual blur, and artifacts at complex tissue boundaries. This study proposes Neuro-Focus Fusion (NFF), a novel architecture based on Implicit Neural Representation (INR) to synthesize optimal all-in-focus images. Unlike conventional pixel-selection approaches, NFF models the focused scene as a continuous differentiable function parame- terized by a deep Multi-Layer Perceptron (MLP). To effectively capture high-frequency focal details, the

framework processes spatial coordinates through a 42-dimensional positional encoding. Experimental evaluations on diverse biological and industrial Z- stack sequences demonstrate that NFF consistently achieves state- of-the-art performance across all no-reference quality metrics, including NIQE, BRISQUE, PSI, and Entropy. Notably, the proposed framework produces visibly sharper reconstructions with superior edge preservation, effectively eliminating the visual blur typical of existing fusion methods. The results confirm that the NFF framework provides a robust and adaptable solution for precision imaging in digital pathology and material science.

AC2059
14:30-14:45

STRUCTURE-GUIDED ADAPTATION NETWORK FOR ULTRASOUND IMAGE SEGMENTATION

Author(s): Marwa Chendeb EL Rai, Aicha Beya Far, Muna Darweesh
Presenter: Marwa Chendeb EL rai, American University in Dubai, United Arab

Abstract: Segmentation of ultrasound images remains a challenging task due to speckle noise, blurred boundaries, and high variability in lesion appearance. Although deep neural networks have achieved strong performance, their learned visual representations do not explicitly capture the structural cues that drive tissue differentiation in ultrasound imaging. In this paper, we present SGAUS-Net, a general structure guided adaptation architecture for ultrasound lesion segmentation. The model combines a pretrained ultrasound encoder, a UNet–style decoder, and a lightweight Structure-Guided Adaptation (SGA) module that injects explicit gradient based and high-frequency cues into the encoder feature hierarchy. These structural cues refine the encoder feature maps by strengthening boundary related responses and suppressing speckle dominated regions. Training proceeds in two phases: an initial encoder–decoder pretraining stage without structural cues, followed by a structure guided transfer stage in which the encoder is frozen and only the SGA modules and decoder are updated. SGAUS-Net is evaluated on two benchmark ultrasound datasets, TN3K and BUSI. Across both datasets, SGAUS-Net achieves state-of-the-art performance, yielding the highest Dice and mIoU scores while significantly reducing HD95 compared to existing methods.

AC2032
14:45-15:00

Assessing the Effectiveness of Pre-Trained Models in Categorizing DME on Retinal OCT Images Under Limited Data Transfer Learning

Author(s): Pavithra K C, Preetham Kumar, Geetha M, Sulatha V Bhandary, Shailaja S
Presenter: Preetham Kumar, Manipal Institute of Technology Manipal Academy of Higher Education Manipal, India

Abstract: The most prevalent cause of visual impairment in diabetic individuals remains diabetic macular edema (DME). Clinicians frequently use optical coherence tomography (OCT), a retinal scanning method to assess DME in patients. Computeraided diagnosis based on deep learning (DL) and OCT has emerged as a crucial tool in the clinical diagnosis of DME. The major downside of DL is that it necessitates massive data for model training. The relatively small size of the medical datasets renders them unsuitable for training DL models. Most of the time, conventional knowledge augmentation fails to deliver the expected outcomes. Adopting transfer learning (TL) is a reasonable strategy

	to address this problem. The present research reviewed seven pre-trained models using both public and private DME OCT datasets in an effort to identify the bestperforming model without employing data augmentation. The statistical measures, accuracy (AC), specificity (SP), sensitivity (SE), and precision (PR) are assessed. Further, model predictions are presented through gradient-weighted class activation mapping (Grad-CAM) heatmaps, revealing valuable insight into the decision-making process. Inception-V3 achieved outstanding results on both the public (AC=98%, SP=100%, SE=96%, and PR=100%) and private (AC=97%, SP=98%, SE=96%, and PR=97.96%) datasets. DenseNet201 achieved good results (AC=97%, SP=94%, SE=100%, and PR=94.34%) on the private dataset and satisfactory scores (AC=86%, SP=94%, SE=78%, and PR=92.86%) on the public dataset. These models can aid DME-OCT categorization when the training data are scarce and augmentation fails to produce representative samples. We expanded our efforts under limited data conditions by performing experiments with 3, 5, and 10 samples per class, leveraging the same TL models on both datasets in order to further explore model resilience in data-scarce scenarios.
AC1029 15:00-15:15	Smart Health Care Application of RFID Technology For Enhancing Hospital Operations and Patient Safety Author(s): Ahed Abugabah, Ahmad Mohammad Al-Smadi Presenter: Ahed Jabor Abugabah, Zayed University, UAE Abstract: Patient safety and efficiency require efficient and real-time information to support healthcare operations. Traditional barcode systems are cheap and have limitations of manual scanning, a limited range of reading, and are prone to wear, which is unacceptable in dynamic hospitals. In order to overcome these constraints, this paper develops and assesses a safe, high-performance Radio Frequency Identification (RFID) solution in healthcare deployment. The suggested system incorporates optimal infrastructure planning, time-window filtering, using middleware to remove redundant reads, and AES-128 authenticated encryption to guarantee the security of data. It was implemented using a simulation model, calibrated to EPC Gen2 and ISO/IEC 18000-6C standards, under the usual conditions in a hospital (915 MHz, 2 W ERP). Findings indicate a detection rate of 96.8%, a latency of 120 ms, throughput of 180 tags/s, and a packet loss of 1.2. By approximately 97 percent, Middleware filtering eliminated redundant reads, with encryption incurring a 1.9 percent overhead on the latency. A cost-benefit analysis of a 300-bed facility shows that it will break even within a period of about 22 months. The results prove RFID to be a valid, safe, and deployable technology that can be used to modernize healthcare processes and improve patient safety immediately.
AC3116 15:15-15:30	Detecting Pen-In-Air States from Video: A Proof-of-Concept Toward Complementary Handwriting Analysis Author(s): Lauren Sismeiro, Rémy Plastre, Binbin Xu, Frédéric Puyjarinet, Gérard Dray Presenter: Lauren Sismeiro, Univ Montpellier, France Abstract: Dynamic aspects of handwriting are critical for assessing developmental disorders such as dysgraphia and are typically captured using digitizing tablets. Tablet-

	based sensing is limited to a short proximity range above the writing surface, which can miss high-lift in-air movements. This restricts observation of Pen-Up behavior that may be informative for handwriting analysis. As a proof of concept, we investigate whether top-view video can provide a complementary source of information for inferring pen-contact states without relying on tablet proximity sensing. We propose an interpretable hybrid pipeline combining pen-tip tracking using a YOLO-based detector with kinematic feature extraction and machine learning classification. A pilot dataset of diverse handwriting videos was manually annotated at the frame level and evaluation used a Leave-One-Video-Out (LOVO) protocol. The method achieved reliable event-level detection of Pen-Up segments, with an F_2 score up to 0.805, consistent with the emphasis on recall in a screening-oriented setting. These results support the feasibility of video-based Pen-Up detection as a low-cost and non-intrusive complement to digitizing tablets, and provide a foundation for future large-scale studies.
AC4182 15:30-15:45	Mechanism of Action of Pharmacological Agents: A New Deep Learning-based Prediction Model Using Smooth Muscle Contractility Signals Author(s): Fatma Tuana Dogu, Ramazan Ozgur Dogan, Hulya Dogan, Ilyas Ay, Zain Kalha, Yesim Kaya Yasar, Sena F. Sezen Presenter: Hulya Dogan, Karadeniz Technical University, Turkey Abstract: Understanding the mechanisms of action (MoA) of pharmacological agents is fundamental to experimental pharma- cology and drug discovery, as it provides insight into the molec- ular interactions that drive physiological responses. In smooth muscle studies, mechanism of action is often inferred from contractility signals, which exhibit complex temporal dynamics characterized by variations in amplitude, frequency, duration, and relaxation behavior. However, the analysis of these signals remains challenging due to their intrinsic variability and the reliance on manual interpretation. To address these challenges, a novel and curated 1D smooth muscle contractility dataset consisting of 578 digitized signals was constructed to address the lack of standardized datasets for pharmacological mechanism of action analysis. A hybrid deep learning-based model was pro- posed to capture complex temporal dependencies in non-linear and non-stationary contractility signals without requiring manual feature engineering. The proposed model outperforms classical machine learning and deep learning models in all evaluation metrics, achieving an accuracy of 0.8046, a precision of 0.8097, a sensitivity of 0.7651, and an F1-Score of 0.7763. These results demonstrate the potential of the proposed approach for robust, objective, and scalable analysis of pharmacological contractility signals in automated mechanism of action prediction.

►Onsite Sessions

► Session 2: Cybersecurity, Privacy and Information Assurance

► **Session Chair: Yan Bai, University of Washington Tacoma, USA**
► 14:00-15: | June 18, 2026 | Location: Wien 2, Ground Floor
► AC3104, AC4199, AC6013, AC1002, AC1017

AC3104 14:00-14:15	Correct-by-Construction Access Control: Formal Threat Modeling and Verification with Event-B Author(s): Timur Umarov, Nurislam Umarov, Oybek Ablakulov Presenter: Nurislam Timurovich Umarov, SRH University of Applied Sciences, Germany Abstract: Today secure systems grow more interconnected and context-sensitive. Traditional heuristic threat modeling and post-hoc access control validation fall short where mathematical precision and compliance guarantees are required. In this paper, we show how Event-B can be used for correct-by-construction access control through set-theoretic modeling and stepwise refinement. We formally specify both Role-Based Access Control and Attribute-Based Access Control logic, enriched with dynamic constraints including user roles, physical location, session validity, and system security state. Threat vectors such as privilege escalation, session replay, and post-compromise misuse are structurally eliminated through formal invariants and guarded events rather than detected after the fact. We instantiate the framework in Stratum, a concrete enterprise document management scenario spanning five roles, three resource sensitivity tiers, and zonebased access constraints, and trace each of four successive refinement levels to a specific, formally eliminated attack scenario. Using the Rodin platform, we discharge twenty-five proof obligations confirming that all critical access control invariants are preserved across the full refinement chain. The result is a scalable, evidence-driven methodology that connects high-level security policy design to low-level formal assurance, with direct applicability to regulated, security-critical domains.
AC4199 14:15-14:30	HONDAR-5G: A Stateful Sandbox-Based Containment Mechanism for 5G Core Attacks Author(s): Aitor Landa-Arrue, Jasone Astorga, Iñaki Garitano, Aitor Urbieta Presenter: Aitor Landa-Arrue, Ikerlan Technology Research Centre (BRTA), Spain Abstract: This paper presents HONDAR-5G, a post-detection containment mechanism for registration-oriented flooding against AMF-facing procedures in 5G core networks. After an external alert, instantiated in our testbed with Suricata rules, HONDAR-5G combines NG-Reset, PCF service-area restriction, and proxy-mediated service-path mutation. Suspicious N1/N2 and N3 traffic is redirected from production functions to a stateful sandboxed core, while benign UE are forced to re-register through allowed radio contexts. The sandbox reuses persistent service state from the legitimate 5GC and supports post-containment analysis through an SBA-aware monitoring sensor. We evaluate HONDAR-5G with PacketRusher-generated flooding from two gNB. Packet captures show when suspicious traffic becomes visible on the sandboxed path, and host measurements show that production AMF CPU load decreases after service-path mutation and backlog drain. Once the proxy forwards traffic on the sandboxed path,

	proxy-to-sandbox propagation remains below 30 ms in the analyzed traces. Dynamic sandbox readiness reaches 77.46 s using a RAID-1 mirror split. The results provide initial evidence that stateful sandbox redirection can reduce production exposure while preserving forensic visibility, although scalability across repeated trials, UE-visible disruption, and sandbox detectability remain future work.
AC6013 14:30-14:45	A Zero-Trust Boot Protocol for Eliminating Router Boot-Time Vulnerability Windows Author(s): Abdulai Tamba Lebbie, Peter Schartner Presenter: Abdulai Tamba Lebbie, University of Klagenfurt, Austria Abstract: Consumer routers mediate traffic for billions of IoT devices, yet their boot sequences prioritize plug-and-play convenience over security. We demonstrate that mainstream router firmware exposes management interfaces with default credentials for 40–50 seconds (OpenWrt) or near-instantaneously (commercial firmware) before any security configuration is applied. This reproducible vulnerability window has enabled large-scale IoT botnets such as Mirai to compromise hundreds of thousands of devices through automated credential stuffing and internet-wide scanning. We present the Zero-Trust Boot Protocol (ZTBP), which architecturally eliminates this exposure by inverting the boot sequence from connect-then-secure to secure-then-connect. ZTBP enforces two defensive mechanisms: (1) a fail-closed boot state with captive Wi-Fi-based provisioning that disables WAN connectivity until cryptographic credentials are established and (2) VLAN-based management-plane isolation (VLAN 99) that prevents both WAN-originated scanning and lateral movement from the standard LAN. Implementation on OpenWrt 23.05.2 demonstrates complete elimination of boottime default-credential attacks and Shodan-style WAN discovery, with only 0.4 seconds of additional boot overhead, no specialized hardware requirements, and alignment with the EU Cyber Resilience Act and UK PSTI Act.
AC1002 14:45-15:00	A Method for Android Malware Detection and Malicious Payload Identification through Explainable Federated Vision Transformer Author(s): Francesco Mercaldo, Sebastian Schrittwieser, Patrick Kochberger, Marta Petyx, Patrizia Agnello, Antonella Santone, Fabio Martinelli, Paul Tavolato Presenter: Francesco Mercaldo, University of Molise, Italy Abstract: Mobile malware detection on resource-constrained and privacy-sensitive devices is currently a challenging problem, particularly as modern threats evolve rapidly and traditional centralized learning approaches rely on aggregating raw data from distributed endpoints. In this paper, we propose a privacy-preserving and explainable approach for on-device Android malware detection and payload identification using opcode-based image representations. The proposed method exploits a Vision Transformer model and two aggregation strategies i.e., FedAvg and FedProx, under different client configurations and learning rates to quantify their robustness and generalization capability. Experimental results demonstrate that the proposed approach obtains interesting performance, with FedProx showing improved stability in heterogeneous client environments. Moreover, with the aim to provide explainability behind the malware detection prediction, we consider attention heatmaps for visual

	explainability of model decisions. In this way we can show to cybersecurity analysits the relevat opcode regions symptomatic of the malicious payload from the model point of view, thus performing malicious payload identification. We evaluate the proposed method on a real-world dataset composed by 8000 (malware and trusted) Android applications, obtaininig interesting results in terms of accuracy and from the malicious payload identification point of view, supporting privacy preservation across diverse edge devices.
AC1017 15:00-15:15	CyberJustice Tutor: An Agentic AI Framework for Cybersecurity Learning via Think–Plan–Act Reasoning and Pedagogical Scaffolding Author(s): Baiqiang Wang, Yan Bai, Juan Li Presenter: Yan Bai, University of Washington Tacoma, USA Abstract: The integration of Large Language Models (LLMs) into cybersecurity education for criminal justice professionals is currently hindered by the ”statelessness” of reactive chatbots and the risk of hallucinations in high-stakes legal contexts. To address these limitations, we propose the CyberJustice Tutor, an educational dialogue system powered by an Agentic AI framework. Unlike reactive chatbots, our system employs a ”Think–Plan–Act” cognitive cycle, enabling autonomous goal decomposition, longitudinal planning, and dynamic context main- tenance. We integrate a Pedagogical Scaffolding Layer grounded in Vygotsky’s Zone of Proximal Development (ZPD), which dynamically adapts instructional support based on the learner’s real-time progress. Furthermore, an Adaptive Retrieval Aug- mented Generation (RAG) core anchors the agent’s reasoning in verified curriculum materials to ensure legal and technical accuracy. A comprehensive user study with 123 participants, including students, educators, and active law enforcement officers, validated the system’s efficacy. Quantitative results demonstrate high user acceptance for Response Speed (4.7/5), Ease of Use (4.4/5), and Accuracy (4.3/5). Qualitative feedback indicates that the agentic architecture is perceived as highly effective in guiding learners through personalized paths, demonstrating the feasibility and usability of agentic AI for specialized professional education.

►Onsite Sessions

► Session 3: Emerging Technologies and Advanced Computing

► **Session Chair: Prabhat. K. Mahanti, University of New Brunswick, Canada**
► 14:00-15:45 | June 18, 2026 | Location: Wien 3, Ground Floor
► AC3109, AC4191, AC1023, AC7021, AC7026, AC7024, AC1018

AC3109 14:00-14:15	Beyond Reactive Scaling: AutoML-Driven Resource Orchestration for Cloud Data Centers Author(s): Daniel Ramirez Bumaguin, Mustafa Daraghmeh, Mohib Magbool, Dariush Ebrahimi Presenter: Dariush Ebrahimi, Wilfrid Laurier University, Canada Abstract: Cloud computing platforms rely on elastic autoscaling to balance SLA compliance with energy efficiency, yet reactive autoscaling suffers from provisioning latency that degrades performance during sudden workload spikes. We propose a hybrid predictive-scaling framework that uses AutoML to identify effective regression models for workload forecasting and couples them with a reactive failsafe. Using Alibaba Cluster (2018) traces and ECLYPSE event-driven simulation, we benchmark the approach against a reactive baseline. The results show that minimizing prediction error (RMSE) does not necessarily yield the best autoscaling behavior. A Random Forest-based policy reduced SLA violations by 91% relative to the reactive baseline, while ECLYPSE emulation sustained an average of only 3.23 active nodes out of 20, indicating strong infrastructure consolidation without sacrificing service guarantees.
AC4191 14:15-14:30	Approach for a Data-Oriented Decision-Making Methodology for Always-Encrypted Database Concepts Author(s): Gabriel Simmann, Reiner Kriesten Presenter: Gabriel Simmann, Karlsruhe University of Applied Sciences, Germany Abstract: The increasing use of sensitive data in cloud environments necessitates the implementation of robust mechanisms to protect data confidentiality. Software-based, always-encrypted databases allow data to be queried and processed in an encrypted form, thereby protecting it from unauthorized access by cloud service providers and malicious actors. Existing solutions are based on various cryptographic mechanisms, including onion encryption, homomorphic encryption, and structured encryption. Each of these mechanisms has specific security, functionality, and performance characteristics. However, there is currently no universally applicable concept that fulfills all three criteria optimally. This makes it challenging for cloud architects to apply these concepts in practice, as selecting a suitable concept for a particular use case requires in-depth knowledge in cryptography. To address this challenge, this work presents a methodology approach for making data-oriented decisions when selecting suitable always-encrypted database concepts for specific use cases. The approach involves a systematic analysis and categorization of existing always-encrypted database concepts regarding their characteristics, strengths, and weaknesses. Furthermore, a framework will be developed

	to describe use case requirements. Finally, a matching algorithm will link these aspects to suggest suitable solutions semi-automatically based on the use case requirements.
AC1023 14:30-14:45	Adaptive Hyperledger Besu Blockchain Applications in Healthcare Author(s): Jackey Cheung, Toddy Cheng, SM Yiu Presenter: Jackey Cheung, The Chinese University of Hong Kong, China Abstract: This paper investigates adaptive blockchain computer applications in healthcare using Hyperledger Besu to improve data security, integrity, and interoperability. Besu enables applications such as electronic health records, clinical trial management, pharmaceutical supply chains, and Healthcare Internet of Things (IoHT) systems, but their performance is difficult to optimize due to dynamic and heterogeneous healthcare workloads. We evaluate adaptive performance tuning of Besu by adjusting key parameters, including block size, block time, gas limit, and consensus mechanisms. Using Hyperledger Caliper, we benchmark PoA algorithms (QBFT, IBFT 2.0, and Clique) under simulated IoHT workloads, measuring throughput, latency, and resource usage. Results show that block size and block time significantly influence application performance, highlighting the need for runtime adaptability. To address this, we develop an adaptive auto-tuning application based on an adaptive-width tunnel-limiter that dynamically adjusts blockchain parameters according to network conditions and hospital workloads. We further propose ABCD-IoHT, an adaptive blockchain computing framework integrating Besu with multi-level tuning. Experiments demonstrate improved throughput while maintaining healthcare-grade reliability and security. We also introduce the Throughput–Latency Ratio (TLR) as a sensitive metric for evaluating performance trade-offs. This work advances adaptive, resource-efficient blockchain applications for scalable healthcare systems.
AC7021 14:45-15:00	Noncoherent Bistatic Integrated Sensing and Communications-Part II: Heisenberg Group Based Waveform Design Author(s): Husheng Li Presenter: Husheng Li, Purdue University, USA Abstract: Integrated sensing and communications (ISAC) is expected to be one of the major pilars of 6G wireless cellular networks. For the communication receiver in bistatistc ISAC, both the communication messages w and the environment H are unknown. Therefore, it is of critical importance to design waveforms in order to avoid the ambiguity in decoding the communication messages w and estimating the environment information H from the received signal $H(w)+n$ (where n is the noise). In the second part of this paper, the focus is shifted to the transmitter side, for optimizing the waveform w. The avoidance of ambiguity is guaranteed by maximizing the waveform distance within the framework of Heisenberg groups. Numerical simulations show that the proposed scheme generates good waveforms that avoid ambiguity in noncoherent bistatic ISAC.
AC7026 15:00-15:15	Experimental Characterisation and Calibration of USRP E313 Output Power vs. GNU Radio Gain Author(s): Muhammd Hassan, Robert M Edwards, James A Flint, Muhammad Ismail

	Presenter: Muhammad Hassan, Loughborough University, United Kingdom Abstract: This paper presents an experimental calibration of the Ettus Research USRP E313 transmit chain at 868 MHz, establishing the relationship between the GNU Radio transmitgain setting and absolute RF output power. A continuouswave single-tone signal was generated and measured using a spectrum analyser, a calibrated power sensor, and a second USRP E313 configured as a receiver. The insertion losses of the interconnecting coaxial cable and fixed attenuator were measured separately and applied as correction factors to estimate the power at the E313 RF output port. Results show an approximately linear increase in output power with GNU Radio transmit gain up to the onset of compression, after which deviation from linearity becomes visible. Across the linear region, the spectrum analyser and power-sensor measurements were in close agreement, while the receiving E313 produced comparable trends at a fixed receiver gain. A 12-hour constant-output test indicated stable operation under the measured conditions. These results provide a practical single-frequency calibration of the USRP E313 at 868 MHz and define an operating region suitable for repeatable laboratory RF measurements. This work is intended as a preliminary calibration stage for wider 868 MHz SDR-based RF measurement and channel-modelling experiments.
AC7024 15:15-15:30	High-Precision Pulse Characterisation of the USRP Using Ultra-Fast Serial Data Acquisition Author(s): Muhammad Ismail, Robert Edwards, Muhammad Hassan, James Flint Presenter: Muhammad Ismail, Loughborough University, United kingdom Abstract: Accurate and precise characterisation of the radio frequency (RF) pulses generated by software-defined radio (SDR) such as Universal Software Radio Peripheral (USRP) is very important for the applications that requires precise timing. However, there are some issues associated with software-defined radio generated signals such as inconsistent pulse shapes, signal jitter (J), and rise time (TR). This paper provides a rigorous analysis of the parameters of a pulse signal generated by USRP recorded with the high-speed serial data analyser. The analysis includes various signal's parameters such as (TR), mean pulse width ($\overline{PW}$), instantaneous power IP , signal-to-noise ratio (SNR), noise level across varying pulse widths (PW), and bandwidth (B) configurations. After extensive experimentation, it was concluded that a higher reception sample rate improves temporal resolution and reduces J, leading to a significant decrease in measured (TR).
AC1018 15:30-15:45	Hardware-Partitioned Servers: Architecture and Management Framework Author(s): Chaofan Chen, Jinfeng Li, Baoyang Liu, Jiaming Huang Presenter: Chaofan Chen, IEIT SYSTEMS Co., Ltd., China Abstract: Driven by the growing demands of artificial intelligence and cloud computing, modern data centers face critical challenges in server architecture, including virtualization overhead, low hardware utilization, and escalating total cost of ownership. To address these issues, this paper proposes a novel hardware-partitioned server architecture that physically divides a multi-socket server into isolated partitions, enabling bare-metal

performance, fine-grained resource allocation, and native heterogeneous computing support. We further introduce the Single-BMC Multiple-Partitions (SBMP) management scheme, which overcomes the I/O limitations of conventional Baseboard Management Controllers (BMCs) through a co-designed BMC and Complex Programmable Logic Device (CPLD) framework. Detailed methods for managing CPU/DIMM (via the Platform Environment Control Interface, PECI), I²C devices, and SPI-based Basic Input/Output System (BIOS) updates are developed and integrated into a functional prototype. Experimental results confirm the reliability and full functionality of the proposed system. Economic analysis shows that the SBMP scheme delivers scalable cost reduction, with hardware savings growing linearly with partition count and deployment scale, significantly lowering the total cost of ownership for large-scale data center deployments.

►Onsite Sessions

► Session 4: Enterprise Architecture and Digital Transformation

► **Session Chair: Luigi Benedicenti, University of New Brunswick, Canada**
► 16:20-17:50 | June 18, 2026 | Location: Wien 1, Ground Floor
► AC3075, AC3065, AC3098-A, AC3136, AC4181, AC2037

AC3075 16:20-16:35	A Chatbot-Based Decision Support System Author(s): Heyn Marlene, Sabine Hanusch Presenter: Heyn Marlene, FH JOANNEUM, Austria Abstract: Growing supply chain volatility, increasing complexity, and rising sustainability requirements intensify the need for structured decision support. At the same time, artificial intelligence (AI) offers various opportunities to improve forecasting, risk management, and operational coordination. However, organizations often lack systematic guidance for linking specific supply chain challenges with suitable AI-based solutions, while existing research predominantly focuses on isolated AI applications rather than structured decision-support frameworks. This paper proposes a structured challenge–solution mapping framework that systematically links supply chain challenges with relevant AI methods and enabling technologies. Based on a literature review, key challenges and solution approaches are identified and integrated into a challenge–solution matrix. This matrix is translated into a hierarchical decision logic grounded in the SCOR-DS framework and the 3P model, enabling a multidimensional classification of supply chain challenges. To demonstrate the practical applicability of the framework, the decision logic is operationalized through a rule-based chatbot prototype that guides users from problem identification to technology recommendation. An exploratory expert evaluation provides initial insights into the system's usability and perceived usefulness for structuring supply chain problems, while highlighting limitations regarding domain specificity. The paper contributes a structured mapping framework, a formalized decision logic, and a chatbot-based implementation that operationalizes the framework in an interactive decision-support environment, thereby bridging the gap between conceptual AI capabilities and their practical application in supply chain decision-making.
AC3065 16:35-16:50	Digital Transformation and Technology Adoption in the Construction Industry: A Bibliometric Review Author(s): Gulden Gumusburun Ayalp, Esra Gokce Pekmezci Presenter: Gulden Gumusburun Ayalp, Gaziantep University, Turkey Abstract: Digital technologies are increasingly reshaping the construction industry by influencing how projects are designed, coordinated, and managed. In recent years, concepts associated with digital transformation, supported by technologies such as building information modelling, the Internet of Things, artificial intelligence, and blockchain, have attracted growing attention within construction research. As the volume of studies addressing these developments continues to expand, gaining a systematic understanding of the intellectual structure of this research field has become increasingly important. This study presents a bibliometric review of research on digital transformation

	and technology adoption in the construction industry (DTAiCI). A dataset of 510 publications was analyzed using bibliometric techniques to examine publication trends, leading researchers, influential journals, and the conceptual relationships among key research themes. The findings reveal a significant increase in research activity in recent years and highlight several dominant thematic directions, including digital construction technologies, organizational readiness and innovation processes, system-level digital transformation, and emerging smart construction solutions. By mapping the conceptual structure of the literature, the study provides an overview of the evolution of this research domain and identifies areas that may benefit from further investigation.
AC3098-A 16:50-17:05	Artificial Intelligence Use Cases in Enterprise Architecture: Evidence from Reddit Analysis Author(s): Ayed Alwadain Presenter: Ayed Alwadain, King Saud University, Saudi Arabia Abstract: Organizations have been utilizing AI to develop and optimize their strategic and competitive advantage, as well as to adapt to or disrupt their operations. The potential of AI is realized through its ability to increase automation and accelerate transformation, as well as optimize organizational processes. Research has emphasized the benefits of AI, particularly its ability to improve performance at both the organizational and process levels. The business and technology levels of an organization are impacted by AI applications, which require job modifications, data restructuring, and the rearrangement of the application landscape. Within this broader context, Enterprise Architecture (EA) is among the disciplines being actively reshaped by AI and related intelligent capabilities. Yet, the practical value of AI in EA remains insufficiently understood. The implications of AI integration into EA practice have not been thoroughly investigated, and empirical research on its specific effects remains limited. To address this gap, this study examines practitioner discussions on Reddit to identify the commonly addressed and operationally relevant AI use cases in EA. Specifically, it explores how practitioners are currently applying AI within EA. The findings show that AI adoption is already in progress and is not limited to a limited set of tasks. Instead, it spans governance, repository management, architecture artifact generation, communication support, and emerging agentic workflows. In doing so, A is strengthening core architectural functions by reducing documentation demands, accelerating analysis, and improving business and technology decisions. The findings offer a practitioner-oriented perspective on AI in EA, illustrating a profession navigating tension between continuity and transformation. On one hand, AI is used to improve existing EA processes such as EA governance and EA repository maintenance. On the other hand, it enables experimentation with novel operational models that may reshape how architectural work is organized and delivered. Accordingly, the influence of AI on EA should be seen not as a singular disruptive shift, but as a series of interconnected adjustments unfolding across the administrative, methodological, analytical, and strategic dimensions of the discipline.
AC3136 17:05-17:20	AI-Based Dataset Assessment of Dataset DCAT Compliance Author(s): Philippe Bourdenet, Cédrick Lelionnais, Louis Delvig, Sebastian Dubiel, Martin Köppel

	Presenter: Cedrick Lelionnais, Philippe Bourdenet, SNCF Voyageurs, France Abstract: This paper investigates the role of structured metadata in enabling the reuse and scalability of AI datasets within a Data Factory context, building on work conducted in the EU-Rail partnership, particularly the R2DATO project [1][2] and the Data Factory workstream (WP7). It positions the European DCAT-AP standard as the core technology for dataset description and explores its extension to address AI-specific requirements in the railway domain. The study is based on an experimental approach using a minimal multimodal dataset (RGB camera + 3D LiDAR, around 100 entries per sensor), designed as a sandbox to surface methodological challenges early. Results show that, regardless of dataset size, a consistent descriptive framework remains essential: structured metadata makes implicit assumptions explicit, clarifies dataset characteristics, and supports reuse beyond the original context. The contribution is threefold: (i) experimental validation of the need for rigorous DCAT-AP–compliant metadata even at small scale; (ii) definition of extended DCAT-AP profiles tailored to AI datasets in the railway domain, including sensor modalities, acquisition conditions, annotations, and object classes; and (iii) development of a prototype API that operationalizes these metadata to compute automated indicators of DCAT compliance and AI readiness. Overall, the results highlight that standardization is not only a technical requirement but a key enabler for building sustainable AI data infrastructures. Early investment in structured and extensible metadata models is shown to be critical for supporting dataset reuse, interoperability, and long-term scalability within Data Factory-based AI systems.
AC4181 17:20-17:35	Sentiment Analysis and Topic Modeling on Artificial Intelligence use in Enterprise Architecture Author(s): Ayed Alwadain Presenter: Ayed Alwadain, King Saud University, Saudi Arabia Abstract: Artificial intelligence (AI) has a significant impact on enterprise architecture (EA). It brings new capabilities, changing how organizations plan and develop their EA practices. Despite the widespread interest in AI's capabilities, empirical research on EA practitioners' opinions and acceptance remains limited. Social networks, such as Reddit, host valuable professional discussions in which professionals share opinions, experiences, and issues. This study aims to understand the sentiments of EA professionals regarding AI and to explore the main topics of AI in EA discussions. This exploratory pilot study employed NLP techniques on Reddit posts centered on AI within the EA domain. In particular, sentiment analysis and topic modeling were used. The overall sentiment analysis indicates that most comments carried positive sentiments regarding the use of AI within EA. Nevertheless, despite the overall positive sentiment, there were some negative sentiments, particularly in discussions surrounding the practical implementation of AI and specific technical challenges. LDA topic modeling resulted in three topics: AI Adoption in EA, EA Documentation and Operations, and AI Agent Implementation and Workflows. While LDA provides high-level themes, BERTopic analysis offers more granular topics, ranging from foundational EA issues to emerging agentic and AI-assisted practices. EA practitioners view AI as a transformative enabler,

	though interest declines when discussions move from generic AI potentials to actual implementations. This study establishes a proof-of-concept for social media mining as an approach to understand EA practitioner discussions.
AC2037 17:35-17:50	Proportional Intuitionistic Fuzzy Sets for Decision Modeling in AI-Enabled Supply Chains Author(s): Fethullah Göçer Presenter: Fethullah Gocer, Kahramanmaraş Sütçü İmam University, Turkey Abstract: Modern supply chains operate in environments characterized by high levels of uncertainty stemming from volatile demand, global disruptions, accelerated digital transformation, and rising sustainability requirements. In such settings, decision makers are often required to evaluate strategic alternatives using information that is incomplete, imprecise, and inherently subjective, limiting the effectiveness of conventional deterministic and crisp multi-criteria decision-making (MCDM) approaches. To address this challenge, this study proposes an integrated decision-making framework based on Proportional Intuitionistic Fuzzy Sets (PIFS) and the MULTIMOORA method for the evaluation of Artificial Intelligence (AI) enabled supply chain strategies. By incorporating proportional relationships between membership, non-membership, and hesitation degrees, the proposed framework provides a more realistic representation of expert judgment than traditional intuitionistic or hesitant fuzzy models. The framework is applied to the assessment of five AI-driven supply chain solutions, including demand forecasting, predictive logistics, and autonomous decision-support systems, evaluated across sixteen criteria covering economic, operational, technological, and sustainability-related aspects. To examine the reliability of the results, the obtained rankings are compared, and a sensitivity analysis is conducted to investigate the influence of criteria weight variations. The results consistently indicate that AI-enabled end-to-end supply chain visibility emerges as the most preferred alternative across all applied methods, emphasizing its importance in enhancing transparency, coordination, and resilience under uncertainty. The comparative and sensitivity analyses further confirm the robustness of the proposed approach. The study contributes to fuzzy decision-making literature by extending proportional intuitionistic fuzzy modelling to AI-enabled supply chain contexts and offers practical implications for decision makers operating in dynamic and uncertain environments.

►Onsite Sessions

► Session 5: Industrial AI and Intelligent Automation

► **Session Chair: Vitaliy Mezhuyev, FH JOANNEUM University of Applied Sciences, Austria**
► 16:20-18:05 | June 18, 2026 | Location: Wien 2, Ground Floor
► AC3087, AC3102, AC4176, AC5011, AC506, AC507, AC6016

AC3087 16:20-16:35	DeFlicker: Reducing Flicker For High-Speed Nighttime and Artificial Light Recordings In Real-Time Author(s): Alexander K. Seewald Presenter: Alexander K. Seewald, Seewald Solutions GmbH, Austria Abstract: Flicker is ubiquitous in high-speed and ultra-high-speed night-time and artificial light recordings. The reasons are flickering light sources still installed in many venues world-wide due to the high costs of installing flicker-free LED lighting. Where normal-speed video can solve this issue with appropriate shutter speeds, for high-speed video this is no longer possible as the much higher recording frame rate requires a much higher shutter speed far beyond usual flicker frequencies. Here, we describe our system deFlicker which removes flicker from high-speed video at broadcasting framerates (25-60fps) and can be easily integrated into its workflow. It has a small set of user-definable parameters with known effects and has been tested in a wide variety of venues. Beyond the main algorithm, we will also describe various initial improvements added to the system due to observations and user feedback, a CPU performance indicator useful to choose deFlicker systems hardware for a specific purpose, and the frameTime model which allows the system to automatically adapt parameter sets to ensure real-time performance. At last, we will show a qualitative evaluation of the original deFlicker with various settings as well as a comparison with a new and improved version.
AC3102 16:35-16:50	Visual Anomaly Detection via Convolutional Autoencoder for Melt Samples in the Steel Industry Author(s): Klaus Stanek, Raphael Hartner, Vitaliy Mezhuyev Presenter: Klaus Stanek, FH JOANNEUM, Austria Abstract: In the field of quality assurance in the steel industry, visual fault detection is frequently implemented via supervised learning due to its established high detection rate. However, unsupervised methods eliminate labeling requirements and facilitate the identification of unseen error types, but it is unclear how the specific architecture should look like. Therefore, the main hyperparameters of a convolutional autoencoder are investigated in this work. This revealed that including a dropout rate in the latent layer prevents overfitting and increases accuracy. Furthermore, the model employs solely non-defective parts to differentiate between normal and anomalous state, hence making the model robust to unseen error types. Therefore, the results suggest that the underlying convolutional autoencoder is viable for anomaly detection for high contrast image with distinct geometries like melt samples in the steel industry.
AC4176 16:50-17:05	Applied LPWAN Protocol Development for Fire Protection Seal Supervision Author(s): Johannes Witzig, Flavio Felder, and Simon Künzli

	Presenter: Flavio Felder, Zurich University of Applied Sciences, Switzerland Abstract: A critical problem for field installations of IoT devices is the connectivity of the individual nodes to the Internet. Specifically, with established LPWAN systems like LoRaWAN, accessing yet uncovered areas is only possible by setting up new gateways. Due to this, reaching nodes that are in an environment where no gateways can be set up is an open problem. A promising idea to solve the proposed problem is to use a node within the range of a gateway for forwarding messages to nodes outside its range. Such approaches have seen extensive discussion in literature. However, solutions for lowpower embedded systems with limited resources heavily depend on the application and usually lead to creating a new protocol or protocol variant. These new protocols have to fulfill a wide variety of requirements, including the choice of RF technologies, battery lifetime, reaction times, and supported data rates. We developed a framework to simplify this protocol development and efficiently develop new protocols to extend established LPWAN systems' reach and applied this framework to a real-world use case, namely fire protection seal supervision. The protocol development framework has proven its applicability and provided a valuable tool for developing and refining protocol design. From our experiments, we conclude that such a framework can speed-up development and serve as the basis for robust protocols also for other fields of applications.
AC5011 17:05-17:20	Artificial Intelligence-Based Fire Detection via WiFi Sensing Author(s): Wa'el Ejkhidem, Mustafa Alshawaqfeh Presenter: Mustafa Alshawaqfeh, German Jordanian University, Amman, Jordan Abstract: Wi-Fi sensing is based on variations in electromagnetic signal propagation, captured through wireless channel characteristics such as Channel State Information (CSI), to enable device-free detection of environmental changes. This work investigates a non-intrusive approach for early fire detection using ESP32-based Wi-Fi modules. CSI amplitude data were collected under controlled fire and no-fire conditions, preprocessed through smoothing and subcarrier selection, and labeled for supervised learning. Two machine learning classifiers were trained to distinguish fire from no-fire states. Both models achieved overall accuracy above 98%, with sensitivity ≥ 0.974 and specificity ≥ 0.995. The SVM exhibited a marginal advantage in reducing false alarms and missed detections, while the RF remains attractive for real-time deployment due to robustness and low computational cost. Performance was analyzed using confusion matrices, revealing the distribution of misclassifications and validating the discriminative power of CSI for fire events. The proposed method demonstrates that fire significantly perturbs Wi-Fi propagation patterns in a detectable manner, enabling early detection without additional hardware. This low-cost, scalable, and infrastructure-compatible approach lays the groundwork for future extensions to multi-room, multiantenna, and dynamic real-world scenarios.
AC506 17:20-17:35	The Relay Electric Vehicle's (EV's) Selection Method for Energy-Efficient Small Cell Data Offloading Author(s): Chung-Ming Huang, Qi-Ru Lee

	Presenter: Chung-Ming Huang, National Cheng Kung University, Taiwan Abstract: When an Electric Vehicle (EV) x, which is outside the signal coverage of a small cell y, wants to transmit data through small cell y, it can be achieved through a relay EV r that is inside the signal coverage of y. Let each EV periodically report its context, including EV's ID, position, speed, driving direction, state-of-charge of its battery, neighboring EVs' IDs, etc., to its administered Multi-access Edge Computing (MEC) server. Based on the reported contexts of EVs, the MEC server can select a suitable relay EV r from x's neighboring EVs that are inside the signal coverage of the small cell y to construct a Cellular Vehicle-To-Vehicle-To-Infrastructure (C-V2V2I) path x-r-y using the proposed Scoring-based Relay Electric Vehicle (EV) Selection for EV's Small Cell data Offloading (SRS-EV-SCO) method. Thereafter, EV x can use the C-V2V2I path x-r-y to have the small cell data offloading before x is inside y's signal coverage. The simulation results show that the proposed method (i) outperform the traditional small cell data offloading method, which launch data offloading only when the EV is inside the signal coverage of the small cell, and (ii) have the lower energy consumption than other small cell data offloading methods.
AC507 17:35-17:50	ADSFra: Data Fingerprinting-Based Anomaly Detection Support Framework Author(s): Dániel László Vajda, Márk Dorozsmai, Tamás Bérczes, Tien Van Do, Károly Farkas Presenter: Dániel László Vajda, Dept. of Networked Syst. and Serv., Faculty of Electr. Eng. and Informatics, Budapest Univ. of Tech. and Economics, Hungary Abstract: Network telemetry time series are highly diverse. Some series exhibit periodic patterns, while others are spiky, irregular, and noisy, and even often change over time. These characteristics make anomaly detection challenging, since no single detector performs well across all time series. A straightforward approach would be manual detector selection, but it does not scale well and quickly becomes suboptimal. In this paper, we propose a framework called ADSFra (Anomaly Detection Support Framework) to minimise manual intervention in the selection of anomaly detectors. ADSFra represents each time series as a fingerprint, optionally applying dimensionality reduction to ensure compactness. Moreover, it utilises the TPOT optimisation tool's genetic programming-based pipeline as a classifier to map the fingerprint to the detector from a pool that is expected to deliver the best performance on the given time series. In our experiments, we investigate and compare three fingerprinting strategies, with and without dimensionality reduction, on three diverse datasets. Our results show that detector selection based on carefully extracted fingerprints and an appropriate detector pool can significantly improve the overall accuracy of anomaly detection compared to applying just one given detector, even if this detector has the best average performance across all time series.
AC6016 17:50-18:05	Receive Signals Forecasting with Temporal Convolutional Network for Free-Space Optical Communications Author(s): Mikhail A Vorontsov, Prabjeet Singh Saggu, Thomas Weyrauch, Austin M Scott

Presenter: Mikhail Vorontsov, University of Dayton, USA

Abstract: Free-space optical (FSO) communication systems operating over atmospheric paths are significantly affected by turbulence-induced signal fading, which limits link performance and reliability. This paper presents and analyzes an approach for real-time forecasting of the signal received at an FSO terminal using temporal convolutional networks (TCN), aimed at proactive mitigation of atmospheric turbulence effects. Using both received-signal time series collected over a 7-km horizontal propagation path at a 5-kHz acquisition rate and corresponding synthetic datasets, we demonstrate short-horizon forecasting (10–20 timesteps ahead) with an average inference time of approximately 1.2 ms and Pearson correlation coefficients in the range of 0.8–0.99. Wave-optics numerical simulations further validate the approach under varying turbulence conditions characterized by different values of the refractive-index structure parameter. The results demonstrate the potential of TCN-based predictive signal processing for enhancing the performance and robustness of practical FSO communication systems.

►Online Sessions

► Session A: AI in Healthcare, Agriculture and Environmental Science

► **Session Chair: Nik Azlina Nik Ahmad, Universiti Kuala Lumpur, Malaysia**
► 10:00-12:15 | June 19, 2026
► Zoom Link: https://us02web.zoom.us/j/81187445500 | Password: 061719
► AC3101, AC3125, AC3064, AC4162, AC2038, AC2042, AC7025, AC7027, AC3094

AC3101 10:00-10:15	Assessment of Soil Type Classification Using Machine Learning Techniques and Sentinel-2 Satellite Images Author(s): Victor Bacu, Razvan Gabriel Madar, Teodor Stefanut Presenter: Victor Bacu, Technical University of Cluj-Napoca, Romania Abstract: This paper investigates the automatic classification of soil types from Sentinel-2 multispectral imagery using modern deep learning methods for tabular data. A WRB-compatible dataset was constructed from Sentinel-2 images. This dataset was enhanced with some spectral indices describing vegetation cover, bare soil, clay mineralogy, moisture, etc. We evaluated and compared two TabNet architectures. To address strong class imbalance across the dataset, we compared different augmentation strategies. The results proves that Sentinel-2 spectral information, when enriched with additional indices and processed with attention-based tabular deep learning, enables scalable, WRB-consistent soil mapping.
AC3125 10:15-10:30	Semantic Segmentation of Ground Penetrating Radar Radargrams Using an Improved U-Net with VGG16 Encoder Author(s): Ansar Tugelbay Presenter: Ansar Tugelbay, Kazakh-British Technical University, Kazakhstan Abstract: This research proposes an improved deep learning- based information system designed to automate and enhance the interpretation of Ground Penetrating Radar (GPR) radargrams. While existing Deep Learning architectures have demonstrated significant potential in identifying subsurface features, their efficacy is often limited by high levels of signal noise and the lack of dataset diversity across different soil conditions. The proposed framework leverages an improved U-Net architecture for semantic segmentation of subsurface anomalies, enabling pixel-level identification of buried features directly from B-scan radargrams. By leveraging diverse real-world datasets, including a comprehensive subsurface utility and void dataset acquired across infrastructure projects in Morocco, this framework can be scaled for civil engineering applications for detecting buried util- ities, tunnel lining defects, and road pavement anomalies across urban, industrial, and transportation environments. Additionally, this work can be applied to archaeological and environmental prospection for identifying structural layers in historic monu- ments and mapping subsurface ancient remains or geotechnical features.
AC3064 10:30-10:45	Digital Zero-Watermarking Techniques for Medical Images: A Systematic Review of Current Methodologies and Future Directions Author(s): Mohammed Abdul Gaffar, Moatsum Alawida

	Presenter: Mohammed Abdul Gaffar, Abu Dhabi University, UAE Abstract: The rapid growth of digital medical images in healthcare systems has increased the need for reliable Intellectual Property Protection and Integrity Verification. Zerowatermarking has emerged as a suitable solution because it generates an ownership signature from image features without modifying the original pixels, thus preserving diagnostic quality. This paper presents a systematic review of zero-watermarking techniques for medical images, analyzing 34 peer-reviewed studies published between 2021 and 2025. The reviewed methods are categorized into four groups: frequency-domain techniques (e.g., DWT and DCT), cryptographic and mathematical approaches (e.g., chaotic maps and Arnold transform), deep learningbased models (e.g., VGG19, ResNet, and autoencoders), and hybrid transform schemes. The advantages and limitations of each category are discussed. The review also highlights several research challenges, including limited robustness against adversarial and AI-driven attacks, scalability issues in IoMT environments, difficulties in handling 3D and multi-modal images, high computational costs of deep learning approaches, and limited interpretability in clinical settings. Finally, a future research direction combining diffusion models with hyperchaotic encryption is suggested to improve secure and fidelity-preserving medical image watermarking.
AC4162 10:45-11:00	Containerized Deployment of the Raven II Surgical Robotics Platform for Reproducible Development and Testing Author(s): Awwal Ishiaku Presenter: Awwal Ishiaku, Innopolis University, Russia Abstract: The Raven II surgical robotics platform has enabled extensive research in robot control, teleoperation, and safety. However, practical use by new developers and testers remains limited by complex host environment setup, dependency drift, and hardware-coupled deployment workflows. This paper presents a containerized software delivery architecture for Raven II that separates development, runtime, and hardware access concerns while preserving real-time robotics usability. The proposed system uses Docker multi-stage builds, ROS-aware compose profiles, remote networking preflight checks, and continuous integration to provide reproducible compilation and deployment across user roles. We describe design decisions, implementation details, and an evaluation protocol based on onboarding time, rebuild latency, and deployment success rate. Results from the implemented workflow demonstrate reliable in-container builds, rapid incremental recompilation, and clear behavior separation between software-only and hardware-in-the-loop execution modes. The approach lowers adoption barriers and improves reproducibility for robotics research and translational prototyping.
AC2038 11:00-11:15	Rice Disease Classification Using MobileNetV2 Author(s): Sarunya Kanjanawattana, Piyathida Nenchoo, Chayanee Hinpha, Wichitchai Pengpara, Watthana Pongsena, Wichai Srisuruk Presenter: Sarunya Kanjanawattana, Suranaree University of Technology, Thailand

	Abstract: Thailand is one of the world's leading rice producers and exporters. A shortage of specialists, coupled with rice illnesses and delayed treatment, negatively impacts both the quality and quantity of rice yields. The study aimed to create a responsive website for classifying rice diseases based on leaf symptoms, using MobileNetV2. The model was trained on 15,174 images across nine categories: Bacterial Leaf Blight, Brown Spot, Healthy Rice Leaf, Leaf Blast, Leaf Scald, Narrow Brown Leaf Spot, Tungro, Rice Hispa, and Sheath Blight. The dataset was partitioned into 70% training set, 10% validation set, and 20% test set. The evaluation indicated that the model's total accuracy was 95.33%. The best F1-score was found in Tungro and Bacterial Leaf Blight. This study's main contribution is the creation and practical application of a responsive web-based diagnostic system utilizing MobileNetV2 for the classification of rice diseases. In the future, this approach should be evaluated in a rice field with restricted or variable internet connectivity and fluctuating light conditions to address classification challenges.
AC2042 11:15-11:30	SmartFlask: An IoT-Based Intelligent Water Monitoring System with Time-of-Flight Sensing and Real-Time Cloud Synchronization for Automated Hydration Tracking Author(s): Chloe Hsu, Jonathan Sahagun Presenter: Chloe Hsu, Harvard Westlake, USA Abstract: SmartFlask is an Internet-of-Things (IoT) hydration monitoring system designed to address widespread dehydration through automated, real-time tracking. The system uses a VL53L4CD Time-of-Flight (ToF) sensor embedded in a custom 3D-printed bottle cap to measure water levels with millimeter-level precision without direct liquid contact. A Particle Boron microcontroller transmits data to a dual-cloud infrastructure combining Particle Cloud and Firebase for real-time synchronization and storage. A cross-platform Flutter application enables seamless user monitoring. Experimental results demonstrate high accuracy (±1.5 mm) and low latency, supporting SmartFlask as a scalable and user-friendly solution for improving hydration habits.
AC7025 11:30-11:45	Adaptive WGAST: Weakly-Supervised Generative Framework for High-Resolution Land Surface Temperature Reconstruction Author(s): Devashish Komiya, Venkat Saahit Kamu, Dr. Indrajit Mukherjee,Prabhat Kumar Mahanti, Jong-Kyou Kim Presenter: Devashish Komiya, Department of Computer Science and Engineering Birla Institute of Technology, India Abstract: High-resolution Land Surface Temperature (LST) mapping is a essential for monitoring urban heat islands, enabling precision agriculture, and assessing broader climate dynamics. However, thermal infrared satellite systems inherently involve a trade-off between spatial resolution and temporal frequency. Recent deep learning approaches , such as WGAST [1] have demonstrated strong potential in multi-sensor data fusion; however, their reliance on fixed Gaussian denoising leads to over-smoothing and loss of critical local thermal boundaries. To address these limitations, we propose Adaptive WGAST, a weakly-supervised generative adversarial framework built to reconstruct high-resolution (10 m) LST maps

	while preserving structural detail and radiometric fidelity. The proposed framework introduces two key enhancements: (i) an Adaptive Denoising Block (ADB) that leverages spatial context to se-lectively preserve fine textures and thermal edges, and (ii) a Similarity Feature Refinement (SFR) module that aligns latent representations across multi-sensor inputs prior to decoding. Extensive experiments on multi-temporal datasets from Land-sat 8/9, Sentinel-2, and Terra MODIS demonstrate that Adaptive WGAST significantly outperforms the baseline model. The pro-posed method reduces RMSE from 2.928◦ C to 2.454◦ C and the MAE from 2.260◦ C to 1.849◦ C. It also mitigates mean bias, improving the coefficient of determination (R2) from −0.424 to −0.012, while maintaining a strong spatial Pearson correlation of 0.703. These results highlight the effectiveness and scalability of Adaptive WGAST for accurate, high-resolution daily thermal mapping.
AC7027 11:45-12:00	Quantum-Enhanced Bare Bones Particle Swarm Optimization for Unsupervised Hyperspectral Image Automatic Clustering Author(s): Tulika Dutta, Siddhartha Bhattacharyya, Bijaya Ketan Panigrahi, Jan Platos, Vaclav Snasel, Ivan Zelinka Presenter: Siddhartha Bhattacharyya, VSB Technical University of Ostrava, Czech Republic Abstract: Unsupervised Hyperspectral image processing is a challenging task due to high data redundancy and the absence of ground-truth information. This work presents two quantum enhanced variants of the Bare Bones Particle Swarm Optimization (BBPSO) algorithm, viz., a bi-level (qubit) based variant (QubiBBPSO) and a tri-level (qutrit) based variant (QutiBBPSO), for automatic clustering of hyperspectral images. Quantum enhanced BBPSO harnesses quantum superposition, Born rule-based probabilistic state initialization, and adaptive rotational gate operations to effectively increase population diversity and prevent premature convergence. An integrated pre-processing stage employs the Structural Similarity Index Measure and Mutual Information-based band selection to reduce spectrally redundant bands. Experiments on the Salinas dataset demonstrate the superior performance of the qutirt version over both classical BBPSO and qubit based versions in terms of cluster quality, convergence speed, and optimization stability. Statistical tests also confirm the significance of the performance gains of the quantum-enhanced versions.
AC3094 12:00-12:15	A Hybrid Physics-Guided Machine Learning Framework for Radio Propagation Loss Prediction in Dynamic Urban Environments Author(s): Tamgno Kouawa James, Zacharia DAMOUE, Wendkuni Assetou CONOMBO Presenter: Tamgno Kouawa James, Ecole Superieure Multinationale des Telecommunications, Senegal Abstract: This paper presents HAPE, a physics-guided machine learning framework for multi-band radio propagation prediction in urban environments. The approach integrates a Two-Ray Ground baseline with a CatBoost model to learn residual environmental losses. Evaluated using only 30% of the training data, HAPE achieves

consistent RMSE reduction across 800 MHz, 7 GHz, and 28 GHz. Results demonstrate strong generalization capability and robustness across distinct frequency regimes, making the proposed hybrid method a scalable solution for multi-band wireless network planning.

►Online Sessions

► Session B: Software Engineering, Digitalization, and Intelligent Systems Optimization

► **Session Chair: Sergi Batalla, FH Joanneum, Austria**
► 10:00-12:15 | June 19, 2026
► Zoom Link: https://us02web.zoom.us/launch/jc/85902467479 | Password: 061719
► AC3113, AC3121, AC2051, T02, AC504, AC2058, AC4184, AC1011, AC3114

AC3113 10:00-10:15	Synapse CI: A Closed-Loop DevOps Framework for Intelligent Test Prioritization and Context-Aware Chaos Engineering using Qwen 2.5 Coder Author(s): M.M.K.S Marasinghe, D.C.Y Fernando, G.S.R.U.R Senarathna, T.L.P Bambarendage, Dharshana Kasthurirathna, Thilini Jayalath Presenter: Kaweesha Sandeep Marasinghe, Sri Lanka Institute of Information Technology, Sri Lanka Abstract: Continuous integration and delivery (CI/CD) pipelines for microservice systems are often slowed by exhaustive regression testing and resilience experiments that are discon- nected from the code changes that triggered the pipeline. This paper presents Synapse CI, a closed-loop Agentic DevOps frame- work that links pre-deployment test prioritization with post- deployment chaos engineering. A QA Agent uses Abstract Syntax Tree (AST) analysis, Qwen2.5-Coder-based semantic reasoning, a Neo4j dependency graph, and historical failure embeddings to rank tests affected by a pull request. After deployment to staging, a Chaos Agent reuses the same dependency context to select bounded LitmusChaos experiments on recently modified service paths. Failure observations are encoded in a FAISS memory layer and fed back into later test-prioritization cycles. Evaluation on a 14-microservice Java benchmark over 60 pull requests shows a 41.9% reduction in executed tests, a 50.0% reduction in pipeline wall-clock time, and a 97.4% fault detection rate. Context-aware chaos experiments discovered 55.6% more vulnerabilities than randomized injection and reduced mean time to first detection by 30.0%. The results demonstrate that sharing semantic context across shift-left and shift-right activities can substantially improve CI/CD efficiency without weakening reliability gates.
AC3121 10:15-10:30	From Real Time Enterprise Theory to Practice: Smart Production Labs as Catalysts for Digital Transformation Author(s): Sergi Batalla, Herbert Kohlbacher Presenter: Sergi Batalla, FH Joanneum, Austria Abstract: This study traces the evolution of the Real-Time Enterprise (RTE) from early ideas on information latency and enterprise integration to today's AI-driven, autonomous systems. Foundational work showed that reducing delays in information and material flows could significantly enhance competitiveness. The RTE concept emerged in the early 2000s with event-driven architectures and complex event processing, later strengthened by advances in Business Process Management (BPM), Service Oriented Architecture (SOA), IoT, and big-data analytics. The paper highlights Smart Production

	Labs (SPLs) as essential infrastructures for applying and advancing RTE concepts. SPLs replicate Industry 4.0 environments, enabling hands-on learning, experimentation, and interdisciplinary research. A detailed use case from the FH JOANNEUM Smart Production Lab demonstrates a secure edge–fog–cloud architecture linking shop-floor machinery to SAP S/4HANA. Using Open Platform Communications Unified Architecture (OPC UA), MQTT, Azure IoT services, and OData, the system enables near real-time fault reporting, illustrating how SPLs operationalize RTE principles. This paper is relevant for consulting firms, industrial management, and Information Systems professionals, offering conceptual grounding and a practical architecture supporting digital transformation, teaching, and applied research.
AC2051 10:30-10:45	FractalX: Automated Migration of Modular Spring Boot Monoliths to Production-Ready Microservices via AST-Driven Static Decomposition Author(s): Sathnindu Kottage, Gayashaan Krishnamoorthy, Dinuvi Asithma, Tharushika Kapugedara, Dharshana Kasthurirathna, Hansi De Silva Presenter: Sathnindu Kottage, Sri Lanka Institute of Information Technology, Sri Lanka Abstract: Migrating monolithic applications to microservices yields strategic benefits but incurs high costs from manual decomposition, infrastructure provisioning, and data consistency challenges. This paper presents FractalX, an open-source, annotation-guided static decomposition framework for Spring Boot. FractalX constructs a deterministic dependency graph from Abstract Syntax Tree analysis, partitions it into service boundaries, and executes a code generation pipeline that produces independent microservices, an Application Programming Interface gateway, a service registry, distributed tracing, saga-based transaction coordination, database isolation, and container descriptors. Additionally, this work introduces NetScope, a remote method invocation library built on Google Remote Procedure Call that generates type-safe client proxies for inter-service communication. Experimental evaluation shows that FractalX generates over two hundred sixty deployment-ready artifacts from a twelve-class monolith in under four seconds. NetScope achieves thirty-eight to forty-eight percent lower median latency compared to Feign and Representational State Transfer. Structural and semantic correctness is confirmed through a nine hundred forty-test validation suite with a one hundred percent pass rate.
T02 10:45-11:00	Automated Evaluation Model for Digitalization Projects Based on Cost–Benefit–Analysis Author(s): Claudia Brandstätter, Martin Tschandl Presenter: Claudia Brandstätter, FH JOANNEUM, Austria Abstract: Digital transformation is causing profound changes in industrial value creation systems and requires extensive investments in digital technologies, data infrastructures, and automated processes. The economic evaluation of digitalization projects poses significant challenges for companies, as traditional investment appraisal methods primarily focus on short-term quantifiable cash flows. Digital investments, however, often generate value through indirect, delayed, and nonlinear effects, such as improved data quality, enhanced innovation capability, or organizational learning processes.

	Network effects, economies of scale, and complementarities with organizational changes further intensify these dynamics. The limited ability to capture these effects in purely monetary terms does not imply their absence; rather, it leads to a systematic undervaluation of digital investments and creates the risk of strategic misjudgments. Against this background, the present paper develops an automated evaluation model for digitalization projects based on an extended cost–benefit analysis (CBA) framework. The model integrates both monetary and non-monetary benefit potentials and combines financial investment evaluation using Return on Investment (ROI) with a qualitative scoring model. Methodologically, the study follows a mixed-methods approach consisting of a systematic literature review, a quantitative online survey of Austrian industrial companies, and semi-structured expert interviews. Based on the findings, a spreadsheet-based evaluation tool was developed to provide companies with a structured and transparent basis for decision-making regarding investments in digitalization initiatives. The results particularly highlight the high relevance of qualitative benefit potentials and the growing need for standardized evaluation approaches for digitalization projects.
AC504 11:00-11:15	Resource Scheduling and Allocation for HPC Cyberinfrastructure: Fundamentals, Challenges, and Advancements Author(s): Ntombovuyo Wayi-Mgwebi, Taiwo Thiophilus Ojo, Femi Abiodun Elegbeleye, Olalekan Samuel Ogunleye Presenter: Ntombovuyo Wayi-Mgwebi, University of Mpumalanga, South Africa Abstract: High-Performance Computing (HPC) systems are critical enablers of scientific discovery, supporting data-intensive and compute-bound tasks in fields such as climate science, genomics, materials engineering, and fluid dynamics. As HPC infrastructures evolve into increasingly complex and heterogeneous cyberinfrastructures integrating compute nodes, GPUs, high-speed interconnects, distributed storage, and cloud extensions, the challenges of resource scheduling and allocation become correspondingly more sophisticated. Efficient scheduling mechanisms are essential to maximize system throughput, minimize job wait times, enhance energy efficiency, and maintain fairness in multi-user environments. This paper presents a comprehensive survey of classical and contemporary approaches to resource scheduling and allocation in HPC environments. It examines foundational algorithms such as First-Come, First-Served (FCFS), Shortest Job First (SJF), and Backfilling, and analyzes their evolution into more adaptive strategies, including Gang Scheduling, Priority Scheduling, and Hybrid Scheduling techniques. Furthermore, the growing importance of energy-aware scheduling methods is addressed, motivated by the rising operational costs and environmental concerns associated with large-scale computing facilities. Emerging paradigms such as machine learning-driven scheduling, serverless computing models, and cloud-integrated HPC architectures are also explored. These approaches offer promising solutions for dynamic workload prediction, adaptive provisioning, and scalable resource orchestration. We highlight recent advancements in intelligent schedulers, including the application of reinforcement learning and neural networks for real-time decision-making in job placement. Through an analysis of algorithmic

	strategies, system design considerations, and practical deployment challenges, this work outlines current limitations and future directions in achieving efficient, scalable, and intelligent resource management for next-generation HPC cyberinfrastructure.
AC2058 11:15-11:30	AI-Enhanced OCR Framework with GPU Acceleration for Automated HMI Validation in Industrial Systems Author(s): Deepmoy Banerjee, RIshi Kumar Presenter: Deepmoy Banerjee, Schneider Electric Private Limited, India Abstract: Human–Machine Interfaces (HMIs) are widely used in industrial systems to show measurement readings, status indicators, alarms, and operation information. In hardware-in-the-loop (HIL) testing scenarios, validation of such display screens becomes necessary in order to verify that the display information corresponds to the expected behavior of the system. Manual validation is commonly used when the device does not provide any means of capturing a screenshot, including screenshot APIs or access to the display data. This paper presents an approach for automatic HMI validation based on artificial intelligence (AI)-based optical character recognition (OCR) technology implemented via PaddleOCR within the existing Python-based test automation framework. The proposed approach is capable of handling both screenshots and images taken by a camera while leveraging the power of GPU acceleration for increased efficiency of processing high-resolution and visually complex industrial displays. We evaluated the performance of the developed approach with about 50 test images obtained from several Schneider Electric HMIs and power-meter displays including LCDs, LED displays, and graphic touchscreen devices. The test dataset contained both simple numeric displays and complex graphic user interfaces with single-line diagrams (SLD), label text, and graphical information. The comparison was carried out using PyTesseract, EasyOCR, and PaddleOCR on two tasks: character-level recognition and word-level recognition. Our findings suggest that PaddleOCR consistently outperforms standard OCR techniques and modern deep learning models of OCR, including recall and F1-score metrics particularly under challenging industrial conditions involving glare, reflections, varying fonts, and dense graphical layouts.
AC4184 11:30-11:45	PM4Cake: A Scriptable Parametric Modeling Interface for Conceptual Cake Design Using PM4VR Author(s): Wanwan Li Presenter: Wanwan Li, Oral Roberts University, USA Abstract: Conceptual cake design combines sculptural geometry, aesthetic intent, and fabrication constraints, yet current digital tools provide limited support for rapid exploration of volumetric cake forms in immersive environments. This paper presents PM4Cake, a scriptable parametric modeling interface for conceptual cake design built on PM4VR (Parametric Modeling for Virtual Reality). PM4Cake introduces a set of variational mathematical surface models, including cylindrical, hemispherical, and conical surface formulations, that naturally represent common cake geometries while supporting continuous deformation and real-time interaction in virtual reality (VR). By embedding these models into PM4VR's script-driven workflow, designers can

	interactively author, adjust, and compose layered cake structures using compact parametric expressions. PM4Cake demonstrates how domain-specific geometric abstractions can extend general-purpose parametric VR modeling systems and enable intuitive, expressive design workflows for edible artifacts.
AC1011 11:45-12:00	Explainable Artificial Intelligence for Trustworthy Decision-Making in Distributed and Intelligent Computing Systems Author(s): Youssef Lahbabi, Abdellah Ait Oufkir, Lalla Touhfa Belgnaoui, Tarik Lafou Presenter: Youssef Lahbabi, EMAA Business School Agadir, Morocco Abstract: Distributed AI decisions rarely come from a single model invocation. A sensor reading may be filtered at the edge, merged with service data, scored by a model running on another node, recorded by observability tools, and finally accepted or challenged by an operator. When such a decision is reviewed, a post-hoc explanation of the last prediction is helpful but incomplete. It does not necessarily reveal the data lineage, the model release, the node condition, the drift state, or the policy path that shaped the decision. This paper proposes XAI-DDS, a software-architecture approach for making explanations part of distributed decision evidence. Instead of treating explanations as static visual summaries, XAI-DDS represents them as records linked to lineage, node identity, model version, confidence, uncertainty, risk level, and governance action. The architecture combines explainable feature views, local explanation services, an explanation broker, a decision ledger, runtime monitoring, and risk-sensitive review. The paper also defines an explanationobject schema, outlines the broker logic, and reports a controlled scenario-based validation covering distributed anomaly detection, edge-assisted resource allocation, and smart production support. The results indicate better recoverability of decision evidence and higher explanation fidelity under the stated workloads, with a bounded cost in latency and scalability. These findings should be read as architectural validation under controlled assumptions, not as evidence from a deployed industrial testbed.
AC3114 12:00-12:15	Active internal AI ISMS Auditor Author(s): Dmytro Nekhoroshykh, Gennadiy Khalimov Presenter: Dmytro Nekhoroshykh, National University of Radio Electronics, Ukraine Abstract: This paper provides a scholarly analysis of contemporary cybersecurity tools in the context of the operation of Information Security Management Systems (ISMS) and identifies their key limitations, including fragmentation of functional capabilities, insufficient integration of the operational cybersecurity layer with ISMS governance processes, and the periodic nature of internal auditing. It is shown that existing platforms, including SIEM, XDR/EDR, SOC, and GRC systems, do not constitute a unified analytical environment capable of implementing continuous auditing, risk assessment, and compliance verification against information security standards. To address these limitations, a conceptual model of an AI-Driven ISMS Auditor is proposed. The model integrates the analytical capabilities of artificial intelligence with information security governance processes. It is conceptualized as a governance-oriented and risk-centric architecture that links the operational cybersecurity layer (SOC, SIEM, XDR)

with the strategic ISMS management layer. The proposed architecture comprises eight functional modules: General Analysis, Context Analysis, Asset Inventory, Risk Management, SOC Monitoring, Compliance Management, Feedback Loop, and Audit Agents. The implementation of this model enables continuous internal auditing, dynamic risk assessment, automated compliance verification, and decision support within the PDCA cycle while preserving the Human-in-the-Loop principle. The proposed approach establishes an integrated analytical environment for information security governance and contributes to improving the adaptability, transparency, and effectiveness of ISMS operation. The new instrument should address both current and emerging challenges. It should be based on a novel approach capable of structurally integrating cognitive autonomy, ethical governance, and the prospects of quantum-resilient defense.

►Online Sessions

► Session C: Cybersecurity, Network Resilience, and Communication Infrastructures

► **Session Chair: Mujeeb Ur Rehman, Montfort University, UK**
► 13:30-16:00 | June 19, 2026
► Zoom Link: https://us02web.zoom.us/j/81187445500 | Password: 061719
► AC2039, AC3076, AC3072, AC4175, AC1014, AC1020, AC6017, AC7023, AC4164, AC3095

AC2039
13:30-13:45

A Case Study Protocol for Cybersecurity Challenges Mitigation Model (CCMM) of Vehicle-to-Vehicle Communications

Author(s): Naeem Ullah, Siffat Ullah Khan, Iftikhar Ahmad, Lipika Deka, Mujeeb Ur Rehman

Presenter: Mujeeb Ur Rehman, Montfort University, UK

Abstract: The rapid connectivity in autonomous and connected vehicles has greatly enhanced the efficiency of traffic jams, road safety, and vehicle maintenance by providing real-time data communication and intelligent communication systems including Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I). However, this has raised the attack surface due to the increased level of interconnectivity and exposed vehicles to a wide range of cybersecurity threats capable of undermining the integrity of data, the safety of vehicle operations, and user trust. To mitigate these issues, the current research will offer the Cybersecurity Challenges Mitigation Model (CCMM) a systematic framework aimed at assisting automotive organizations in detecting, evaluating, and countering cybersecurity threats in vehicular communication settings. The model is developed through a Multivocal Literature Review (MLR) findings that found significant cybersecurity challenges and the mitigation strategies common to both academic and industrial perspectives. These results were also validated through a survey conducted in a practical context by cybersecurity and automotive experts. The CCMM is structured into five hierarchical levels, which represent progressive stages of cybersecurity capability and organizational maturity. In order to determine the efficacy of the model, a case study protocol is designed to validate the model in three automotive organizations through feedback sessions and in-person observation. The expected outcomes will streamline the CCMM and align it with actual practices, making it more adaptive and useful in industrial settings. Finally, this study provides a validated, feasible, and scalable model that assists automotive organizations in enhancing their cybersecurity posture and enables the creation of safe and resilient connected and autonomous vehicle systems.

AC3076
13:45-14:00

AI-Powered Detection of Hardware Trojans in Integrated Circuits Using Side-Channel Analysis

Author(s): Hazem W. Marar

Presenter: Hazem Wael Marar, Princess Sumaya University for Technology, Jordan

Abstract: With the growing necessity for high-performance computing, there is a sharp demand for integrated circuits (ICs) to support emerging applications in artificial intelligence (AI), telecommunications, and embedded systems. Hardware Trojans (HT) pose a significant threat to the security and reliability of ICs, especially in critical applications. Detecting these malicious modifications is challenging due to their stealthy nature and the

	complexity and large scale of modern IC designs. This paper presents an AI-driven framework for HT detection using sidechannel signal analysis. By utilizing machine learning (ML) techniques, specifically Convolutional Neural Networks (CNN), the proposed system analyzes power consumption, timing delays, and electromagnetic (EM) emissions to identify anomalies that may indicate the presence of HT. The framework is designed to be scalable and adaptable to various IC architectures, making it suitable for real-world deployment. Unlike existing works that focus on a single side-channel modality or a single IC architecture, the proposed framework provides a multi-modal, cross-architecture detection system validated across AES encryption modules, serial communication interfaces, widely-used controller architectures, with real hardware measurements. Experimental results demonstrate the system's ability to detect HT with high accuracy while maintaining low false-positive rates. The proposed approach achieves an average accuracy of 92% across the tested architectures, showcasing its effectiveness in diverse scenarios. This work highlights the high potential of AI-driven techniques in enhancing hardware security and providing a practical solution for HT detection in ICs and securing modern electronic systems against malicious modifications and embedded hardware attacks.
AC3072 14:00-14:15	Optimizing False Alarm Reduction in IoT Intrusion Detection Systems Using Machine Learning Author(s): Alketa Hyso, Dezdemona Gjylapi Presenter: Alketa Hyso, University Ismail Qemali, Albania Abstract: The rapid expansion of Internet of Things (IoT) environments has significantly increased exposure to cyber threats, making intrusion detection systems (IDS) essential for maintaining network security. However, a major limitation of existing IDS solutions is the high rate of false positives, which reduces operational reliability and generates unnecessary alerts. This study investigates the use of machine learning techniques to reduce false positive rates in IoT intrusion detection systems. Experiments are conducted using a subset of the CICIoT2023 dataset, which contains large-scale network traffic data and multiple categories of IoT attacks. A binary classification framework is adopted to distinguish between benign and malicious traffic, enabling a focused evaluation of false alarm behavior. Several machine learning models, including Logistic Regression, Random Forest, and Multi-Layer Perceptron, are implemented and evaluated using performance metrics such as False Positive Rate (FPR), Precision, Recall, F1-score, and Receiver Operating Characteristic – Area Under the Curve (ROC-AUC). In addition, threshold optimization is applied to improve the trade-off between detection performance and false alarm reduction. The results indicate that ensemble-based models, particularly Random Forest, achieve the lowest false positive rates while maintaining high detection capability. Furthermore, threshold tuning significantly reduces false alarms without substantially affecting recall. SHapley Additive exPlanations (SHAP)-based analysis is used to interpret model behavior and identify the most influential features. These findings demonstrate the effectiveness of machine learning in improving the reliability of IoT intrusion detection systems.
AC4175 14:15-14:30	Attacks on FreeIPA and detection mechanisms Author(s): Niiaz Misbakhov, Awwal Ishiaku Presenter: Niiaz Misbakhov, Innopolis University, Russia

	Abstract: This paper examines the security of FreeIPA. The authors analyze the architecture of the system and provide a description of its core components. To conduct the research, a set of attack scenarios based on techniques from the MITRE ATT&CK matrix was selected. Each technique was studied in detail, and detection rules were developed for identifying related malicious activity. For detection and monitoring purposes, the Wazuh SIEM platform was used. The paper also discusses auditd as a tool for implementing extended system auditing and improving visibility into security events.
AC1014 14:30-14:45	Multi-Model Deep Learning with Adversarial Defenses for Robust RSSI-Based Indoor Localization Author(s): Ayesha Ayub, Zuhairiah Zainal Abidin, Zuhaini Ismail Khan, Fauziahanim Che Seman Presenter: Ayesha Ayub, Universiti Tun Huseein Onn Malaysia, Malaysia Abstract: RSSI-based indoor localization is cost-effective and widespread; however, it is significantly vulnerable to adversarial disturbances. This study presents a defense framework that integrates dataset-specific perturbation generation with adver sarial training to enhance the robustness of regression models. An AdvGAN-inspired generator produces realistic adversarial examples used to evaluate standard adversarial training (AT) and curriculum adversarial training (CAT). Experiments conducted on the SODIndoorLoc Wi-Fi buildings (CETC331, HCXY, SYL) and a BLE school dataset reveal that baseline models experience significant degradation under attack, with adversarial MAE reaching 8.3 m and success rates reducing by 86%. Both adversarial training approaches improve resilience, with AT reducing adversarial error across all datasets. CAT provides the most consistent robustness, lowering adversarial MAE to as low as 1.36 m and reducing adversarial success rates to below 8% (Wi-Fi) and 9% (BLE), while maintaining negligible losses in clean accuracy. These findings indicate that combining multi model deep learning with GAN-generated perturbations and curriculum-based adversarial training offers an effective strategy
AC1020 14:45-15:00	Detection of Presentation-Layer Code Smells in Declarative Android Architectures Author(s): Arda Gokalp Batmaz, Feza Buzluca Presenter: Arda Gokalp Batmaz, Istanbul Technical University, Turkey Abstract: The adoption of declarative UI frameworks like Jetpack Compose invalidates traditional Android quality models that rely on imperative XML and View hierarchies. While new industrial tools address API correctness, a significant analytical gap remains regarding architectural degradation in compositional, state-driven interfaces. This study bridges that gap with DeSmell, a static analysis tool that operationalizes a new taxonomy of twelve presentation-layer smells derived via the Goal-Question-Metric paradigm. Unlike standard linters that flag local style violations, DeSmell utilizes syntax-tree metrics to identify structural risks, including excessive recomposition complexity and logic accumulation in UI components. Empirical results from five open-source projects confirm that DeSmell detects unique maintainability flaws distinct from the output of standard tools like Slack Compose

	Lints or Android Lint, highlighting the necessity of metric-based analysis for modern declarative architectures.
AC6017 15:00-15:15	Heterogeneous Graph Neural Network for Joint User Association in 5G MIMO HetNet Author(s): Konstantinos Tsachrelias, Chrysostomos-Athanasios Katsigiannis, Vasileios Kokkinos, Apostolos Gkamas, Christos Bouras, Philippos Pouyioutas, Presenter: Konstantinos Tsachrelias, University of Patras, Greece Abstract: In dense 5G heterogeneous networks, user association and antenna-level power allocation form a tightly coupled optimization problem central to achieve high spectral efficiency. Conventional methods such as Weighted Minimum Mean Squared Error (WMMSE) or exhaustive search provide strong performance, but they incur high computational cost and cannot adapt efficiently to changing channel or traffic conditions. This work introduces a heterogeneous graph neural network model that represents Base BSs (BSs), User Equipment (UEs), and antenna elements as distinct node types in a unified graph. Type-aware message passing enables the network to jointly predict UE-to-BS assignments and per-antenna transmit power in a single inference pass. Evaluation results indicate that this model achieves spectral performance close to that of WMMSE while reducing inference time significantly and generalizes well across varying network layouts and load settings.
AC7023 15:15-15:30	New Technique for Constructing of Four-Dimensional Signal System Author(s): Nodar Ugrelidze, Nikoloz Bokolishvili Presenter: Nikoloz Bokolishvili, University of Georgia, Georgia Abstract: This paper presents a simple new technique for con-structing effective four-dimensional signal systems based on frequency-phase modulation, using a combination of 2-ary FSK and M_P-ary PSK signals(2FSK-M_P PSK system) which contains two sub-constellations. A new signal set is formed by composition (vector summation) of the signals from the individual sub-constellations. The proposed signals are compared with similar signal sets in the symbol error rate, which is obtained both analytically and by computer simulation under the conditions of using an optimal signal detector. The communication channel is represented by additive white Gaussian noise.
AC4164 15:30-15:45	Agent-Driven Autonomous Resilience Framework for Real-Time Threat Neutralization and Systemic Risk Mitigation in Global Financial Systems Author(s): Sagar Bharat Shah Presenter: Sagar Bharat Shah, University of Cincinnati, United States of America Abstract: The growing sophistication of world financial systems and networked digital infrastructures increases vulnerability to fraud, cyber threats, and systemic market risks, necessitating dynamic and smart risk management solutions. The proposed research would introduce one multi-agent architecture of real-time risk detection and mitigation in the areas of financial fraud, cybersecurity intrusion, and stock market prediction, based on heterogeneous data sets of IEEE-CIS, UNSW-NB15 and stock market data. The approach will involve data preprocessing, multilevel feature engineering, and ML models such as LightGBM, XGBoost, Random Forest, Extra Trees, deep neural networks, and stacking

	ensembles. The system of PSO-based fusion combines the outputs of the agents, and the reinforcement learning and graphbased RL enables mitigating the risks in real time and stabilizing the system. The results show high performance, with fraud detection accuracy of 96.09, market risk of 89.79, cyber threat of 97.84, and an AUC of 99.65. The fusion model has an AUC of 0.9877 and an F1score of 0.9717, and MARL decreases system risk by 59.34. The comparative analysis shows that the high performance is stable compared with existing methods, such as BERT, ANN, RF, and CatBoost. The global resilience index of 0.7015 shows that the system is moderately resilient and stable under operating conditions that implies the success of the suggested scalable multi-agent system of real-time financial and cybersecurity risk intelligence.
AC3095 15:45-16:00	AI-Enhanced Path Loss Estimation Across Multi-Band Frequencies Using a Two-Ray Baseline and CatBoost Residual Modeling Author(s): James KOUAWA TAMGNO, Wendkuni Assetou CONOMBO, Boudal NIANG Presenter: Tamgno Kouawa James, Ecole Superieure Multinationale des Telecommunications, Senegal Abstract: This paper presents HAPE, a physics-guided machine learning framework for multi-band radio propagation prediction in urban environments. The approach integrates a Two-Ray Ground baseline with a CatBoost model to learn residual environmental losses. Evaluated using only 30% of the training data, HAPE achieves consistent RMSE reduction across 800 MHz, 7 GHz, and 28 GHz. Results demonstrate strong generalization capability and robustness across distinct frequency regimes, making the proposed hybrid method a scalable solution for multi-band wireless network planning.

►Online Sessions

► Session D: NLP, Agentic AI, and Intelligent Enterprise Applications

► **Session Chair: Jan Fesl, FIT CTU in Prague, Czech Republic**
► 13:30-16:00 | June 19, 2026
► Zoom Link: https://us02web.zoom.us/launch/jc/85902467479 | Password: 061719
► AC4165, AC1026, AC3097, AC4201, AC1016, AC3117, AC1022, AC3077, AC4154, AC3122

AC4165 13:30-13:45	A Convergent Agent-Based Framework for Auditable Algorithmic Governance: Ensuring Regulatory Compliance and Ethical Integrity in High-Stakes Fintech Architectures Author(s): Sagar Bharat Shah Presenter: Sagar Bharat Shah, University of Cincinnati, United States of America Abstract: As more people resort to digital banking, online payments, and automatic financial services, fraud incidents and regulatory issues are a growing problem in fintech systems. The purpose of this work is to create a convergent agent-based framework of auditable algorithmic governance to guarantee regulatory compliance, ethical integrity, and enhance performance in detecting fraud. Several real-world fraud datasets are combined and pre-processed with feature engineering, label encoding, missing value processing, and class balancing via SMOTE. Three ensemble models are trained (Random Forest, Xgboost, LightGBM) and compared with LightGBM being the best with the highest accuracy (91.34) and F1-score (42.39). The implementation of AI prediction, user behavior analysis, regulatory compliance checking, explainability, and policy enforcement with adaptive decision fusion results in the introduction of a new multi-agent governance framework that classifies transactions into ALLOW, REVIEW, and BLOCK. Fairness correction decreases TPR disparity by 0.229 to 0.133, and convergence analysis, SHAP explainability, intelligent compliance monitoring and blockchain-style audit trails enhance trustworthiness and auditability. The framework suggests a more balanced approach to fraud detection, false positive control, fairness, and compliance than the current models.
AC1026 13:45-14:00	Empirical Evaluation of Fine-Tuned LLMs for Hierarchical HS Code Prediction Author(s): Ihsan Gökcül, Baran Özaydın, Erdem Karaosmanoğlu, Çağlar Günel, Hatice Şeyma Koç, Serdar Arslan Presenter: Serdar Arslan, Cankaya University, Turkey Abstract: This work addresses the problem of predicting 12- digit Harmonized System (HS) codes from free-form product descriptions. We propose a parent-aware multi-stage classifica- tion strategy combined with fine-tuned large language models (LLMs), and evaluate performance at the 4-, 6-, and 12-digit HS code levels. We first explore embedding-only and embedding- plus-reranker baselines, then systematically fine-tune Large Lan- guage Models of different sizes and quantization levels with positive and negative samples. On a test set of 1,248 instances, a 32B-parameter Qwen3 model as LLM, quantized to 4 bits and trained with hard negative sampling, achieves 81.3%, 71.7%, and 62.1% accuracy at 4-, 6-, and 12-digit levels, respectively. These results indicate that

	a parent-aware LLM-based approach with carefully designed negative sampling provides a strong solution for HS code classification from product descriptions.
AC3097 14:00-14:15	Dynamic Adaptive Attention and Supervised Contrastive Learning: A Novel Hybrid Framework for Text Sentiment Classification Author(s): Qingyang Li Presenter: Qingyang Li, University of California, USA Abstract: The exponential growth of user-generated movie reviews on digital platforms has made accurate text sentiment classification a cornerstone task in natural language processing. Traditional models, including standard BERT and recurrent architectures, frequently struggle to capture long-distance semantic dependencies and resolve ambiguous emotional expressions in lengthy review texts. This paper proposes a novel hybrid framework that seamlessly integrates dynamic adaptive multi-head attention with supervised contrastive learning into a BERT-based Transformer encoder. The dynamic adaptive attention module employs a global context pooling vector to dynamically regulate the contribution of each attention head, thereby focusing on critical sentiment-bearing tokens while suppressing noise. Simultaneously, the supervised contrastive learning branch enforces tighter intra-class compactness and larger inter-class separation in the embedding space. Extensive experiments on the IMDB dataset demonstrate that the proposed model achieves competitive performance with an accuracy of 94.67\%, outperforming strong baselines by 1.5--2.5 percentage points. The framework is lightweight, efficient, and readily extensible to other text classification tasks.
AC4201 14:15-14:30	Automatic Detection of Sport Fanaticism in Arabic Social Media Posts Using Transformer-Based Models Author(s): Abdulmajeed Alameer Presenter: Abdulmajeed Alameer, King Saud University, Saudi Arabia Abstract: Sport fanaticism on Arabic-language social media is a high-volume, domain-specific phenomenon characterised by extreme partisanship, hostile rhetoric toward rivals, and irrational partisan support; although affectively adjacent to hate speech and sentiment polarity, it is an operationally distinct construct that existing classifiers do not adequately capture, and we therefore propose an automatic detection method combining a tailored Arabic-social-media preprocessing pipeline with SaudiBERT, a transformer encoder pre-trained exclusively on Saudi-dialect social-media text and fine-tuned for binary fanaticism classification, which we evaluate on a publicly available, manually annotated corpus of 10,600 Saudi-football posts from X against two classical baselines (TF-IDF + Logistic Regression and TF-IDF + Linear SVM) and a Modern Standard Arabic transformer baseline (AraBERT) under matched preprocessing and 10-fold stratified cross-validation, achieving a Macro-F1 of 0.8922 at a per-sample inference latency of 13.86 ms and significantly outperforming all baselines, with AraBERT notably falling below both TF-IDF baselines, demonstrating that dialect-matched pre-training rather than transformer capacity alone is the key driver of accuracy, while classical TF-IDF pipelines remain a practical fallback where inference latency or compute budget is the binding constraint.

AC1016 14:30-14:45	Selection Approaches of Vector Databases and Domain-Specific Small Llms via an Ai Orchestrator Author(s): Yassine KARIM, Noussair Fikri, Azzouazi Mohamed Presenter: Yassine Karim, University Hassan II, Morocco Abstract: Large language models (LLMs) have demonstrated impressive capabilities across domains, but their deployment at scale raises significant challenges in terms of cost, latency, and energy efficiency. This paper proposes an alternative architecture where, instead of relying on a single giant model, a system is built on a set of smaller domain-specific LLMs (each under one billion parameters) combined with a vector database for knowledge retrieval. At the core of this architecture lies on a dispatcher that dynamically orchestrates the workflow: given a user prompt, the agent selects the most relevant vector database for retrieval and routes the request to the most suitable domain-specific LLM. By decomposing tasks in this way, the system achieves better efficiency while maintaining accuracy, reduces inference costs, and allows fine grained control over specialization. We discuss the design of the agent, criteria for LLM selection (complexity of the query, domain relevance, latency and cost constraints), and strategies for integrating retrieval with generation. Preliminary results suggest that this approach can reduce computational overhead and improve response quality compared to one-size-fits-all LLM deployments. This architecture paves the way for cost aware, domain-specialized, and sustainable AI systems that scale more efficiently in enterprise and academic contexts.
AC3117 14:45-15:00	Personalized Shopping Agents from Human Feedback Author(s): Nishank Soni Presenter: Gaurang Munje, Duke University, United States Abstract: AI-powered e-commerce systems increasingly rely on personalized recommendations to enhance user experience and drive sales. However, existing recommender systems often assume static user data and struggle with new or evolving customer preferences. In this work, we introduce Personalized Shopping Agents from Human Feedback (PSHF), a continual personalization framework for e-commerce platforms. PSHF equips each shopping agent with an explicit user memory and dual feedback channels: it can ask clarifying questions before acting (pre-action) and incorporate user feedback after acting (post-action) to update the user's preference profile. We propose two evaluation domains a Conversational Shopping scenario and a Static Product Browsing scenario to assess PSHF across a range of experiments including cold-start learning, multi-turn interaction depth, preference drift recovery, and memory backend robustness. Experiments using realistic shopping-session simulations (e.g., the Shop-CART dataset with ~52k user sessions) show that PSHF significantly outperforms baselines with no memory or single feedback channels. In initial personalization tests, PSHF achieves ~90% task success versus ~60% for no-memory baselines. After user preferences shift, PSHF recovers to ~80% accuracy within 20 rounds compared to ~20–30% for non-personalized agents. Cold-start analysis shows PSHF

	reaches 83% SR by Round 10, and multi-turn depth analysis confirms that richer interaction (5 turns) yields an MRR of 0.85.
AC1022 15:00-15:15	Optimizing Retail Replenishment: A Machine Learning Framework for Service- Inventory Trade-offs Author(s): David Jardim, Setareh Borjian Presenter: David Jardim, Oracle Corporation, Portugal Abstract: We propose a machine learning based framework for scalable evaluation of retail replenishment policies under stochastic demand. The approach combines high-fidelity inventory simulation on a stratified subset of products with supervised learning models that predict key performance metrics, including fulfilled sales and average inventory, across a broad policy space. These models act as surrogates for simulation, enabling rapid assessment of service-inventory trade-offs. Our experiments show that accurate prediction of inventory and service outcomes can be achieved using a relatively small fraction of simulated data, yielding substantial computational savings. We further demonstrate that inference-based policy selection preserves the structure of inventory-service trade-offs and consistently identifies near-optimal replenishment policies when evaluated against full simulation. The proposed framework supports efficient, large-scale replenishment decision-making and is well suited for retail environments requiring frequent and adaptive inventory optimization.
AC3077 15:15-15:30	Intent-Preserving Regeneration of End-to-End Tests from DOM Changes Using Large Language Models Author(s): Imran Al Munyeem, Mohammad Ahmad, Mahmoud Artemi Presenter: Imran Al Munyeem, EasyAsk24 Ltd, UK Abstract: Web end-to-end (E2E) tests often fail after front-end changes because modifications to the Document Object Model (DOM) invalidate selectors, even when the user workflow remains unchanged. This paper presents a method for automated repair of broken UI tests by modelling repair as intent preserving regeneration instead of selector substitution. We introduce a pipeline, which, by combining the use of DOM differencing, summarising the changes, test regeneration with a constrained LLM and multi-level validation in terms of syntax and workflow structure as well as execution and selector robustness, is presented. A pilot evaluation in a set of DOM evolution scenarios shows the ability of this approach to regenerate executable tests automatically in most of the cases and to preserve major aspects of the initial workflow. Failure analysis reveals that UI changes and dynamic visibility conditions are still difficult to deal with. These results provide exploratory evidence that intent-preserving regeneration can automatically restore executability for a substantial portion of UI test failures caused by DOM evolution.
AC4154 15:30-15:45	A Unified Control Room Framework for Human-in-the-Loop AI Workflow Orchestration in Enterprise Systems Author(s): Gaurav Gupta Presenter: Gaurav Gupta, Punjab Technical University (PTU), United States of America Abstract: The adoption of various forms of automation in enterprises, such as RPA and

	ML techniques, is growing rapidly, largely driven by their potential for increasing efficiency and cutting costs. However, even as these tools have proven useful to businesses, several problems remain, including disjointed workflows, inadequate transparency in AI decisions, and lack of integration of human oversight. Current solutions focus mainly on design-time configurations but offer little in terms of runtime governance and control. In this paper, we introduce the concept of Unified Control Room Framework (UCRF) as a runtime governance model for enterprise automation with a focus on decision-making processes. The proposed framework combines workflow orchestration, decision transparency, and human-in-the-loop into a single tool for monitoring and managing AI-driven workflows. The decision routing algorithm, which relies on confidence scoring to determine task handling, automatically routes decisions either autonomously or to humans. In evaluating the performance of our solution through the simulation of a typical warranty workflow, it becomes apparent that enterprise automation can benefit greatly from a formal runtime governance approach.
AC3122 15:45-16:00	A Protocol for Behavioral Attestation of LLM Agent Execution via Induced Dynamics Author(s): Francesco Buccafurri, Carmen Licciardi, Christophe Rosenberger Presenter: Carmen Licciardi, University Mediterranea of Reggio Calabria, Italy Abstract: The deployment of LLM agents as remote services creates economic incentives for providers to deviate from intended execution, for example using cheaper models, cached outputs, or approximate inference. These deviations reduce cost but are hard to detect from outputs. Trusted execution environments (TEEs) ensure the integrity of the execution stack, but do not provide evidence on how outputs are generated, leaving a gap between environment integrity and execution observability. We propose a protocol for behavioral attestation based on induced execution dynamics. We inject structured, challenge-dependent perturbations into execution, producing behavioral signatures tightly linked to the process and verifiable externally. To limit adversarial imitation, we introduce a memory-hard query gating mechanism inside the TEE, which constrains how fast execution traces can be collected. We also define a compact behavioral certificate and a likelihood-based verification method. The combination of induced dynamics and memory-hard gating creates an asymmetry between honest execution and adversarial imitation. This suggests that behavioral signaling with constrained observability can support verification of execution integrity in remote LLM services.