ICCIDA 2025 International Conference

# CONFERENCE PROGRAM

# ICCIDA 2025

## 4th International Conference On

## Computing, IoT And Data Analytics

**July 17 – 18, 2025 Madrid, Spain**

ICCIDA 2025 Organizers:

HCTLab

UAM | ESCUELA POLITÉCNICA SUPERIOR

ingeniumgroup Research Group www.ingeniumgroup.eu

UCLM Universidad de Castilla-La Mancha

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# Introduction to ICCIDA

This conference builds on the success of the previous editions: the 1st edition held at Kocaeli University, Turkey, in 2022, the 2nd edition at Universidad de Castilla - La Mancha, Spain, and the 3rd edition at Shenyang University of Technology, Liaoning, China. ICCIDA has established itself as a premier interdisciplinary platform to help the research community advance by sharing their findings.

The conference provides an excellent opportunity for researchers, scholars, professionals, students, and academicians to foster collaborative relationships and gain access to the latest research advancements. It serves as a forum for sharing ideas, exploring innovative technologies, and contributing to the growth of knowledge in the fields of Computing, IoT, and Data Analytics. Each submitted paper will undergo a rigorous peer-review process by at least two reviewers. Papers will be evaluated based on originality, technical or research depth, correctness, relevance to the conference themes, contributions, and overall readability. Acceptance will be determined by technical merit, relevance, applicability, and alignment with a well-balanced technical program.

# Introduction to HCTLab and Universidad Autónoma de Madrid

Hardware & Control Technology Laboratory (HCTLab) is a multidisciplinary research group committed to advancing technologies at the intersection of human–machine interaction, embedded systems, power electronics, intelligent instrumentation, Unmanned Aerial Vehicles and Machine Learning. The group integrates expertise from various domains, e.g., digital control, signal processing, sensors, and hardware–software co-design, applying these to cutting-edge applications in energy, automation, and digital systems. One of the key research lines of the group is the Digital Control Line, which is centered on the regulation of switched-mode power converters using FPGAs (Field-Programmable Gate Arrays). This line explores high-performance digital control architectures that enable real-time control, low latency, and precise operation of power electronic systems. Particular focus is placed on the modeling, simulation, and hardware implementation of digital controllers capable of handling fast transients and nonlinear system behavior.

A growing line of research focuses on the use of UAVs for indoor navigation in emergency scenarios and the intelligent analysis of photovoltaic systems using machine learning techniques. This line addresses the growing need for flexible, efficient, and automated solutions for monitoring indoor and energy systems.

The Autonomous University of Madrid (UAM) is a public institution internationally recognized for the quality of its teaching and research, its strong international vocation and high level of employability. Located in a unique natural environment, UAM offers a wide range of degree programs, postgraduate and doctoral studies and a complete university experience, with libraries, laboratories, sports facilities, cultural and solidarity activities, and a large variety of mobility opportunities. Become part of a vibrant and diverse community of more than 30.000 students, where everyone can experience university life to the fullest. Every year, UAM campuses welcome 1.500 international students from 50 different countries. UAM is part of CIVIS, an alliance made up of 11 prestigious European universities and has signed more than 1.900 international mobility agreements.

# Introduction to Ingenium Research Group and Instinye University

## Ingenium Research Group

Ingenium from the University of Castilla-La Mancha is a multidisciplinary research group formed by members from different countries, with an extensive experience in national and international projects. Our mission is to contribute to improving social welfare by the implementing projects in the fields of engineering, business administration and economics, and the pursuit of excellence in research. In order to carry out these projects, Ingenium Research Group has developed their own tools, sometimes with general purpose, but often particularly suited for each project.

Ingenium consists of members from the University of Castilla-La Mancha (UCLM), and it has a direct collaboration of thirteen members of Spanish institutions (e.g., Catalonia Polytechnic, College of Financial Studies, Bank of Spain, RENFE, and Novotec consultants) and also international (University of Lancaster and Birmingham in the UK). Ingenium Research Group offers customized training for companies, according to Royal Decree 395/2007 regulated by the Order TAS/2307/2007, by which the companies have a fee for training workers in the form of bonus contributions to Social Security.

## Istinye University

Istinye University aims to take a place among Turkey and the world's most prestigious universities by contributing to producing new knowledge through its education and research performance while helping its students become well-equipped in their fields by sharing existing knowledge with them.

Applying a student-oriented understanding of education to all its processes, Istinye University intends to expand the borders of science thanks to the academic staff's research, put the findings obtained through scientific developments into practice for social welfare, and offer quality and accessible health services to the society in line with its vision of being a science and research center. By conducting education, research and social service activities at universal standards, the university provides its students with a wide range of knowledge, as well as a learning and progressive environment that also covers the fields of technology and art. By elevating the competent, creative and forward-looking individuals of the future, Istinye University aims at contributing to the progress of humankind and playing a significant role in the social, cultural, economic, scientific and technological development of our society.

# Message of UAM Representation

**Prof. Daniel Jaque García**

*Vicerector of Scientific Policy, Universidad Autónoma de Madrid*

Dear Attendees,

The Autonomous University of Madrid (UAM), Spain, the institution that I proudly represent, and myself are grateful for the presence of all attendees at this relevant event, the 4th International Conference on Computing, IoT and Data Analytics. UAM is one of Spain's leading public universities, recognized for its strong commitment to excellence in teaching, cutting-edge research, and social responsibility. This university has consistently ranked among the top universities in Spain and is globally recognized for its contribution to science, technology, humanities, and social progress. Since its foundation, the UAM has played a vital role in promoting economic, social, and cultural development, not only within the Madrid region but also through its international collaborations and research networks. The university comprises several faculties and research institutes spread across its main campus in Cantoblanco. The UAM currently hosts over 50 research institutes and centers, with more than 200 active research groups working across a broad range of fields—from physics to health sciences, environmental studies, economics, law, artificial intelligence, and beyond.

This conference is co-organized by our international research group HCTLab, together with Ingenium Research Group from the university of Castilla-La Mancha, and Istinye University (Turkey). We would like to thank all the organizers for their great teamwork in attracting this important international conference because it represents a unique opportunity to share our academic work and to present the UAM and the region of Madrid to a global audience. At UAM, we are committed to offer the best of ourselves to ensure the success of the conference and to leave in each of you a positive experience with new synergies and collaborations.

Thank you all and enjoy the conference

# Message of General Chairs

## Professor Fausto Pedro García Márquez

*Director of Ingenium Group, European doctor*

*Research topics on Operation Research, Predictive Maintenance*

Dear Assistants,

I would like to personally welcome each of you to the 4th International Conference on Computing, IoT and Data Analytics (ICCIDA).

It is an exciting time for Ingenium Research Group, University of Castilla-La Mancha (Spain), as we continue to grow and adapt, open to your new ideas. Our organization is confronting a time of many changes, but we are meeting these changes during a time of larger nation-wide and global change. The world of data analysis, visualization, Internet of Things, computer vision or artificial intelligence are exciting areas in which to research, and we will continue to meet and bring inspired people together to forums like ICCIDA, to ensure our organizations remains at the cutting edge.

We are transforming the way we operate to continuously improve our ability to advance in analytics, engineering, economics, and management. Our employees and partners have continued to meet the challenges of our field and to excel despite setbacks. We should all be very proud of where we are today and excited about where we are headed.

Finally, I would like to thank each of you for attending our conference and bringing your expertise to our gathering. You, as reference researcher, have the vision, the knowledge, the wherewithal and the experience to help us pave our way into the future. You are truly our greatest asset today and tomorrow, and we cannot accomplish what we do without your research work. Throughout this conference, I ask you to stay engaged, keep us proactive and help us shape the future of Ingenium. My personal respect and thanks go out to all of you, and specially to the Universidad Autónoma de Madrid, that have been working very hard to bring you this excellent event, to bring us the great opportunity to co-organize this reference event together with them.

# Organizers & Committee

**GENERAL CHAIRS**

| | |
|---|---|
| **Prof. Carlos Quiterio Gómez Muñoz**<br>HCTLab Research Group<br>Universidad Autónoma de Madrid, Spain<br>Email: Carlosq.gomez@uam.es | **Prof. Fausto Pedro García Márquez**<br>Director of Ingenium Group, European doctor<br>University of Castilla-La Mancha. Spain<br>E-mail: FaustoPedro.Garcia@uclm.es |
| **Prof. Alaa Ali Hameed**<br>Assistant Professor<br>Istinye University, Turkey<br>Email: alaa.hameed@istinye.edu.tr | **Prof. Isaac Segovia Ramirez**<br>HCTLab Research Group<br>Universidad Autónoma de Madrid<br>E-mail: Isaac.Segovia@uam.es |

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| **Dr. Carlos Quiterio Gómez Muñoz**<br>HCTLab Research Group<br>Universidad Autónoma de Madrid, Spain<br>Email: Carlosq.gomez@uam.es | **Dr. Isaac Segovia Ramirez**<br>HCTLab Research Group<br>Universidad Autónoma de Madrid<br>E-mail: Isaac.Segovia@uam.es |

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| | | | |
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| **Dr. Ziyan Ren,** Shenyang University of Technology, China | **Dr. Zuoxia Xing,** Shenyang University of Technology, China | | |

# ICCIDA 2025 Schedule

| July 17th Teams Link | | July 18th Teams Link | |
|---|---|---|---|
| **09:00-10:00** | Participants Registration | **09:00-09:30** | Participants Registration |
| **10:00-10:30** | Opening Ceremony & Awards | **09:30-10:10** | **Keynote Speaker IV:** Dr. Jorge Portilla |
| **10:30-11:10** | **Keynote Speaker I:** Prof. Rubén Tolosana | **10:10-10:50** | **Keynote Speaker V:** Dr. Long Zhang |
| **11:10-11:40** | Coffee Break | **10:50-11:20** | Coffee Break |
| **11:40-12:20** | **Keynote Speaker II:** Prof. Mayorkinos Papaelias | **11:20-12:40** | **Parallel Sessions 4, 5 and 6** (will be held at different Microsoft Teams sessions respectively) |
| **12:20-13:00** | **Keynote Speaker III:** Prof. Gloria Bueno | **12:40-13:20** | **Keynote Speaker VI:** Prof. Andrés Otero |
| | | **13:20-13:30** | Farewell/ Conference closing |
| **13:00-15:00** | Lunch & Noon Break | **13:30-15:00** | Lunch & Noon Break |
| **15:00-16:30** | **Parallel Sessions 1, 2 and 3** (will be held at different Microsoft Teams sessions respectively) | | |
| | Free time | | |
| **20:30** | Social Dinner | | |

**Note: All schedules are following the Spain time (UTC/GMT+2)**

# Parallel Sessions Presentations

**July 17th**

| **Session ONE; Chairman:** Isaac Segovia Ramírez<br>**Time:** 15:00-16:20 **Room:** Salón de Grados C **Session ONE Meeting LINK** | | |
|---|---|---|
| **No.** | **Speaker** | **Paper Title** |
| 13 | Jorge Cisneros-González | Application of Generative Artificial Intelligence to Improve Academic Assessment |
| 39 | Mahdi Shamisavi | Aerial Thermal Fault Detection in Solar Panels: A Comparative Evaluation of YOLO-Based Models |
| 41 | Isaac Segovia Ramirez | Indoor Real-Time Detection Using UAVs Equipped with Thermal and Visual Sensors for Security Inspection |
| 19 | Miguel Ángel Rojo-Gala | Adaptive Autonomous Drone Navigation for Enhanced 3D Mesh Generation by Reinforcement Learning |
| 35 | Jorge García-Gonzalez | Automated Road Data Collection with UAVs and Arduino Portenta |
| 27 | Lucía López-García | Development and Implementation of an IoT System for Monitoring the Intelligent Air Handling Unit in Data Centers |

| **Session TWO; Chairman:** Nourdine Aliane<br>**Time:** 15:00-16:20 **Room:** Sala de Juntas C **Session TWO Meeting LINK** | | |
|---|---|---|
| **No.** | **Speaker** | **Paper Title** |
| 14 | Jorge García-Gonzalez | Big Data Infrastructure for Traffic Data Acquisition and Storage |
| 3 | Sura Yassin | Frequency Domain Watermarking: A Robust Approach for Secure and Imperceptible Video Protection |
| 6 | Thisura Wijesekera | Challenges and Emerging Trends in Kernel Resource Isolation and Security Enhancements for Containerization |
| 34 | Şengül Bayrak | Autism Spectrum Disorder Classification in Children and Adults by Using Machine Learning Methodologies |
| 45 | Sidra Safdar | Self-Supervised Representation Learning for Anomaly Detection in Brain MRI |

**July 17th**

| **Session THREE; Chairman:** Elyas Zamiri Mamooliraftar<br>**Time:** 15:00-16:20 **Room:** Aula Polivalente **Session THREE Meeting LINK** | | |
|---|---|---|
| **No.** | **Speaker** | **Paper Title** |
| 8 | Gaurab Baral | Forecasting Sticker Sales: A Comprehensive Analysis Using Regression Models |
| 17 | Santiago Alejandro Acurio Maldonado | Optimization of LoRaWAN Network Coverage in Urban Environments Using Genetic Algorithms: A Case Study in Ambato, Ecuador |
| 20 | Cesar Viloria-Nuñez | 4C Smart City: A Strategic Model for Sustainable and Citizen-Centered Urban Transformation |
| 25 | Faezeh Soleimani, Fabiha Aroni | Enhancing Early Detection of Heart Disease with Machine Learning: A Comparative Analysis |
| 43 | Kushal Bhatt | AI-Powered Decision Optimization for Dynamic Resource Management |

**Note: 12 minutes for one speech including a brief introduction of the paper using E-text and a discussion after the speech. Please prepare your PowerPoint or PDF file in advance.**

**July 18th**

| **Session FOUR; Chairman:** Elyas Zamiri Mamooliraftar<br>**Time:** 11:20-12:40 **Room:** Salón de Grados C **Session FOUR Meeting LINK** | | |
|---|---|---|
| **No.** | **Speaker** | **Paper Title** |
| 5 | Rubén Cádiz | A Blockchain-Enabled Drone Framework for Secure and Efficient Intelligent Vehicular Networks |
| 12 | Shadi Motaali | Hybrid Feature Selection and Explainable Machine Learning for BGP Anomaly Detection |
| 28 | Jorge E. López de Vergara | Mobile Application Identification in Encrypted Traffic Using JA4+ Fingerprints |
| 30 | Daniel Perdices | Training LLMs to Speak Network |
| 38 | Kawthar DELLEL | Leveraging Posit Arithmetic for Deep Learning on FPGAs: Comparative Insights with IEEE Floating and Fixed-Points Formats |

| **Session FIVE; Chairman**: Mariano Alberto García Vellisca<br>**Time:** 11:20-12:40 **Room:** Aula Polivalente **Session FIVE Meeting LINK** | | |
|---|---|---|
| **No.** | **Speaker** | **Paper Title** |
| 49 | Álvaro Quintana Martín de Vidales | High-Speed Electronic Design for Data Extraction from a SPAD-Array |
| 36 | Eva Avilés and Clara Aibar | Preliminary Comparison of Optical Sensors for Capillary Refill Time Measurement: Towards Integration into IoMT Systems for Intensive Care Units |
| 26 | Haggouni jamal, Hayat bihri | Optimizing Anemia Prediction: A Comparative Study of Deep Learning Techniques |
| 46 | Basharat Hussain | Enhancing Capabilities of Forecasting Models using LLMs and Agentic RAG |
| 47 | Faezeh Soleimani | Contribution Title 3D Reconstruction of MRI Scans Using Neural Radiance Fields (NeRF) |

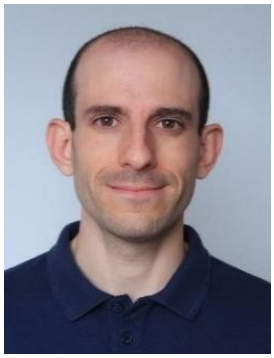
**July 18th**

| **Session SIX; Chairman:** Isaac Segovia Ramírez<br>**Time:** 11:20-12:40 **Room:** Sala de Juntas C **Session SIX Meeting LINK** | | |
|---|---|---|
| **No.** | **Speaker** | **Paper Title** |
| 9 | Khairul Eahsun Fahim* | Blockchain Based Food Traceability System To Ensure Sustainable Food Security in Bangladesh |
| 16 | Assem Shayakhmetova * | Machine Learning for Optimization of Control Systems under Uncertainty and Noise |
| 22 | Gulshat Amirkhanova* | Development of a digital twin for a bakery line with predictive analytics and adaptive control functions |
| 48 | Hema C | SECOT – A Complete Penetration Testing Suite for IoT devices |
| 29 | Abdelrahman Abdelrahim* | An Intelligent Endless Runner Game Using Deep Learning for Dynamic Difficulty and Educational Content Enhancement |
| 37 | Ahmed Mostafa | FurniStage: A Dual-Approach Furniture Recommendation and Staging System Based on Deep Learning |

| **Session SEVEN; Chairman:** Carlos Quiterio Gómez Muñoz<br>**Time:** 11:20-12:40 **Room:** Online **Session SEVEN Meeting Link** | | |
|---|---|---|
| **No.** | **Speaker** | **Paper Title** |
| 23 | Parukuru Reddy* | Multi-Model Communication Device for Deaf-Blind Individuals: Bridging the Gap with Recognition, Vibration |
| 31 | Gnanendra Bachu* | Visualizing Extreme-Scale Systems: A Modular Approach to Topology-Aware Performance Analytics |
| 32 | Aigerim Rakhysh* | A Four Layer Cybersecurity Framework For Digital Twin Systems In The Food Industry |
| 40 | Ahmed Abdeltawab* | Colon Cancer Prediction and Detection Using Machine Learning and Artificial Intelligence |
| 42 | Kishan Reddy Bhimavaram* | IoT-Based Urban Agriculture Container Farm Design and Implementation for Localized Produce Supply |

**Note: 12 minutes for one speech including a brief introduction of the paper using E-text and a discussion after the speech. Please prepare your PowerPoint or PDF file in advance.**

# Keynote Address Presentation I



July 17th, 10: 30~11: 10 am

## Synthetic Data and Foundation Models: Challenges and Opportunities in Security Applications

**Prof. Rubén Tolosana**

*Associate Professor at Escuela Politécnica Superior (UAM)*

**ABSTRACT**

The field of Artificial Intelligence (AI) has experienced a rapid advance in the last years. Companies such as OpenAI, Anthropic, Meta or Google have revolutionized the world in which we live through the release of powerful Foundation Models such as ChatGPT or DeepSeek that can be used to facilitate several of our daily-basis tasks, e.g., summarizing documents or creating project plans. Also, they can be used to generate digital content of all kinds, from images to high-quality videos. Recent popular examples of this type of technology are DALL-E, Sora, or Veo, which allow the generation of hyper-realistic images and videos in a simple way, e.g., text prompting. Although AI technology can be used for good purposes, it could be also very harmful in the wrong hands, e.g., creating misinformation through popular DeepFakes or even attacking security systems using fake documents. In this talk, challenges and opportunities related to the application of synthetic data and Foundation Models in security scenarios will be covered, including but not limited to how to generate realistic synthetic data for training better biometric recognition systems in terms of performance and fairness; how to increase explainability in biometric face recognition through Foundation Models.

**SHORT BIO**

Ruben Tolosana received the M.Sc. degree in Telecommunication Engineering, and the Ph.D. degree in Computer and Telecommunication Engineering, from UAM, in 2014 and 2019, respectively. In 2014, he joined the Biometrics and Data Pattern Analytics Laboratory (BiDA-Lab) at the UAM. His research interests are mainly focused on signal and image processing, pattern recognition, and machine learning, particularly in the areas of DeepFakes, Human-Computer Interaction, Biometrics, and Health. He is the author of more than 100 scientific articles published in international journals and conferences, selected as one of the most influential researchers in the world according to "Ranking of the World Scientist: World Top 2%" in 2023 and 2024, carried out by Stanford University and Elsevier. Recently, he has also organized key international workshops and challenges in top AI conferences such as FRCSyn, ReFIP (IEEE FG-2024), WAMWB (ACM MobileHCI-2023), KVC (IEEE BigData-2023), etc. Dr. Tolosana has also received several awards such as the "Juan Lopez de Peñalver Award (2024)" from the Spanish Royal Academy of Engineering for his research contributions and transfer of technologies.

# Keynote Address Presentation II

July 17th, 11: 40~12: 20 am

## Autonomous marine robotic systems for sustainable data collection from our oceans and seas: The ENDURUNS and MERLIN projects

**Dr. Mayorkinos Papaelias**

*Full Professor at University of Birmingham*

**ABSTRACT**

Autonomous marine robotic systems have the potential to play a vital role in enabling sustainable, long-term data collection from our oceans and seas, particularly in areas that are remote, deep, or environmentally sensitive. Two innovative European projects—ENDURUNS and MERLIN—have been at the forefront of this effort. The H2020 ENDURUNS project developed an autonomous, hybrid-powered underwater robotic system capable of deep-sea exploration and seabed mapping, using renewable energy sources such as wave and solar power to minimize environmental impact and extend operational endurance. Building on this foundation, the ongoing Horizon Europe MERLIN project is advancing the integration of various types of sensors, AI-based navigation, and improved energy autonomy into next-generation autonomous marine robotic platforms. Both projects aim to support a sustainable Blue Economy by enabling efficient environmental monitoring, climate research, and resource assessment without relying on traditional, fuel-intensive marine operations. These robotic systems not only reduce human risk and operational costs but also contribute to real-time, high-resolution ocean data that is essential for informed marine policy and conservation strategies.

**SHORT BIO**

Professor Mayorkinos Papaelias is a leading academic in the field of Non-Destructive Testing (NDT) and Condition Monitoring, currently serving as a Professor at the School of Metallurgy and Materials, University of Birmingham. He earned his Ph.D. in Metallurgy from the same university in 2004, following an MSc in New Materials from the University of Aberdeen and a B.Eng. (Hons.) in Materials Science and Engineering from Queen Mary, University of London. His research focuses on structural health monitoring, particularly in the energy and transport sectors, with applications in wind turbines, railway systems, marine infrastructure and robotic systems. Professor Papaelias has published over 150 peer-reviewed journal and conference papers and has co-authored and edited several books. He has led and contributed to numerous high-impact European research projects under FP6, FP7, H2020, and Horizon Europe, such as OPTIMUS, ENDURUNS, and MERLIN. His teaching spans undergraduate and postgraduate courses in NDT, condition monitoring, and nuclear reactor physics, reflecting his deep commitment to both research excellence and education.

## Keynote Address Presentation III

July 17th, 12: 20~13: 00 am

# The Fragile Side of AI: Understanding Hidden Pitfalls, Systemic Failures, and Their Implications

**Prof. Gloria Bueno**

*Full Professor University of Castilla-La Mancha*

*VISILAB research group*

**ABSTRACT**

This talk presents a comprehensive taxonomy of AI errors, encompassing algorithmic and perception failures, such as hallucinations where language models confidently generate false or misleading information and deep-rooted biases in data and algorithms that reinforce existing inequalities, particularly in areas like facial recognition and automated credit assessments. A central focus is on adversarial examples, small, often imperceptible input perturbations that can dramatically alter a model's output. These subtle manipulations expose structural vulnerabilities, as seen when minor changes to a stop sign's texture cause an autonomous system to misinterpret it as a speed limit sign, posing clear safety risks. Beyond technical flaws, we delve into project-level and organizational shortcomings, including poorly defined objectives, low-quality or biased datasets, lack of rigorous validation under real-world conditions, and deployments rushed by commercial or competitive pressures. Drawing on diverse case studies and recent empirical research, this talk proposes an integrated framework to analyze these failures by their technical or social nature, predictability, mitigability, and the degree of human involvement. It also highlights why adversarial vulnerabilities uniquely underscore the absence of true semantic comprehension in current AI architectures.

**SHORT BIO**

Gloria Bueno holds a BSc in Physics (1993) and a PhD in Computer Vision (1998), awarded by Coventry University (UK), where she specialized in advanced methodologies for image understanding. Currently, she is a Full Professor at the School of Industrial Engineering of UCLM, where she has been based since 2003. At UCLM, she leads the VISILAB research group, a team dedicated to exploring cutting-edge problems in Computer Vision and Artificial Intelligence. Her academic trajectory includes a Marie Curie postdoctoral fellowship at Université Louis Pasteur (Strasbourg, France), and significant research stays, where she applied AI-driven approaches to both biomedical diagnostics and industrial inspection systems. She has served as Principal Investigator on 24 publicly funded research projects, five of them at the European level. Prof. Bueno actively collaborates with globally renowned institutions, including CERN or CEA, among others, fostering international partnerships. She is member of IEEE, SEIB and SPIE, a promoter of the ESDIP scientific society, and a founding partner of the UBOTICA Ltd.

# Keynote Address Presentation IV

July 18th, 09: 30~10: 10 am

## Post-Quantum Security in IoT at the Extreme Edge

**Dr. Jorge Portilla**

*Associate Professor at Universidad Politécnica de Madrid (UPM)*

*Director of the Centro de Electrónica Industrial at UPM*

**ABSTRACT**

In an increasingly technological world, the security of digital information has become a critical need. With the advancement of quantum computing, many of today's cryptographic systems, which protect everything from banking communications to government secrets, could become vulnerable. Post-quantum security emerges as a response to this challenging threat, offering new cryptographic schemes that are resistant to attacks by future quantum computers. This field aims to ensure confidentiality, integrity, and authenticity of information even in a scenario dominated by unprecedented computational capabilities.

This need for protection becomes even more urgent in the context of the Internet of Things (IoT), especially in extreme edge scenarios where devices operate in remote environments with limited resources and intermittent connectivity. In such cases, implementing post-quantum security solutions presents a dual challenge: providing resistance to quantum threats without compromising performance, energy efficiency, or device latency. The integration of post-quantum cryptography at the extreme edge of IoT is not just a necessary technological evolution but also a fundamental requirement for building resilient and trustworthy systems in the post-quantum era.

**SHORT BIO**

Jorge Portilla is an Associate Professor at the Universidad Politécnica de Madrid (UPM), where he conducts research at the Centro de Electrónica Industrial. He holds an M.Sc. in Physics from Universidad Complutense de Madrid (UCM) and a Ph.D. in Electronic Engineering from UPM. He has contributed to over 40 funded research projects, mostly in H2020 and Horizon Europe programs, national grants, and industry collaborations. His international experience includes research stays at Industrial Technology Research Institute (ITRI) and Taipei Tech in Taiwan. His main research interests include wireless sensor networks, Internet of Things at the edge, digital embedded systems, FPGA-based reconfigurable platforms, and cybersecurity in embedded systems. He is currently the director of the Centro de Electrónica Industrial at UPM.

# Keynote Address Presentation V

July 18th, 10: 10~10: 50 am

## Data-driven methods and their applications to Renewable Energy

**Dr. Long Zhang**

*Senior Lecturer (Associate Professor) University of Manchester*

**ABSTRACT**

Renewable energy, particularly wind and solar power, has seen rapid and widespread deployment over the past two decades — a trend that is expected to continue in the coming decades to help meet the 2050 carbon emissions targets. For instance, the latest offshore wind turbines now have capacities exceeding 20 MW, with rotor diameters of around 300 meters. More recently, ocean renewable energy — such as wave and offshore wind power — has also been recognized as a key area of potential growth in the coming decades. To ensure these large-scale renewable energy systems operate efficiently and safely throughout their typical 20- to 25-year lifespan and beyond, it is crucial to adopt effective planning, design, and operational strategies. Advanced techniques in system design and operation are particularly important for reducing the overall cost of renewable energy.

This talk will present a range of data-driven approaches — including statistical and machine learning methods, system identification, and frequency-domain techniques — and explore their applications in wind, wave, and solar power. Case studies will illustrate how these methods support planning, design, condition monitoring, and fault diagnosis in real-world renewable energy systems.

**SHORT BIO**

Dr Long Zhang is a Senior Lecturer in the Department of Electrical and Electronic Engineering at The University of Manchester. His research focuses on data-driven methods, including machine and statistical learning, neural networks, system identification, frequency analysis, condition monitoring, intelligent control, and instrumentation — with practical applications in smart renewable energy, robotics, and transportation systems. His work has been extensively supported by funding bodies such as EPSRC, EPSRC IAA, Innovate UK, and various industrial partners. He has secured over £2.5 million in research funding as Principal Investigator or Co-Investigator. Dr Zhang is the founding director of the first industrial-scale wind turbine pitch bearing and blade laboratory, and he has led pioneering work in fault detection for wind turbine pitch bearings. He also serves as the Director of the MSc programme in Advanced Control and Systems Engineering.

# Keynote Address Presentation VI

July 18th, 12: 40~13: 20 am

## Neuromorphic Architectures and Evolutionary Algorithms for Self-* Cyber-Physical Systems

**Prof. Andrés Otero**

*Associate Professor at Universidad Politécnica de Madrid (UPM)*

**ABSTRACT**

One of the primary challenges in designing Cyber-Physical Systems (CPS) is providing them with the capability to adapt and respond to changes in the environment, system requirements, or operational conditions autonomously, without direct human intervention. The crucial aspect lies in the ability to reconfigure and self-adjust the systems to ensure optimal performance.

In this talk, the focus will be on addressing adaptability in Self-* CPSs from an architectural perspective, combining evolutionary computation with artificial neural networks, commonly known as neuroevolution. Special emphasis will be given to various architectural approaches, including block-based, neuromorphic, and deep neural networks, which serve as targets for continuous optimization and self-adaptation enabled by evolutionary algorithms. By embedding learning capabilities within CPSs, they can achieve self-optimization and self-adaptation, leading to continuous or lifelong learning. The talk will explore different applications in image processing, physical control, and reinforcement learning domains.

**SHORT BIO**

**Andrés Otero** holds a degree in Telecommunications Engineering from the University of Vigo, where he graduated with honors in 2007. He completed a master's and a PhD in Industrial Electronics at the UPM in 2009 and 2014, respectively. He is part of the Centro de Electrónica Industrial at UPM. His research interests include embedded and/or reconfigurable systems, microelectronic design, evolutionary computing, and edge machine learning. He has co-authored 23 articles in JCR-indexed journals. He has also published two book chapters and over 30 conference papers at venues like FPL, ReConFig, AHS, DATE, and ARC. He co-authored the best paper award winners at ReConFig 2012 and ARC 2020. He is a regular member of the program committees of several of these conferences, having served as Program Chair of ReCoSoC 2017 and Track Chair at FPL 2021, and he is also an editor of IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (IEEE TCAD). His research has been developed within the framework of publicly funded projects, both national (DR. SIMON, DREAMS, among others) and European (SMART, ENABLE-S3, ENVIGUARD, FASTCUDA, among others), being the Principal Investigator for some of these projects.

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