



CONFERENCE PROGRAM



IEEE



**Università
di Brescia**

2026 IEEE INTERNATIONAL WORKSHOP ON

METROLOGY for

AUTOMOTIVE

BRESCIA, ITALY - JUNE 17-19, 2026



IEEE



BRESCIA2026

METROAUTOMOTIVE

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Welcome Message from the General Chairs

On behalf of the Organizing Committee, we warmly welcome you to the **2026 IEEE International Workshop on Metrology for Automotive – IEEE MetroAutomotive 2026**.

Since its first edition in 2021, followed by successful editions in Modena, Bologna, and Parma, IEEE MetroAutomotive has grown into a recognized meeting point for the automotive metrology community. The 2026 edition marks an important milestone: for the first time, the Workshop is held in Brescia, bringing together researchers, industry experts, and professionals to discuss the key role of instrumentation, sensing, and measurement technologies in the automotive field.

This 6th edition of the Workshop will be hosted by the **University of Brescia Department of Economics and Management**, in the historic **San Faustino complex**, whose origins date back to the 9th century. This unique venue, where history and innovation meet, provides an inspiring setting for a Workshop devoted to the future of automotive technologies and measurement science. Brescia also offers participants a remarkable historical and cultural setting. The city is part of the UNESCO World Heritage List within the serial site “*Longobards in Italy. Places of the Power (568–774 A.D.)*”, thanks to the monastic complex of San Salvatore–Santa Giulia and the archaeological area of the Capitolium. Together with its Roman heritage, medieval landmarks, elegant squares, and vibrant cultural life, Brescia provides an inspiring backdrop for scientific exchange and networking. Participants will also have the opportunity to discover the rich local gastronomic tradition, from **casoncelli bresciani** to the renowned wines of **Franciacorta**, reflecting the distinctive character of the region.

The fundamental goal of the Workshop is to bring together Researchers from universities, research centers, and industry, to stimulate the exchange of the latest scientific and technological research findings, and to foster discussions free of barriers of any kind in a common forum where innovative ideas can be exchanged to inspire further developments in the fascinating field of Automotive.

The 2026 IEEE MetroAutomotive Workshop is scheduled over three days, aiming to cover all the main fields of Metrology for Automotive, with the keynotes providing a focus on the current and future trends as seen by some major players in the Automotive scenario. The Technical Program includes 1 short keynote, 4 keynotes, and 14 technical sessions. We would like to thank the Organizers of the 6 technical special sessions for their cooperation and support in organizing the Workshop.

The Keynotes will be held by recognized experts from the industry in the field of Metrology for Automotive, as follows:

- Gianmarco Montanari, General Director of Fondazione MOST, the National Center for Sustainable Mobility, Italy: *The National Center for Sustainable Mobility (Short Keynote)*

- Alessandro Marini, Brescia Mobilità, Italy: *From Deterministic Rail Automation to Learning Mobility Systems*
- Michele Magno, ETH Zurich, Switzerland: *From Signal to Intelligence: Efficient Edge AI Architectures for Automotive Sensing*
- Alessandro Cultrera, INRIM – Istituto Nazionale di Ricerca Metrologica, Torino, Italy: *Electrical Impedance Metrology for Automotive Energy Storage: from Material Properties to Device Performance*
- Arun Balodi, Dayananda Sagar University, Bengaluru, India: *Signal Processing Driven Edge Intelligence for Vehicular Systems: From Traffic Prediction to Driver Behavior Analytics*

Keynotes and technical presentations will be followed by live Q&A sessions, designed to encourage active participation, open discussion, and meaningful interaction between speakers, authors, and attendees. All contributions will be peer-reviewed, and acceptance will be based on quality, originality and relevance. Accepted and presented papers will be submitted for inclusion into IEEE Xplore Digital Library, subject to meeting IEEE Xplore’s scope and quality requirements.

This year marks the first time that the IEEE Instrumentation and Measurement Society is serving as a financial sponsor of IEEE MetroAutomotive 2026. The conference is also promoted by IEEE Region 8 and by the IEEE Sections of Italy, Algeria, and Bulgaria. For the first time, IEEE MetroAutomotive 2026 is pleased to offer student travel grants to participants from low- and middle-income countries.

As in the previous editions, the 2026 IEEE MetroAutomotive also benefits from a Panel Session organized by the IEEE Women in Engineering (WIE) Italy Section, to foster discussion about the impact of gender diversity in the design methodologies, technologies, and approaches pursued in the Automotive Sector.

Last, and by no means the least, we would like to give recognition and special thanks to all our sponsors and to the Technical Program Committee and International Program Committee members, as well as all the Reviewers, who have contributed to making this 6th Edition possible.

We all did our best for the success of *MetroAutomotive 2026*, which we hope will stimulate the curiosity of Attendees, provide innovative ideas, and allow us to meet up with established and new friends.

We wish you all a stimulating, inspiring, and enjoyable Workshop in Brescia!

General Chairs

Alessandra Flammini, *University of Brescia, Italy*
Pier Andrea Traverso, *University of Bologna, Italy*

IEEE MetroAutomotive 2026 Committee

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IEEE MetroAutomotive 2026 Keynote Speakers

Short Keynote - Wednesday June 17 - H 09:45



The National Center for Sustainable Mobility

Gianmarco Montanari

Centro Nazionale per la Mobilità Sostenibile

ABSTRACT

The National Center for Sustainable Mobility (MOST) is one of the most significant strategic initiatives launched in Italy under the National Recovery and Resilience Plan (PNRR), with the aim of strengthening the national research system and supporting the transition towards more sustainable, innovative and competitive mobility.

In this address, the Director General of MOST will present an overview of the results achieved by the Center to date, highlighting the value of the MOST model as an integrated ecosystem connecting universities, research organizations, industry and institutions. This approach has enabled the translation of PNRR resources into project capabilities, shared research infrastructures and concrete initiatives supporting the automotive and mobility value chain.

The speech will refer to selected projects developed within MOST as examples of an impact oriented approach: experimental platforms, demonstrators, public private collaborations and initiatives aimed at enhancing the value of research results, with the objective of reducing the distance between research and industrial application. Particular attention will be given to system reliability, measurement quality and data robustness as key enabling factors for next generation vehicles, infrastructures and mobility services, in line with the thematic framework of IEEE MetroAutomotive.

The intervention will also look beyond the PNRR horizon, outlining MOST's future perspectives: consolidating skills and research infrastructures, strengthening Italy's international research positioning, and contributing in a stable manner to European and global sustainable mobility policies. The experience of MOST shows how a large public investment can generate long term value, leaving not only project based outcomes, but also a shared, systemic vision for the future of mobility.

SPEAKER BIOGRAPHY

General Director of Fondazione MOST, Eng. **Gianmarco Montanari** has extensive professional experience as Chief Executive Officer/General Manager across various sectors, including Automotive, Banking and Insurance, Energy, AI, Digital and Cyber Security, Central and Local Public Administration, and the Management of Applied Research at both national and international level. He holds five university degrees and several specializations in Business and Innovation Management from prestigious business schools (Harvard, Columbia, INSEAD, IMD, ...) and is widely recognized as an expert in innovation management and corporate governance in both the private and public sectors. He was awarded the title of Commendatore al Merito della Repubblica Italiana by the President of the Republic, Sergio Mattarella.

Keynote Lecture - Wednesday June 17 - H 10:00



From Deterministic Rail Automation to Learning Mobility Systems

Alessandro Marini

Brescia Mobilità, Italy

ABSTRACT

The experience of Brescia Mobilità provides a concrete perspective on the evolution of mobility automation from deterministic rail systems towards more adaptive and learning-oriented transport infrastructures. Since the inauguration of its fully automated driverless metro line in 2013, Brescia has operated one of the earliest medium-size urban rail network relying on advanced automatic train capabilities based on communication technologies. These systems enabled safe and reliable operations through precise measurement and control of vehicle position, speed and separation within fully segregated operating environments.

Today, the city is taking a further step by developing a new generation tram system designed to progressively introduce autonomous operational capabilities in open urban environments. Unlike metro systems, tramways interact continuously with mixed traffic, pedestrians and dynamically changing urban conditions. Addressing this complexity requires moving beyond purely deterministic control architectures towards perception-driven and context-aware operational strategies. Emerging solutions based on multi-sensor perception, onboard high-performance computing and synthetic simulation environments are enabling vehicles to

interpret real-time operational contexts and progressively enhance their decision-making capabilities while remaining embedded within certified safety frameworks.

This transition reflects a broader expansion of the measurable domain of mobility systems. While traditional automation focuses on controlling trajectories, future approaches aim to understand and influence mobility behaviour at system level. Distributed sensing fleets, digital twins and data-driven orchestration platforms may enable cities to evolve towards “learning mobility systems”, capable of optimising multimodal transport flows and supporting more sustainable and user-centred urban mobility ecosystems.

SPEAKER BIOGRAPHY

Alessandro Marini is President of Brescia Mobilità, the municipal company responsible for public transport, automated metro operations and integrated urban mobility services in the city of Brescia, Italy. With more than 35 years of experience, he has developed his professional career at the intersection of advanced manufacturing, digital innovation and management control, working both as an industrial executive and as a consultant.

He is Managing Partner at Quantra, supporting companies in the digital transformation of production and logistics systems, with a focus on cyber-physical infrastructures and data-driven operations. Alessandro holds a PhD in Information Engineering from the University of Brescia, where he also teaches topics related to industrial operations and information systems. His current interests include the evolution of urban mobility towards automation, real-time orchestration and learning mobility ecosystems, bridging engineering principles from manufacturing with emerging challenges in transport and smart cities.

Keynote Lecture - Wednesday June 17 - H 14:15



From Signal to Intelligence: Efficient Edge AI Architectures for Automotive Sensing

Michele Magno

ETH Zurich, Switzerland

ABSTRACT

Modern vehicles increasingly rely on a large array of sensors to perceive the environment and support advanced driver assistance and autonomous driving functions. Radar, cameras, inertial sensors, and emerging sensing modalities generate vast amounts of raw data that must be processed reliably, accurately, and in real time. Transforming these signals into actionable intelligence poses significant challenges in terms of latency, energy efficiency, and system scalability. This talk presents recent advances in efficient Edge AI architectures that bridge the gap between sensing and intelligent decision-making directly at the sensor node. By tightly integrating sensing hardware, signal processing, and machine learning, these architectures enable real-time perception while significantly reducing data movement and computational overhead. The presentation will discuss hardware–software co-design strategies for automotive sensing, including energy-efficient embedded AI accelerators, near-sensor processing techniques, and optimized neural network models tailored for radar and multimodal sensing systems. Particular attention will be given to real-time signal interpretation from radar and other sensing technologies, highlighting how edge intelligence can enhance object detection, localization, and situational awareness while operating under strict power and latency constraints. Through selected application examples, the talk will illustrate how edge-native AI pipelines can transform raw sensor signals into reliable high-level information, enabling safer and more responsive automotive systems. The discussion will also highlight future research directions in scalable sensing architectures, distributed intelligence, and next-generation automotive metrology frameworks.

SPEAKER BIOGRAPHY

Michele Magno (Fellow Member, IEEE). He is Head of the D-ITET Center for Project-Based Learning Center and Edge AI and Intelligent Sensing Lab. He is also Fellow at IT:U Austria, Michele Magno contributes to the development of new academic initiatives within the IT:U Smart Space Sensing and Systems Lab (S³ Lab) and the IT:U Satellite Lab. His main research

interests include wireless sensor networks, wearable devices, machine learning at the edge, smart sensors and autonomous robots, energy harvesting, low-power management techniques, and extending the lifetime of battery-operated devices. He has collaborated with several universities and research centers including industry cooperation with IBM Research, Sony, STMicroelectronics, Infineon, Ferrari and many others. He has published more than 400 papers in international journals and conferences and has received multiple Best Papers and Best Posters awards.

Keynote Lecture - Wednesday June 18 - H 11:00



Electrical Impedance Metrology for Automotive Energy Storage: from Material Properties to Device Performance

Alessandro Cultrera

INRIM - Istituto Nazionale di Ricerca Metrologica, Italy

ABSTRACT

The electrical impedance of a device is related to both its macroscopic structure and to the electromagnetic properties of its constituent materials. Impedance-based techniques are powerful material characterisation tools: they can quantify, through proper modeling, the material bulk and interface polarization and transport mechanisms of the device materials at the macro-, meso- and microscopic scale. These methods span from standard LCR measurements to advanced techniques such as electrical impedance tomography (EIT) for mapping material conductivity and electrochemical impedance spectroscopy (EIS), which is widely used to assess materials, devices and modules. Reliable impedance measurements are essential for defensible decision-making from the material to the device level, supporting materials characterisation, chemistry selection, device state-of-health assessment, and the quantified evaluation of impedance-estimation accuracy. This talk presents and discusses key aspects of impedance metrology, including measurand definition and traceability, quantities of influence, and measurement uncertainty. These concepts will be addressed in the context of impedance measurements applied to energy-storage-oriented materials and devices, highlighting their role in ensuring reliable measurement results that are fundamental for a sound interpretation of material properties and device performance, including the reliability of prospective onboard implementations in electric vehicles.

SPEAKER BIOGRAPHY

Alessandro Cultrera received the degree in Physics and the Ph.D. degree in Chemical and Materials Science from the Università degli Studi di Torino, Turin, Italy. In 2014, he joined the Istituto Nazionale di Ricerca Metrologica (INRIM), Turin, as a postdoctoral fellow with the Quantum Metrology and Nano Technologies Department, where he worked on electrical characterization of nanostructured materials, precision electronic measurements, and calibration methods. Since 2022, he has been a Researcher with INRIM in electrical metrology. His research activity is focused on electrical impedance metrology applied to both calibration methods and precision measurements of materials electrical properties. A few topics covered are impedance tomography for quantitative conductivity mapping of thin-film, two-dimensional, and nanostructured materials, including graphene, novel calibration methods for signal recovery instrumentation like lock-in amplifiers, electrical noise spectroscopy, supercapacitor characterization, and traceability of electric power measurements under non-sinusoidal distorted regimes. Since 2019 he is a member of Comitato Elettrotecnico Italiano and participates in IEC/TC 113 standardization activities on nano-enabled electrotechnical systems characterization.

Keynote Lecture - Friday June 19 - H 11:00



Signal Processing Driven Edge Intelligence for Vehicular Systems: From Traffic Prediction to Driver Behavior Analytics

Arun Balodi

Dayananda Sagar University, Bengaluru, India

ABSTRACT

The rapid evolution of intelligent transportation systems demands the integration of signal processing, machine learning, and vehicular technologies to enable safer, smarter, and more autonomous mobility. This keynote explores the transformative role of edge intelligence and signal processing frameworks in addressing two critical challenges: adaptive traffic control and driver behaviour analysis.

First, we present a TinyML-based traffic prediction system, where real-time sensor signals are processed using feature extraction techniques (time-domain and spectral analysis) to

dynamically optimize traffic signals. The system demonstrates high efficiency and low latency, achieving real-time decision-making on resource-constrained edge devices.

Second, we extend the discussion to vehicular signal analytics, highlighting a Multi-Task Learning (MTL) LSTM framework that simultaneously detects illegal drivers, identifies authorized users, and evaluates driving behaviour using in-vehicle sensor signals such as speed, throttle, and steering angle. The approach leverages temporal signal patterns to enhance classification accuracy and road safety.

By bridging signal processing techniques (feature extraction, spectral analysis) with edge AI and vehicular networks, this keynote demonstrates how intelligent systems can evolve from reactive to predictive and autonomous frameworks. The session concludes with insights into future directions, including V2X communication, smart cities, and autonomous driving ecosystems.

SPEAKER BIOGRAPHY

Dr. **Arun Balodi**, Senior Member IEEE, Fellow IETE, Life Member ISTE is currently working as Professor and chairman at the Department of Electronics and Communication Engineering, Dayananda Sagar University in Bangalore, India. Dr Arun completed his PhD from the Department of Electrical Engineering, Indian Institute of Technology, Roorkee, India, 2018, M. Tech., Digital Signal Processing, Govind Ballabh Pant Engineering College, Pauri, India, 2010, and B.Tech. in Electronics and Communication Engineering, Uttar Pradesh Technical University, Lucknow, India, 2005. He was awarded Gold Medal in M. Tech., and the Academic Excellence Award in 2010 and 2011. His research area is Biomedical Signal and Image Processing, Artificial Intelligence. Dr. Balodi has more than 18 years of teaching and research experience in various institutions in India. His research area is Digital Signal and Image Processing, Medical Image Analysis, Machine Learning and Pattern Recognition. He has published over 65 papers in peer-reviewed journals, international conferences, and 07 Patents. He is an active researcher and reviewer for various indexed Journals and Conferences and has given various technical talks. He has actively participated in more than 50 FDPs and more than 100 webinars and conducted workshops in the domain of Signal and Image Processing. He has delivered expert talks in more than 21 STPs, conferences, and webinars. Dr. Balodi received a Certificate of Appreciation and Research Incentive for his research contribution in publishing good Journal Papers, Patents, Book Chapters, and International Conference in the years 2020 and 2021. He has also received the Research Excellence Award and Incentive for research contribution in terms of publishing good Journal Papers, Patents, Book Chapters, and International Conference and editing one International Book in the academic year 2022-23.

IEEE MetroAutomotive 2026 Venue



IEEE MetroAutomotive 2026 will be held at the University of Brescia - Department of Economics and Management in San Faustino, a complex originally built in the 9th century. Most of the complex dates back from the 16th century and was part of a Benedictine convent. During the Napoleonic times, the religious community was suppressed whilst the convent was confiscated and used as barracks. The military use of the complex continued until the 1980s, after which it became the property of the University of Brescia. The damages of nearly 200 years of army exploitation were finally restored. Now, the San Faustino complex hosts part of the Faculty of Economics.

ADDRESS

Via S. Faustino, 74b
Brescia



BY UNDERGROUND

From Brescia Train Station (Stazione FS) you can reach the Venue and the closest stop is San Faustino or Vittoria (about 9 minutes walk).

For tickets and timetable visit [Brescia mobilità](#)

BY BUS

By bus, you can reach the Venue with the line 2, 7, 11, 17 or 18.

For tickets and timetable visit [Brescia mobilità](#)

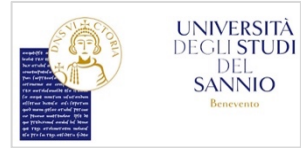
BY CAR

If you arrive by car you can park inside the Fossa Bagni Parking (nearest) or Vittoria Parking (about 9 minutes walk).

Otherwise, you can park in one of the parking lots and reach the city center by subway.

The parking areas are close to the subway stops: Prealpino, Poliambulanza, and Sant'Eufemia Buffalora.

IEEE MetroAutomotive 2026 Patronages



IEEE MetroAutomotive 2026 Sponsors



Program Schedule - Wednesday, June 17

WEDNESDAY JUNE 17	
09:30 - 09:45	Aula Magna - OPENING CEREMONY - WELCOME ADDRESSES
09:45 - 10:00	Aula Magna - Short Keynote - Gianmarco Montanari, <i>Centro Nazionale per la Mobilità Sostenibile</i> The National Center for Sustainable Mobility
10:00 - 10:45	Aula Magna - Keynote Lecture - Alessandro Marini, <i>Brescia Mobilità</i> From Deterministic Rail Automation to Learning Mobility Systems
10:45 - 11:10	COFFEE BREAK
	Aula Magna
	Sala Biblioteca
11:10 - 12:50	S1.1 - General Track - PART I
	S1.2 - AI-Driven Metrology for Next-Generation Automotive Systems
12:50 - 14:15	LUNCH
14:15 - 15:00	Aula Magna - Keynote Lecture - Michele Magno, <i>ETH Zurich, Switzerland</i> From Signal to Intelligence: Efficient Edge AI Architectures for Automotive Sensing
15:00 - 15:20	COFFEE BREAK
	Aula Magna
	Sala Biblioteca
15:20 - 16:20	S2.1 - General Track - PART II
	S2.2 - Measurement for Improving Quality, Reliability and Safety in Automotive Applications
17:15	Bus Departure for the Welcome Party
18:00 - 20:00	WELCOME PARTY - Azienda Agricola Al Rocol – Franciacorta

Program Schedule - Thursday, June 18

THURSDAY JUNE 18		
	Aula Magna	Sala Biblioteca
09:00 - 10:40	S3.1 - Sensors, systems and methods for measuring driver performance and interaction with the vehicle - PART I	S3.2 - Advanced Sensing and Measuring Systems for Drivers and Vehicles Safety - PART I
10:40 - 11:00	COFFEE BREAK	
11:00 - 11:45	Aula Magna - Keynote Lecture - Alessandro Cultrera, <i>INRIM – Istituto Nazionale di Ricerca Metrologica, Torino, Italy</i> Electrical Impedance Metrology for Automotive Energy Storage: from Material Properties to Device Performance	
	Aula Magna	Sala Biblioteca
11:50 - 12:50	S4.1 - Sensors, systems and methods for measuring driver performance and interaction with the vehicle - PART II	S4.2 - Advanced Sensing and Measuring Systems for Drivers and Vehicles Safety - PART II
12:50 - 14:10	LUNCH	
	Aula Magna	Sala Biblioteca
14:10 - 15:30	S5.1 - Software-Defined Vehicles: Sensing, Communication, Processing and Control	S5.2 - The "Smart Battery" Paradigm: sensors, modeling, characterization and diagnostics for the next generation batteries and BMSs - PART I
15:30 - 15:50	COFFEE BREAK	
	Aula Magna	Sala Biblioteca
15:50 - 16:50	S6.1 - General Track - PART III	S6.2 - The "Smart Battery" Paradigm: sensors, modeling, characterization and diagnostics for the next generation batteries and BMSs - PART II
20:00 - 22:00	Gala Dinner	

Program Schedule - Friday, June 19

FRIDAY JUNE 19		
	Aula Magna	Sala Biblioteca
09:00 - 10:40	S7.1 - General Track - PART IV	S7.2 - General Track - PART V
10:40 - 11:00	COFFEE BREAK	
11:00 - 11:45	Aula Magna - Keynote Lecture - Arun Balodi, <i>Dayananda Sagar University, Bengaluru, India</i> Signal Processing Driven Edge Intelligence for Vehicular Systems: From Traffic Prediction to Driver Behavior Analytics	
11:45 - 12:25	PANEL - IEEE Women in Engineering	
12:25 - 12:50	Closing and Award Ceremony	
12:50 - 14:00	LIGHT LUNCH	

Technical Program - Wednesday, June 17

09:00 - 16:00 *University of Brescia - Department of Economics and Management*
REGISTRATIONS

09:30 - 09:45 *Aula Magna*
OPENING CEREMONY - WELCOME ADDRESSES

Institutional Greetings

Prof. Fabio **Baronio**, *Director of the Department of Information Engineering, University of Brescia*

Dr. Maria Chiara **Franceschetti**, *President of Gefran, representing Confindustria Brescia*

Dr. Alessandro **Marini**, *President of Brescia Mobilità, representing the Municipality of Brescia*

09:45 - 10:00 *Aula Magna*
SHORT KEYNOTE
Chairs: Alessandra Flammini, *University of Brescia, Italy*
Pier Andrea Traverso, *University of Bologna, Italy*

The National Center for Sustainable Mobility

Gianmarco Montanari, *Centro Nazionale per la Mobilità Sostenibile - MOST*

10:00 - 10:45 *Aula Magna*
KEYNOTE LECTURE
Chairs: Alessandra Flammini, *University of Brescia, Italy*
Pier Andrea Traverso, *University of Bologna, Italy*

From Deterministic Rail Automation to Learning Mobility Systems

Alessandro Marini, *Brescia Mobilità*

10:45 - 11:10 *Chiostro Maggiore*
COFFEE BREAK

11:10 - 12:50 *Aula Magna*
S1.1 - General Track - PART I
Chair: Stefano Rinaldi, *University of Brescia, Italy*

- 11:10 A Three-Dimensional Multi-Physics Finite Element Analysis and Validation of a Spring-Pin Electrical Connector Comprising Cu-Ni-Si Alloy**
Santosh V. Angadi (CMR University, India)
- 11:30 Geometric and Radiometric Enhancements of Vehicles in LiDAR Point Clouds with Snow Accumulation**
Yiming Yang and Jeremy P Bos (Michigan Technological University, USA)
- 11:50 Measurement-Based Performance Evaluation of SmartRSUs with Heterogeneous Antenna Architectures for V2X Communications**
Marco Savarese, Gaetano Orazio Cauchi, Salvatore Iandolo, Antonio Solida, Martin Klapez and Maurizio Casoni (University of Modena and Reggio Emilia, Italy); Micaela Verucchi and Enrico Vincenzi (Hipert SRL, Italy); Ignacio Sanudo Olmedo (Hipert Srl, Italy); Marko Bertogna and Carlo Augusto Grazia (University of Modena and Reggio Emilia, Italy)
- 12:10 Design, Fabrication and Performance Analysis of a Modular Electric Vehicle for Campus Logistics**
Belinda Boateng (Kwame Nkrumah University of Science and Technology, Ghana); Godwin Ayetor, Oliver Kwame Abakah, Rhoda Akua Afedziwaa Coleman, Michael Baalayel Cheyuo, Michael Abeiku Okyere Forson, Prince Ansa Opare and Wisdom Dolyine Abane (KNUST, Ghana)
- 12:30 Performance Evaluation and Techno-Economic Analysis of an EV Conversion in a Tropical Climate: A Toyota Corona Case Study in Ghana**
Solomon Akumanyin, Prince Yaw Andoh, Mariwan Sulemana, Elijah Collins-Hespelt, Benjamin Gyimah, Sarpong Ama Sarpomaa-Yeboah and Ofori Kwasi Dzokoto (Kwame Nkrumah University of Science and Technology, Ghana)

11:10 - 12:50 *Sala Biblioteca*
S1.2 - AI-Driven Metrology for Next-Generation Automotive Systems
Chair: Valentina Bianchi, *University of Parma, Italy*

- 11:10 Vision Transformers Vs CNNs for Diesel Particulate Filter Pre-Inspection**
Kaung Myat and Charles Fox (University of Lincoln, United Kingdom)
- 11:30 Memory-Efficient Hydraulic Pump Thermodynamic Efficiency Calculation for Non-Road Mobile Machinery**
Muhammad Ameer Hamza, Matteo Dalboni, Alessandro Soldati and Carlo Concari (University of Parma, Italy)

- 11:50 Reinforcement Learning Based State of Charge Estimation of a Lithium Ion Battery**
Sadia Ali (University of Parma, Italy & University of Bologna, Italy); Valentina Bianchi
and Ilaria De Munari (University of Parma, Italy)
- 12:10 Hardware-Friendly Machine Learning Approach for Battery SoH Estimation with
Different Cells Chemistries and Different Measurement Setups**
Valentina Bianchi, Andrea Toscani, Nicola Delmonte, Marco Simonazzi, Danilo
Santoro, Paolo Cova and Ilaria De Munari (University of Parma, Italy)
- 12:30 An Experimental Platform for Sensor Characterisation Supporting Measurement-
Based Modelling of Automotive Perception Systems**
Zoltan Ferenc Magosi and Arno Eichberger (Graz University of Technology, Austria)

12:50 - 14:15 *Chiostro Maggiore*
LUNCH

14:15 - 15:00 *Aula Magna*
KEYNOTE LECTURE
Chair: Alessandra Flammini, *University of Brescia, Italy*

**From Signal to Intelligence:
Efficient Edge AI Architectures for Automotive Sensing**

Michele Magno, *ETH Zurich, Switzerland*

15:00 - 15:20 *Chiostro Maggiore*
COFFEE BREAK

15:20 - 16:20 *Aula Magna*
S2.1 - General Track - PART II
Chairs: Alessandro Depari, *University of Brescia, Italy*
Ada Fort, *University of Siena, Italy*

- 15:20 Assessment of Temperature-Profiled MOX Measurements in Multi-Node Mobile
IoT Platforms**
Enza Panzardi, Marco Tani, Elia Landi, Ada Fort, Marco Mugnaini, Irene Cappelli,
Stefano Parrino and Valerio Vignoli (University of Siena, Italy)

- 15:40 Experimental Characterization of UAV-Based Photogrammetric Pavement Inspection for Cycling Infrastructure**
 Davide Astolfi, Salvatore Dello Iacono, Alessandra Flammini and Marco Pasetti (University of Brescia, Italy); Giorgio Paolo Maria Vassena (GEXCEL SRL & University of Brescia, Italy); Stefano Rinaldi (University of Brescia, Italy)
- 16:00 A Low-Cost Broadband MEMS Vibration Sensing System with Encapsulated Mounting and Embedded Spectral Feature Extraction for Automotive Applications**
 Elia Landi, Ada Fort, Enza Panzardi, Irene Cappelli, David Baldo, Marco Mugnaini and Valerio Vignoli (University of Siena, Italy)

15:20 - 16:20 *Sala Biblioteca*
S2.2 - Measurement for Improving Quality, Reliability and Safety in Automotive Applications
 Chair: Lorenzo Ciani, *University of Brescia, Italy*

- 15:20 An Innovative Telemetry-Based Testing Profile for Developing a Battery Pack for Formula SAE Vehicles**
 Lorenzo Ciani and Fabio Canzanella (University of Florence, Italy); Pietro Sassoli, Valerio Donnini and Edoardo Pippi (University of Florence & Firenze Race Team, Italy); Gabriele Patrizi (University of Florence, Italy)
- 15:40 Environmental Metrology Applied to Automotive Testing: The Strategic Role of Environmental Simulation Systems**
Lorenzo Asa (Angelantoni Test Technologies Srl, Italy); Patrizio Quattrocchi and Riccardo Baldelli (Angelantoni Test Technologies, Italy)
- 16:00 AVSim-Cyber: A Multi-Domain Cyberattack Simulation and Intrusion Detection Framework for Autonomous Vehicles**
 Devrim Unal (KINDI Center for Computing Research, College of Engineering, Qatar University, Qatar); Ahmet Alperen Polat and Alper Kanak (Ergünler R&D Co.Ltd., Türkiye); Salih Ergun (Ergtech Research GmbH, Switzerland)

17:15 **BUS DEPARTURE FOR THE WELCOME PARTY**

18:00 *Al Rocol - Franciacorta*
WELCOME PARTY

Technical Program - Thursday, June 18

08:30 - 16:00 *University of Brescia - Department of Economics and Management*
REGISTRATIONS

09:00 - 10:40 *Aula Magna*
S3.1 - Sensors, systems and methods for measuring driver performance and interaction with the vehicle - PART I
Chairs: Antonio Affanni, *University of Udine, Italy*
Susanna Spinsante, *Polytechnic University of Marche, Italy*

- 09:00 Driver Attention Monitoring and Vehicle Sound Interaction: Experimental Evaluation**
Andrea Generosi (Università Pegaso, Italy); Valeria Bruschi (Marche Polytechnic University, Italy); Thomas Agostinelli (Università Politecnica Delle Marche, Italy); Alessandro Terenzi (Università Politecnica delle Marche, Italy); Stefania Cecchi (UNIVPM, Italy); Maura Mengoni (Università Politecnica delle Marche, Italy)
- 09:20 Driver's Mental Workload Monitoring by Unobtrusive Textile Electrodes on the Wheel**
Luca Bomprezzi (Università Politecnica Delle Marche, Italy); Valeria Bruschi (Marche Polytechnic University, Italy); Stefania Cecchi (UNIVPM, Italy); Gianluca Ciattaglia and Susanna Spinsante (Università Politecnica Delle Marche, Italy); Alessandro Terenzi (Università Politecnica delle Marche, Italy)
- 09:40 Hand Grip Sensing on the Steering Wheel by a Layered Velostat and Silver-Based Textile Sensor**
Ludovico Marziali (Università Politecnica delle Marche, Italy); Valeria Bruschi (Marche Polytechnic University, Italy); Stefania Cecchi (UNIVPM, Italy); Gianluca Ciattaglia and Susanna Spinsante (Università Politecnica Delle Marche, Italy); Alessandro Terenzi (Università Politecnica delle Marche, Italy)
- 10:00 Retrieval Transparency for Reliable Automotive Voice Assistants: A Comparative Study of Managed and Auditable RAG Pipelines**
Maria Luz and Thaís Medeiros (Federal University of Rio Grande do Norte, Brazil); Morsinaldo Medeiros (UFRN, Brazil); Marianne Silva (Federal University of Rio Grande do Norte, Brazil); Dennis Brandão (University of Brescia, Italy); Ivanovitch Silva (Federal University of Rio Grande do Norte, Brazil)

10:20 Embedded PMV-Driven Localized Heating for Electric Vehicle Cabin Comfort
 Riccardo De Lazzari, [Manuel Manfrin](#), Giacomo Peruzzi and Michele Forzan (University of Padova, Italy); Fabrizio Dughiero (Università degli studi di Padova, Italy); Lorenzo Cerasti and Giulia Smonker (IRCA SpA, Italy); Antonio De Moliner (Zoppas Industries, Italy); Alessandro Pozzebon (University of Padova, Italy); Nicola Trivellini (UNIPD, Italy)

09:00 - 10:40 *Sala Biblioteca*
S3.2 - Advanced Sensing and Measuring Systems for Drivers and Vehicles Safety - PART I
Chairs: Mauro Serpelloni, *University of Brescia, Italy*
 Jan Sobotka, *Czech Technical University in Prague, Czech Republic*

09:00 A Multi-Sensing Wearable Device Integrating Printed Electrodes and Metal-Organic Frameworks for Stress Detection in Drivers: A Feasibility Study
[Nadine La Salvia](#) (Università di Brescia, Italy); Batoul Hosseinzadeh and Sarah Tonello (University of Brescia, Italy); Nicola Francesco Lopomo (Politecnico di Milano, Italy); Emilio Sardini (University of Brescia, Italy)

09:20 Passive Reconstruction of Embedded IP Network Topology from Multi-Segment Traffic
[Jan Sobotka](#) and Martin Kala (Czech Technical University in Prague, Czech Republic)

09:40 Preliminary Investigation of Printed Strain Gauges for Smart Glove Interface
[Giona Bonomi](#), Michela Borghetti and Mauro Serpelloni (University of Brescia, Italy)

10:00 Experimental Investigation into the Effects of Fog on LiDAR Beams
[Davide Cassanelli](#) (Università degli studi di Modena e Reggio Emilia, Italy); Stefano Cattini and Luigi Rovati (University of Modena and Reggio Emilia, Italy)

10:20 Assessing the Effect of Inclement Winter Weather on Automotive Lidars: Experimental Design
 Ian Q Mattson and [Jeremy P Bos](#) (Michigan Technological University, USA)

10:40 - 11:00 *Chiostro Maggiore*
COFFEE BREAK

11:00 - 11:45 *Aula Magna*
KEYNOTE LECTURE
Chair: Alessandra Flammini, *University of Brescia, Italy*

Electrical Impedance Metrology for Automotive Energy Storage: from Material Properties to Device Performance

Alessandro Cultrera, *INRIM - Istituto Nazionale di Ricerca Metrologica, Italy*

11:50 - 13:10 *Aula Magna*
S4.1 - Sensors, systems and methods for measuring driver performance and interaction with the vehicle - PART II
Chairs: Antonio Affanni, *University of Udine, Italy*
Susanna Spinsante, *Polytechnic University of Marche, Italy*

- 11:50 AutoTSLM: Interpretable Driver Behavior Analysis Using Multimodal Time-Series Language Models on Automotive Telemetry**
Morsinaldo Medeiros (UFRN, Brazil); Marianne Silva (Federal University of Rio Grande do Norte, Brazil); Dennis Brandão (University of Brescia, Italy); Ivanovitch Silva (Federal University of Rio Grande do Norte, Brazil)
- 12:10 Vision-Based Clothing Insulation Estimation for Driver Aware Thermal Comfort Control**
Manuel Manfrin, Giacomo Peruzzi and Michele Forzan (University of Padova, Italy); Fabrizio Dughiero (Università degli studi di Padova, Italy); Alessandro Pozzebon (University of Padova, Italy); Nicola Trivellin (UNIPD, Italy)
- 12:30 Design of a Wearable Ring for the Measurement of Heart Rate and Blood Oxygen Saturation on Drivers**
Antonio Affanni (University of Udine, Italy)
- 12:50 Correlation Analysis Between Vehicle Control Inputs and Physiological Signals for Driver State Monitoring**
Antonio Affanni (University of Udine, Italy)

11:50 - 12:50 *Sala Biblioteca*
S4.2 - Advanced Sensing and Measuring Systems for Drivers and Vehicles Safety - PART II
Chairs: Mauro Serpelloni, *University of Brescia, Italy*
Jan Sobotka, *Czech Technical University in Prague, Czech Republic*

- 11:50 Modeling the Effects of Residual Snow Clutter on Position Estimation and Vehicle Energy Efficiency**
Logan Schexnaydre and Ian Q Mattson (Michigan Technological University, USA); Chaz Cornwall (Michigan Technological University, USA); Jeremy P. Bos (Michigan Technological University, USA)
- 12:10 Preliminary Analysis on Novel PDMS Based Capacitive Pressure Sensor for Wearable Application**
Michela Borghetti, Hizb Ullah Khan and Mauro Serpelloni (University of Brescia, Italy)
- 12:30 Preliminary Study on Capacitive Humidity Sensors Printed on Automotive Polymer Parts**
Michela Borghetti, Paolo Bellitti and Mauro Serpelloni (University of Brescia, Italy)

13:10 - 14:10 *Chiostro Maggiore*
LUNCH

14:10 - 15:10 *Aula Magna*
S5.1 - Software-Defined Vehicles: Sensing, Communication, Processing and Control
Chair: Luca Davoli, *University of Parma, Italy*

14:10 AI-Based Metrology-Centric Framework of Cyber-Physical Attacks in Software-Defined Electric Vehicles
Ben Hammouda Khouloud (ENIM, Tunisia); Alper Kanak (Ergtech Research Center, Switzerland); Muhammed Enis Sen (AI4SEC ÖÜ, Harju maakond, Tallinn,, Estonia); Batuhan Cinar (AI4SEC ÖÜ, Harju maakond, Tallinn, Estonia); Ali Serdar Atalay (AI4SEC ÖÜ, Estonia); Salih Ergun (TUBITAK - Informatics and Information Security Research Center, Turkey & ERGTECH Research Center, Switzerland); Mohamed Trabelsi (ENSM, Marseille, France); Trabelsi Ramzi (Monastir Engineering School, Tunisia); Riadh Abdelati (école nationale d'ingénieurs de Monastir ENIM, Tunisia); Ibrahim Arif (Ergünler R&D Co.Ltd. (Erange), Turkey & Ergtech Research GmbH, Switzerland)

14:30 AI-Assisted Pipeline for Code Security Quality Measurement in Software-Defined Vehicles: Dataset Generation, Fine-Tuning and Energy-Aware Evaluation
Ahmet Alperen Polat and Ibrahim Arif (Ergtech Research GmbH, Switzerland); Alper Kanak (Ergünler R&D Co.Ltd., Türkiye); Salih Ergun (Ergtech Research GmbH, Switzerland); Ali Serdar Atalay (AI4SEC ÖÜ, Estonia)

14:50 A Software-Defined Architecture for Secure Optical Communication and Edge-Based State Estimation in Automotive BMS
Emre Dinçer (Gebze Technical University, Turkey & Togi Teknoloji Ltd. Co., Turkey); Tolga Baykal (Togi Teknoloji Ltd. Co., Turkey); Wenzel Prochazka (NXP Semiconductor, Italy); Florian Scherr (Graz University of Technology, Austria); Dino Hrvanovic (Virtual Vehicle Research GmbH, Austria); Ömer Öztin (AI4SEC ÖÜ, Estonia)

14:10 - 15:30 *Sala Biblioteca*
S5.2 - The "Smart Battery" Paradigm: sensors, modeling, characterization and diagnostics for the next generation batteries and BMSs - PART I
Chairs: Roberta Ramilli, *University of Bologna, Italy*
Salvatore Dello Iacono, *University of Brescia, Italy*

14:10 Sustainable E-Bike Charging Stations Within MOST Spoke 5: Design and Experimental Characterization of off-Grid Transportable and Portable Prototypes
Davide Astolfi (Università di Brescia, Italy); Salvatore Dello Iacono, Alessandra Flammini, Chiara Franzoni and Massimiliano Gaffurini (University of Brescia, Italy);

Paolo Malighetti (University of Bergamo, Italy); Marco Pasetti, Emiliano Sisinni and Antony Vasile (University of Brescia, Italy)

14:30 Vibration Assessment of an LFP Battery Module for e-Powertrains with Innovative rCFRP Enclosure

Hadi Eidinejad (University of Bologna, Italy); Roberto Palazzetti (Politecnico di Milano, Italy); Tommaso Brugo, Alessandro Rivola and Alberto Martini (University of Bologna, Italy)

14:50 Battery Model Identification Based on Binary Measurements

Alessio De Angelis, Mario Luca Fravolini and Paolo Carbone (University of Perugia, Italy)

15:10 On the Calibration of Miniaturized Impedance Analyzers for Online Electrochemical Impedance Spectroscopy of Battery Cells

Roberta Ramilli, Marcella Lucciardi, Morena Fabozzi, Marco Crescentini and Pier Andrea Traverso (University of Bologna, Italy)

15:30 - 15:50 *Chiostro Maggiore*
COFFEE BREAK

15:50 - 16:50 *Aula Magna*
S6.1 - General Track - PART III
Chairs: Davide Astolfi, *University of Brescia, Italy*
Silvia Iuliano, *University of Sannio, Italy*

15:50 Development and Experimental Validation of a Low-Intrusive Wake Rake for Automotive Wake Pressure Measurements in a Wind Tunnel

Alessandro Canali (Università degli studi di Perugia, Italy); Andrea Bartolomei (University of Perugia, Italy); Davide Astolfi (Università di Brescia, Italy); Matteo Becchetti and Francesco Castellani (University of Perugia, Italy)

16:10 Decentralized Game-Theoretic Orchestration of Energy Storage Systems for Providing Flexibility Services

Silvia Iuliano, Viktoriya Mostova and Alfredo Vaccaro (University of Sannio, Italy)

16:30 A Dynamic Game-Theoretic Framework to Estimate the Willingness of Electric Vehicles to Provide Grid Flexibility Services

Silvia Iuliano and Alfredo Vaccaro (University of Sannio, Italy)

15:50 - 16:50 *Sala Biblioteca*
S6.2 - The "Smart Battery" Paradigm: sensors, modeling, characterization and diagnostics for the next generation batteries and BMSs - PART II
Chairs: Roberta Ramilli, *University of Bologna, Italy*
Alessio De Angelis, *University of Perugia, Italy*

- 15:50 A Robust and Trusted Smart Battery Paradigm: Evaluating Environmental Resilience, CAN Bus Security, and FNN-Based Diagnostics**
 Emre Dinçer (Gebze Technical University, Turkey & Togi Teknoloji Ltd. Co., Turkey); Tolga Baykal (Togi Teknoloji Ltd. Co., Turkey); Muhammed Atav and Umutcan Ağgez (Musoshi EV - R&D Center, Turkey); Julie Bürki and Niels Nijdam (University of Geneva, Switzerland); Teri Lenard (University of Medicine, Pharmacy, Science and Technology of Targu Mures, Romania); Anastasija Collen (University of Applied Sciences and Arts of Western Switzerland (HES-SO)); Dino Hrvanovic (Virtual Vehicle Research GmbH, Austria)
- 16:10 Comparative Analysis of Recurrent Deep Learning Models for Lithium-Ion Battery State-of-Health Forecasting**
 Onur Elma and Murat Kuzlu (Old Dominion University, USA); Umit Cali (American University of Sharjah, United Arab Emirates)
- 16:30 A DC/DC Charging System Based on USB-C for Light Electric Vehicles: Architectures, Control Strategies, and Experimental Perspectives**
Salvatore Dello Iacono, Solinas Davide, Alessandra Flammini and Stefano Rinaldi (University of Brescia, Italy); Consolatina Liguori and Vincenzo Paciello (University of Salerno, Italy)

20:00	<i>Restaurant Al Monastero</i> GALA DINNER
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Technical Program - Friday, June 19

08:30 - 12:00 *University of Brescia - Department of Economics and Management*
REGISTRATIONS

09:00 - 10:40 *Aula Magna*
S7.1 - General Track - PART IV
Chairs: *Ciro Tordela, University of Naples Federico II, Italy*
Antony Vasile, University of Brescia, Italy

- 09:00 Accelerating Automotive Perception: An Outlook on Smart Sensing and Edge AI Trends**
Luigi Capogrosso (Interdisciplinary Transformation University of Austria, Austria); Michele Magno (ETH Zurich, Switzerland)
- 09:20 Experimental Analysis of the True Power Factor in UAV Charging Stations Using Autonomous Docking Stations**
Davide Astolfi (Università di Brescia, Italy); Alessandra Flammini (University of Brescia, Italy); Paolo Malighetti (University of Bergamo, Italy); Marco Pasetti and Stefano Rinaldi (University of Brescia, Italy); Eleonora Riva Sanseverino (University of Palermo, Italy); Antony Vasile (University of Brescia, Italy)
- 09:40 A Double-Track Vehicle Based Nonlinear Estimator for Sideslip Angle and Tire-Road Forces Assessment**
Salvatore Strano, Mario Terzo and Ciro Tordela (University of Naples Federico II, Italy)
- 10:00 An in-Plane Tire-Road Forces Physical Estimator Driven by Strain-Based Smart Tires**
Salvatore Strano, Mario Terzo and Ciro Tordela (University of Naples Federico II, Italy)
- 10:20 Prototype-Based Validation of a Design Framework for off-Grid E-Bike Charging Stations Using Field PV Measurements**
Davide Astolfi, Salvatore Dello Iacono, Alessandra Flammini and Chiara Franzoni (University of Brescia, Italy); Paolo Malighetti (University of Bergamo, Italy); Marco Pasetti, Stefano Rinaldi and Antony Vasile (University of Brescia, Italy)

09:00 - 10:40

Sala Biblioteca

S7.2 - General Track - PART V

Chairs: Stefano Rinaldi, *University of Brescia, Italy*
Fabio Corti, *University of Florence, Italy*

- 09:00** **An Experimental Dataset for Wireless Power Transfer in Electric Vehicle Systems**
Mehmet Ogün Tanağardı, İ. Yasin Şimşek, Cengiz Bektaş and Muhammed Fatih Özkaya (Ergünler R&D Co.Ltd., Turkey); Alper Kanak (Ergünler R&D Co.Ltd. Turkey); Salih Ergun (Ergtech Research GmbH, Switzerland)
- 09:20** **Measurement-Based Validation of Seamless Grid-Forming/Grid-Following Transition Control for Automotive Bidirectional Inverters**
Madhusudan Nyaupane (Tribhuvan university, Nepal); Stefano Rinaldi (University of Brescia, Italy); Pradip Prasad Sah (Tribhuvan University, Nepal); Prabin Dhakal (Institute of Engineering, Pulchowk Campus, Nepal); Yukta Sharma (Tribhuvan University, Nepal)
- 09:40** **Performance Enhancement of off-Grid Charging System for Micromobility in Touristic Scenarios**
Vipinkumar Shriram Meshram (University of Campania Luigi Vanvitelli, Italy); Lorenzo Becchi, Matteo Intravaia, Fabio Corti, Gabriele Maria Lozito and Alberto Reatti (University of Florence, Italy)
- 10:00** **Augmented Reality-Enabled Cross-Operator Quality Verification in Automotive Assembly Lines**
Luzia Saraiva and Natanael Sarmento (Polytechnic University of Viseu, Portugal); Joao Henriques (University of Coimbra, Portugal); Andre Barbosa (Inklusion Entertainment, Portugal); Rui Duarte (Polytechnic University of Viseu, Portugal); Serafim M. Oliveira (Polytechnic Institute of Viseu, Portugal)
- 10:20** **Design and Prototyping of an Arduino-Based Smart Toolbox for Cyclists' Safety Monitoring**
Chiara Franzoni, Greta Brognoli, Alessandra Flammini, Salvatore Dello Iacono, Alessandro Depari, Stefano Rinaldi, Emiliano Sisinni and Paolo Ferrari (University of Brescia, Italy)

10:40 - 11:00

Chiostro Maggiore

COFFEE BREAK

11:00 - 11:45

Aula Magna

KEYNOTE LECTURE

Chair: Stefano Rinaldi, *University of Brescia, Italy*

**Signal Processing Driven Edge Intelligence for Vehicular Systems:
From Traffic Prediction to Driver Behavior Analytics**

Arun Balodi, Dayananda Sagar University, Bengaluru, India

11:45 - 12:25

Aula Magna

PANEL - IEEE Women in Engineering

Chairs: Alessandra Flammini, *University of Brescia, Italy*

Valentina Bianchi, *University of Parma, Italy*

12:25 - 12:50

Aula Magna

CLOSING AND AWARD CEREMONY

12:50 - 14:00

Chiostro Maggiore

LIGHT LUNCH
