



16th Advanced Doctoral Conference on Computing, Electrical and Industrial Systems



Technological Innovation for AI-Powered Cyber-Physical Systems

July 2-4, 2025
Caparica (Lisbon) – Portugal

Including the associated event:

YEF-ECE 2025

9th Young Engineers Forum on Electrical and Computer Engineering

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Welcome Message

The 16th Advanced Doctoral Conference on Computing, Electrical, and Industrial Systems (DoCEIS 2025) aims to serve as a central hub, bringing together Ph.D. students, professors, researchers, engineers, and specialists from various countries around the topic of Technological Innovation for AI-Powered Cyber-Physical Systems.

AI-powered Cyber-Physical Systems (AI-CPS) are intelligent and interconnected systems that monitor and analyse the physical world in real time, while some may directly interact with it. They consist of sensors, actuators, software, and networks with AI algorithms. These systems can learn from data, make autonomous decisions, and adapt dynamically to changing environments. These are present across various domains such as autonomous vehicles, smart manufacturing, healthcare, energy systems, and infrastructure. As such, these systems are quintessential with Industry 5.0 and Society 5.0 bringing new technology to everyday human experiences, ensuring that innovation serves both industrial and societal purposes in a balanced manner.

DoCEIS 2025 promotes innovative thinking and the exchange of cutting-edge ideas capable of driving research breakthroughs within a multidisciplinary context. The sixteenth edition of this conference aims to advance the field of AI-powered CPS by fostering interdisciplinary approaches to address present-day challenges, ultimately contributing to the development of a more efficient, resilient, and sustainable society. With a strong focus on early-career researchers, this conference provides a valuable opportunity for doctoral students and young researchers to present, share and refine their ideas, engage in constructive discussions, and receive valuable feedback from a highly qualified audience. Aligned with this, DoCEIS offers a collaborative and supportive environment that brings together researchers, academics and company stakeholders to share expertise, discuss concerns and co-develop future directions. Thus, it represents a significant opportunity to help young researchers improve their skills for their academic and professional development.

DoCEIS 2025, sponsored by SOCOLNET, IFIP, and IEEE IES, attracted 59 paper submissions from PhD students and their supervisors. Out of these submissions, 29 were selected by the International Program Committee for inclusion in the main program and covers a spectrum of application domains. As such, research results and ongoing work are presented, illustrated, and discussed in areas such as:

- AI in Business Applications
- AI in Industry 4.0
- Smart Systems in Sustainable Development
- AI-Powered Healthcare
- AI in Systems, Decision & Control
- Intelligent Sensing & Communication Systems

- Smart Power Systems
- Electronic Systems

We envisage that this compilation of papers will offer participants a captivating set of novel concepts and intellectually stimulating challenges spanning multiple disciplines. The diverse nature of the included findings is intended to spark and invigorate further research and development initiatives, encouraging a broader exploration of innovative multidisciplinary pathways.

We would like to express our sincere gratitude to all the authors for their valuable contributions to this year's conference. We also thank the PhD students involved in the organizing committee that are essential for the success of the conference. Additionally, we would like to extend our deepest appreciation to the dedicated members of the DoCEIS International Program Committee. Their assistance in the article selection process as well as their insightful comments have immensely contributed to enhancing the overall quality of the papers.

This year we are pleased to also include, as an associated event, the YEF-ECE 2025, the 9th International Young Engineers Forum on Electrical and Computer Engineering, which also attracted a good number of submissions.

We hope that all participants will take the opportunities offered by these events to exchange experiences and knowledge with colleagues from different universities and areas of research.

Prof. Luis M. Camarinha-Matos
Conference Chairman

Prof. Filipa Ferrada
Program Co-Chair

Message from the Organizers

Greetings and welcome to DoCEIS 2025!

We are delighted to have your participation, and we hope that the conference will meet your expectations as well as your sojourn in Lisbon will be pleasant. We are celebrating the 16th edition of the Advanced Doctoral Conference on Computing, Electrical and Industrial Systems and whether you are attending for the first time or have been part of all fifteen editions, we would like you to know that your attendance is an essential part of the success of this event.

The conference, held from July 2nd to the 4th, is organized in the context of the Electrical and Computer Engineering doctoral programme of the School of Science and Technology of NOVA University of Lisbon, by PhD students from the doctoral programme. The process, which entails program definition, dissemination, venue identification, and sponsorship solicitation, has proved a unique and rewarding experience that will hopefully serve as a foundation to develop the set of skills needed to contribute to the greater scientific community.

With submissions from several countries, it is our conviction that the 16th edition of DoCEIS, will give opportunities for sharing and exchanging original research ideas and opinions, especially for PhD students, who will have the opportunity to share and present their work in an international conference, often for the first time, gaining inspiration for future research. Additionally, this forum provides a networking platform for attendees to connect, collaborate, and communicate with fellow researchers, broadening knowledge about various fields in computing, electrical and industrial systems.

We would like to express our gratitude to our keynotes and invited speakers for taking time out of their busy schedules to share their knowledge at this event. We also want to express our sincere appreciation to all participants, for your interest, and for having submitted your papers and posters to the conference. We would also like to give a special thanks to the International Program Committee, for their critical review of the submitted papers.

We wish everyone a very pleasant and remarkable conference and we look forward to sharing with you a memorable event in DoCEIS 2025!

The Local Organizers.

DoCEIS 2025 Conference Organisation

Conference and Program Chair:

Luis M. Camarinha-Matos, NOVA University Lisbon, Portugal

Program Co-Chair:

Filipa Ferrada, NOVA University Lisbon, Portugal

Organizing Committee Co-chairs:

Pedro Pereira, NOVA University Lisbon, Portugal

Sanaz Nikghadam-Hojjati, NOVA University Lisbon, Portugal

Rodolfo Oliveira, NOVA University Lisbon, Portugal

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Sérgio Sousa, Portugal
Tiago Reis, Portugal

Invited Keynote Speakers



Keynote 1: Rita Cunha, IST, Portugal

Title: Aerial Robotics: Advances in Motion Planning and Control

Short Bio: Rita Cunha received her Ph.D. degree in Electrical and Computer Engineering from Instituto Superior Técnico (IST), Universidade de Lisboa, Portugal, in 2007. Since 2019 she has been with the Department of Electrical and Computer Engineering of IST, where she teaches in the areas of Control and Robotics. She is currently

an Associate Professor of IST, member of the Executive Board of the Department of Electrical and Computer Engineering, and a senior researcher with the Institute for Systems and Robotics (ISR). Her research interests and expertise include dynamical systems, nonlinear control systems, motion planning and control of autonomous vehicles, distributed control systems, vision-based control, and aerial robotics. She has participated in several research projects, including 2 EU projects as coordinator of IST's participation and 4 national projects as principal investigator and 3 national projects as co-PI. Selected projects for which she coordinated IST's participation include: MULTIDRONE – Multiple Drone platform for media production (H2020), LOTUS - Load Transportation using Unmanned Aerial Vehicles (FCT, Portugal2020), and SCARVE - Sensor-based Control of Autonomous Aerial Vehicles (FCT).

Abstract: Unmanned Aerial Vehicles (UAVs), commonly known as drones, are rapidly evolving to become versatile sensing platforms, capable of navigating and tracking trajectories with remarkable accuracy. While motion control in free flight is now well established, new challenges are driving the field toward richer interaction with the environment and greater cooperation between multiple vehicles. In this talk, I will first give a brief overview of past work on trajectory tracking and path following control of quadrotor UAVs, which leverages Lyapunov stability theory to provide high-performance autonomous flight. I will then highlight developments related to three topics of research: i) formation planning and control for multi-vehicle systems; ii) visual servoing control using optical flow for reactive landing, and iii) and motion planning and control for aerial transportation of slung loads.



Keynote 2: Filippo Sanfilippo, University of Agder, Norway

Title: Human-Robot Teaming, a Forward Leap into Real Life Applications

Short Bio: Filippo Sanfilippo holds a PhD in Engineering Cybernetics from the Norwegian University of Science and Technology (NTNU), Norway, with a focus on intelligent control approaches for robotic manipulators. His research interests include robotics, wearables,

human-robot teaming, artificial intelligence, and control theory. He is currently appointed as a Professor at the Faculty of Engineering and Science, University of Agder (UiA), Grimstad, Norway. He is also an adjunct Professor at the Faculty of Informatics, Kaunas University of Technology, Kaunas, Lithuania. He is also the Director of Science at Twilligent AS, Norway, a company that is at the forefront of creating intelligent digital twins to visualise, simulate and optimise the operation of complex facilities, production lines and processes. He carries a vast experience in participating in European research programs and various national

projects from the Research Council of Norway (RCN). He is an IEEE Senior Member. He is the former Chair of the IEEE Norway Section. He is the Chair of the IEEE Robotics and Automation, Control Systems and Intelligent Transportation Systems Joint Chapter. He is the Chair of the Norway Section Life Members Affinity Group. He is currently a member of the IEEE Region 8 Chapter Coordination Committee, of the Conference Coordination Committee, of the IEEE Public Visibility Committee, of the IEEE R8 Awards and Recognitions Committee, and of the Professional and Educational Activities Committee. He is also the Treasurer of the Norsk Forening for Kunstig Intelligens (NAIS), the Norwegian Association for Artificial Intelligence. He has authored and co-authored several technical papers in various journals and conferences. He is a reviewer for several international conferences and journals.

Abstract: Human-robot interaction (HRI) is the study of how humans and robots interact, as well as how to develop robots that can adapt to human behavior. Human-robot cooperation (HRC) expands on this by creating new approaches and technologies that allow robots to collaborate with people in shared environments. The field of human-robot teaming (HRT) goes one step further, by studying how to create teams of humans and robots that can work together effectively and efficiently to achieve common goals. In this talk, an overview of the possible real-life applications for HRT will be presented.

Keynote 3: José Machado, University of Minho, Portugal

Title: Low-Power Real-Time Machine Learning Approach using IMU Data on FPGA



Short Bio: *José Machado is a Full Professor at the University of Minho, Portugal, and a senior researcher at the ALGORITMI Research Center, where he coordinates the Computer Science and Technology (CST) group and the Knowledge Engineering Laboratory. He is also a member of the coordination committee of LASI-Intelligent Systems Associate Lab. His research spans Artificial Intelligence, Data Science, and Medical Informatics, with a particular focus on intelligent decision-support systems, responsible AI, and digital health. He has led several national and international R&D projects and has supervised numerous Ph.D. and M.Sc. theses. He is actively involved in scientific committees and serves regularly as a reviewer and evaluator for international journals, conferences, and funding agencies.*

Abstract: This talk presents a low-power, real-time machine learning approach for processing inertial data on FPGA platforms. Leveraging data from Inertial Measurement Units (IMUs), the system performs efficient classification tasks directly on hardware, enabling immediate response with minimal energy consumption. Designed for embedded and mobile applications, it addresses critical constraints such as latency, power usage, and data privacy. By executing all processing locally on the FPGA, the solution avoids transmitting raw sensor data to external servers, thereby preserving user privacy. This architecture is particularly suited for smart vehicles, wearable devices, and autonomous systems, where energy efficiency, real-time responsiveness, and privacy protection are essential. Experimental results demonstrate the feasibility of deploying lightweight ML models on FPGA with high performance and privacy-aware operation.

Program Overview

	Morning	Afternoon
Day 1 2 July	- Opening Session - Keynote 1: <i>Rita Cunha</i> - Sessions: A. AI in Business Applications	- Horizontal Session: The Future Engineer: Skills Beyond Technology - Sessions: B. AI-Powered Healthcare - Posters - Welcome Reception
Day 2 3 July	- Sessions: C. AI in Systems, Decision & Control D. Smart Power Systems - Sessions: E. AI in Industry 4.0 F. Smart Systems in Sustainable Development	- Keynote 2: <i>Filippo Sanfilippo</i> - Sessions: G. Electronic Systems - Panel: From Lab to Field: Scaling AI Innovations - Conference Dinner
Day 3 4 July	- Opening YEF-ECE 2025 - Sessions: - Y1. - Y2. - Y3. - Sessions: - Y4. - Y5. - Y6.	- Keynote 3: <i>José Machado</i> - Sessions: - H1. Intelligent Sensing - Y7. - Y8. - Sessions: - H2. Communication Systems - Y9. - Y10. - Posters - Closing Session & Awards

Detailed Schedule DoCEIS 2025

Day 1 – Wednesday 2 Jul 2025

09:00 – 09:30 Opening session

09:30 – 10:30 Keynote 1

Aerial Robotics: Advances in Motion Planning and Control

Rita Cunha – University of Lisbon, Portugal

10:30 – 10:45 Coffee break

10:45 – 12:45 Session A

A – AI in Business Applications

Chairs: Ali Sousaraei, Clarisse Feio

- **A Collaborative Approach to Last-Mile Logistics**
Dionisio Fama Noque, Luis M. Camarinha-Matos and Ana Inês Oliveira
- **Processes Classification Tool Development Based on BERT for Logistics Laboratory**
Rene Maas, Eduard Shevtshenko, Hendrik Laanemets, Tatjana Karaulova
- **An Access Control Method Against Unauthorized and Noncompliant Behaviors Leveraging Large Language Models**
Nastaran Farhadighalati, Sepideh Kalateh, Luis A. Estrada-Jimenez, Sanaz Nikghadam Hojjati, and José Barata
- **A Pattern-Based Approach to Data Privacy in Business Processes**
Lukas Waidelich and Thomas Schuster

12:45 – 14:15 Lunch

14:15 – 15:30 Horizontal Session

15:30 – 15:50 Ice Breaking Session

Ready to break the ice and spark some fun? Join our Ice Breaking Session for an unforgettable start of DoCEIS'25! Meet new people, share laughs, and build

connections through exciting activities designed to make everyone feel welcome and energized. Don't miss out!!

15:50– 16:05 Coffee break

16:05 – 18:05 Session B

B – AI-Powered Healthcare

Chairs: Emanuel Mango, Eurico Clemente

• Device Prototype for Kinematic and Electromyographic Analysis of the Upper Limb <i>Patrícia Santos, Filipa Marquês, Carla Quintão and Cláudia Quaresma</i>
• Explainable Normative Modeling: Subcortical Changes in Frontotemporal Dementia Subtypes <i>Helena Rico Pereira, José Manuel Fonseca, and Hugo Alexandre Ferreira</i>
• User-Centered and Technical Requirements for Myoelectric Pediatric Arm Prosthesis Design: A Preliminary Study <i>Ana Oliveira, Ana Londral, Ana Giordano, Bruno Soares, Cláudia Quaresma</i>
• Embedding Predecessor Information in Optimization of Genetic Algorithm (GA) based Blind Image Restoration <i>Chaudhary Muhammad Shahbaz Anjum and Aftab Khan</i>

18:05 – 18:50 Posters I

Chairs: Fábio Gregório, Francisco Silva

• Design and Optimization of Hybrid Photovoltaic Systems for Off-Grid Telecommunication <i>José Francisco Calandula, João Murta Pina and Nuno Vilhena</i>
• Hybrid Lyapunov and Barrier Function-Based Control with Stabilization Guarantees <i>Hugo Matias and Daniel Silvestre</i>
• Improving Hydrogen Production Through Pulsed Electrolysis <i>Emanuel Mango, Stanimir Valtchev, Manuela Vieira and Rui Lobo</i>

19:00 - Welcome reception

09:00 – 11:00 Sessions C, D

C – AI in Systems, Decision & Control

Chairs: Hugo Matias, Hugo Viana

- **Deep Learning Models for GNSS-denied Target Navigation**

Ricardo Serras Santos, João P. Matos-Carvalho, Carlos T. Calafate, Sérgio D. Correira, Slavisa Tomic, Marko Beko, and Pietro Manzoni

- **Coarse-Grained Reconfigurable Arrays for High-Performance Low-Power Deep Neural Networks on Embedded Devices**

João D. Lopes, Horácio C. Neto, and José T. de Sousa

- **Autonomous Vehicle Decision Making Through Multi- Grid Markov Decision Processes**

Tiago Caldeira, Majid Khonji, Jorge Dias, Pedro U. Lima

- **High-Level Petri Nets for Modeling Cyber-Physical Multi-Agent Systems**

Rui Guerreiro, João Paulo Barros, Luís Gomes

D – Smart Power Systems

Chairs: João Cabacinho, José Calandula

- **Detection and Mitigation Using PCA -Adaptive Sliding Mode Controller**

Seema Yadav, Nand Kishor, Shubhi Purwar

- **Analytical Modeling and Simulation of a Superconducting Saturated Core Reactor**

Leonardo Miúdo, João Murta-Pina, Nuno Amaro, Nuno Vilhena

- **Control of a Multiphase Superconducting Axial Machine Drive for Electric Aircraft**

Fábio Encarnação-Gregório, João Murta-Pina, Mohammad Yazdani-Asrami and Vitor Fernão Pires

- **Investigation of the Impact of Geometrical and Operational Parameters on AC Transport Losses in HTS Pancake Coils Using Extensive FEM Simulations and Regression Analysis: Insights**

into Design Acceleration

*Masoud Ardestani, João Murta-Pina, Simone Sparacio,
Roberto A.H. de Oliveira, Mohammad Yazdani-Asrami*

11:00 – 11:15 Coffee break

11:15 – 12:45 Sessions E, F

E – AI in Industry 4.0

Chairs: José Luis, Rui Guerreiro

- **Large Language Models to Support Altruistic Collaborative Healing in Smart Manufacturing**
Luis A. Estrada-Jimenez, Nastaran Farhadighalati, Sepideh Kalateh, Sanaz Nikghadam Hojjati, and José Barata
- **Data Pre-processing of Hard Disk Drive Data for failure prediction in the context of Industry 4.0**
Kazeem Balogun, Lai Xu
- **Forecasting Power Demand in Complex Buildings Using Machine Learning: A Shopping Center Case Study**
Bruno Palley, Hermano Bernardo, João Poças Martins, Rosaldo Rossetti

F – Smart Systems in Sustainable Development

Chairs: Sérgio Sousa, Tiago Reis

- **Ensemble Deep Learning Model for AI-Powered Cyber-Physical Systems in Precision Agriculture**
Laura Cosma, Ștefan Vasile Oniga, Ovidiu Cosma
- **An Integrated Framework for the Development of a Multi-Sensor Node to Support Wildfire Management**
Miguel Lourenço, Luís Bica Oliveira and Henrique Oliveira
- **Detection and Characterization of Plume-Dominated Wildfires**
Afonso Oliveira, Nuno Fachada, João P. Matos-Carvalho

12:45 – 14:15 Lunch

14:15 – 15:15 Keynote 2

Human-Robot Teaming, a Forward Leap into Real Life Applications

Filippo Sanfilippo - University of Agder, Norway

15:15 – 16:45 Session G

G – Electronic Systems

Chairs: Ali Sousaraei, Emanuel Mango

- | |
|--|
| <ul style="list-style-type: none">● A Comprehensive Study of the Reference Voltage Buffer Design for CR- and CS-based SAR-ADCs
<i>Hugo Viana, Pedro Barquinha and João Goes</i> |
| <ul style="list-style-type: none">● A Physically Unclonable Function Systematic Performance Analysis Methodology
<i>João Cabacinho, João Casaleiro, Luis B. Oliveira</i> |
| <ul style="list-style-type: none">● Recent Trends in Audio Power Amplifiers for Battery-Powered Applications
<i>José Francisco Luís and Nuno Paulino</i> |

16:45 – 17:00 Coffee break

17:00 – 19:00 Panel Session

From Lab to Field: Scaling AI Innovations

19:30 – 23:00 Conference Dinner

Day 3 – Friday 4 Jul 2025

09:00 – 09:10 Opening session YEF-ECE

09:10 – 10:50 YEF-ECE Sessions Y1, Y2, Y3

10:50 – 11:05 Coffee break

11:05 – 12:45 YEF-ECE Sessions Y4, Y5, Y6

12:45 – 14:15 Lunch

14:15 – 15:15 Keynote 3

Low-Power Real-Time ML Approach using IMU Data on FPGA

José Machado – Universidade do Minho, Portugal

15:15 – 16:15 DoCEIS Session H1, YEF-ECE Sessions Y7, Y8

H1 – Intelligent Sensing

Chairs: Clarisse Feio, Eurico Clemente

- **Electronic Noses for Cyber-Physical Systems: Preliminary Results on TiO₂ Thin Film as a Humidity Sensor**

Tiago Reis, Paulo A. Ribeiro, Susana Ribeiro, Maria Helena Fino and Maria Raposo

- **AI for Plasmonic Nanoparticles: a Tool to Improve the Colorimetric Detection of PoC Devices**

Caterina Serafinelli, Alessandro Fantoni, Elisabete C.B.A. Alegria, Manuela Vieira

16:15 – 16:45 Coffee break

16:45 – 17:45 DoCEIS Session H2, YEF-ECE Sessions Y9, Y10

H2 – Communication Systems

Chairs: Fábio Gregório, Hugo Matias

- **Low Complexity and High Performance in Selective LIS Systems**

Ali Gashtasbi, Mario Marques da Silva and Rui Dinis

- **Improved Channel Estimation for LIS Systems Using Regularized RLS in SC-FDE Frameworks**

Ali Gashtasbi, Mario Marques da Silva and Rui Dinis

17:45 – 18:15 Posters II

DoCEIS Posters II

Chairs: Hugo Viana, João Cabacinho

- **Digital Twins in Co-Creative Robotics: Enhancing Human-Robot Collaboration through Virtual Modelling**

Zahra Babaei, Sanaz Nikghadam-Hojjati, José Barata and Paulo Leitão

- **Using Artificial Intelligence to Predict Gunfire Deaths**

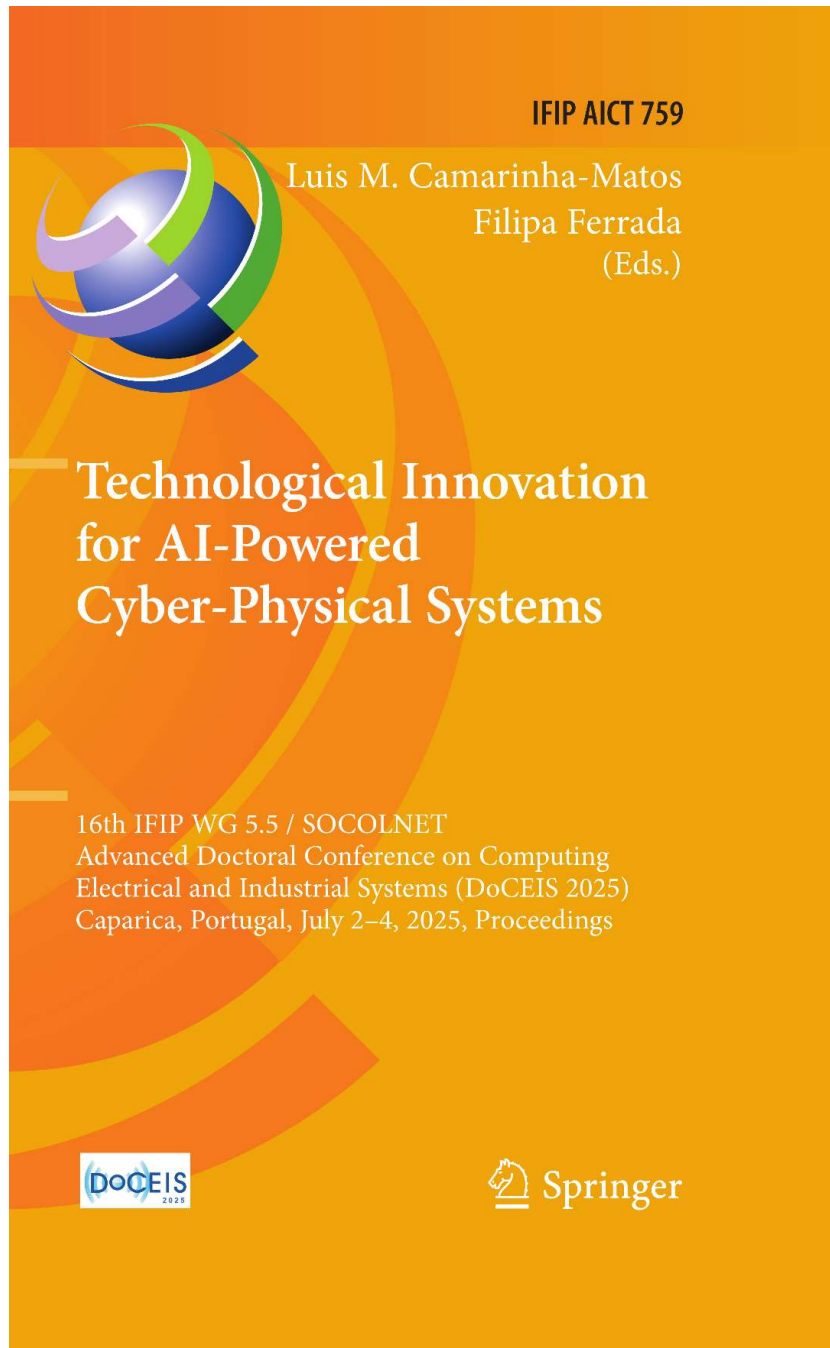
Eurico Clemente

18:15 – 18:45 Closing Session & Awards

Proceedings

DoCEIS 2025 Proceedings are published by Springer, under its IFIP AICT series.

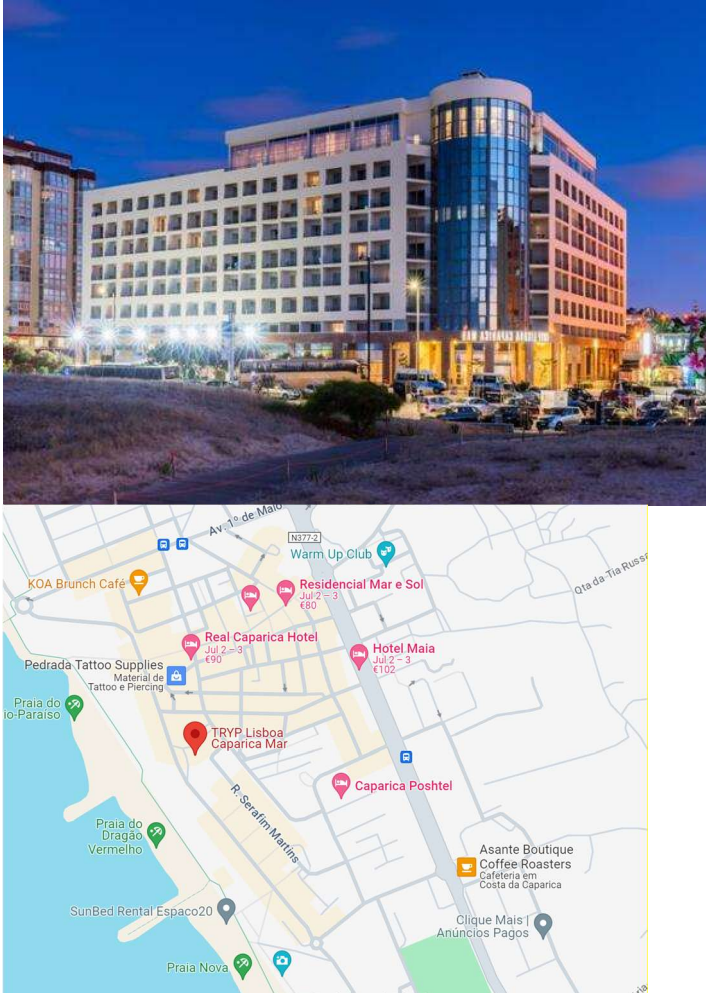
Proceedings in digital format are available through a link provided at the conference website.



Similar to previous years, these proceedings will be submitted to indexing in ISI Web of Science, SCOPUS and DBLP.

Local

The conference will be held at [TRYP Lisboa Caparica Mar Hotel in Caparica](#).



How to Arrive at the Conference

 By Car

Directions via [Google Maps](#).

 By Boat

From Cacilhas, take bus TST no. 124 to "Costa de Caparica". Timetables available [here](#).

 By Taxi

Approximate cost is €30 during the day. Make sure the meter is running. Higher fares at night.

 By Uber

An often cheaper and convenient alternative to taxis.

Organizational Sponsors



Organized by:

PhD Program in Electrical and Computer Engineering,
School of Science and Technology - NOVA University Lisbon

Program Overview

DoCEIS 2025 & YEF-ECE 2025

Wednesday – 2 Jul 2025			Thursday – 3 Jul 2025			Friday – 4 Jul 2025		
09:00	Opening Session		09:00	C AI in Systems, Decision & Control	D Smart Power Systems	09:00	Opening YEF-ECE 2025	
09:30	Keynote 1 <i>Aerial Robotics: Advances in Motion Planning and Control</i> Rita Cunha					09:10	Y1 5 papers	Y2 5 papers
10:30	<i>Coffee break</i>					10:50	<i>Coffee break</i>	
10:45	A AI in Business Applications		11:00	<i>Coffee break</i>		11:05	Y4 5 papers	Y5 5 papers
12:45			11:15	E AI in Industry 4.0	F Smart Systems in Sustainable Development	12:45	Y6 5 papers	
	<i>Lunch</i>		12:45				<i>Lunch</i>	
14:15	Horizontal Session The Future Engineer: Skills Beyond Technology		14:15	Keynote 2 <i>Human-Robot Teaming, a forward leap into real life applications</i> Filippo Sanfilippo		14:15	Keynote 3 <i>Low-Power Real-Time ML Approach using IMU Data on FPGA</i> José Machado	
15:30	Ice Breaking		15:15	G Electronic Systems		15:15	H1 Intelligent Sensing	Y7 3 papers
15:50	<i>Coffee break</i>		16:45	<i>Coffee break</i>		16:15	<i>Coffee break</i>	
16:05	B AI-Powered Healthcare		17:00	Panel From Lab to Field: Scaling AI Innovations		16:45	H2 Communication Systems	Y9 3 papers
18:05	Posters (3)		19:00			17:45	Posters (2)	
18:50			19:30	Conference dinner		18:15	Closing Session & Awards	
19:00	Welcome Reception					18:45		