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Welcome Message from the Chairpersons

On behalf of the organizing committee, we wish to welcome you to the 2019 IEEE International Workshop on Metrology for Industry 4.0 and IoT - MetroInd4.0&IoT.

The growing interest of industrial applications to the new Information and Communication Technologies has recently improved thanks to the fourth industrial revolution combined with mass deployment of the Internet of Things (IoT). In reality, this topic has several implications. In the World Economy Forum 2016 (WEF), organized by the worldwide foundation each year in Davos as a symposium to discuss about the emerging trends of economy, technology, environment and health, the title of the last event was “Mastering the Fourth Industrial Revolution” with the global vision about the impact on lost work positions, robots, and artificial intelligence.

The fourth industrial revolution implies evolutions and developments in fields, such as artificial intelligence, machine-learning, robotics, nanotechnologies, 3D Printer, genetics and biotechnologies. This revolution will determine a wide change in the field of business models and the emersion of new job sectors in the field of Smart-Energy, Financial Services, Health, ICT, Media & Entertainment, and Logistic.

All these deep changes are possible also thank to the recent developments in the field of metrology. Actually, monitoring remote physical phenomena and try to control them, requires the developments of new sensors, acquisition techniques, improve data acquisition systems, and so on.

MetroInd4.0&IoT aims to discuss the contributions both of the metrology for the development of Industry 4.0 and IoT and the new opportunities offered by Industry 4.0 and IoT for the development of new measurement methods and apparatus.

MetroInd4.0&IoT wants to gather people who work in developing instrumentation and measurement methods for Industry 4.0 and IoT, with new technologies for metrology-assisted production, component measurement, sensors and associated signal conditioning, and calibration methods for electronic test.

MetroInd4.0&IoT organization was a challenging task due to the large and increasing interest of our research and application areas. Efforts from many people were required to shape the technical program, arrange accommodation, manage the administrative aspects, and set up the social functions. We like to take this

opportunity to thank all and each of them. We like also to thank the public and private organizations that supported the meeting in different ways.

MetroInd4.0&IoT hosts three plenary lectures, one tutorial, and 16 oral and poster sessions designed to take advantage of a multidisciplinary approach to give a complete picture of the measurements utilizations and data treatments with the ultimate goal of increasing knowledge on the fourth industrial. Thanks to all of the Technical Program Committee members and the reviewers who have contributed to make this outstanding program possible.

We received 112 abstracts from all over the world, from Korea to the South America. The technical program encompasses several events and activities.

A Student Hackathon has been organized with the support of MathWorks, University of Cambridge, STMicroelectronics and Bluenet. 60 student from different countries will compete for two days on three different technological challenges.

The keynote speeches will be held by experts in the field of metrology and industry with a common view on the ongoing industrial revolution: Bruno Siciliano, University of Naples “Federico II”, Italy, will talk about *The Future is Now! Robotics, AI and Automation*; Marco Sacco, President of European Association of Virtual Reality and Augmented Reality, Italy, will discuss about *Augmented (and a bit of Virtual Reality) as enabler for the Factory 4.0*; Max Felser, Bern University of Applied Sciences BFH, Switzerland, will deal with *Who owns the information generated by sensors?*

With the aim of providing a common ground for researches to share their findings about the metrology for industry of the future, the MetroInd4.0&IoT is based on a significant number of Special Sessions. The main reason is that a centralized research address definition is usually not suited for new research fields, while a spontaneous aggregation of well-focused themes is more effective. Therefore, several application-oriented Special Sessions have been organized. We wish to thank the organizers of these Special Sessions for their cooperation and support to the conference organization. A special attention has been given to the link between Academia and Industry, with an Industrial Special Session.

Awards will be assigned, including young researchers and woman in engineering.

The social program includes a welcome cocktail held at School of Polytechnic and Basic Sciences of University of Naples “Federico II”, and the Conference dinner in a famous Neapolitan restaurant “*La Bersagliera*”, so please enjoy the hospitality of Naples and surroundings.

The 2nd International Workshop on Metrology for Industry 4.0 and IoT is about to begin. You are now in a position to enjoy the fellowship of colleagues and experts and to pass free time in natural and artistic beauties. It is up to you to appreciate the conference worth! Be critical! We, metrologists, colleagues, and friends, we know that this is the best way to improve quality, and to achieve lasting excellences.

Leopoldo Angrisani, General co-Chair

Pasquale Daponte, General co-Chair

Emilio Sardini, General co-Chair

MetroInd4.0&IoT 2019 Committee

GENERAL CHAIRS

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Emilio Sardini, *University of Brescia, Italy*

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Mauro D'Arco, *University of Naples Federico II, Italy*

STUDENT BRANCH CHAIR

Francesco Bonavolontà, *University of Naples Federico II, Italy*

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Oscar Casas, *Castelldefels School of Technology, Spain*
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Giovanna Sansoni, *Università di Brescia, Italy*
Franco Docchio, *Università di Brescia, Italy*

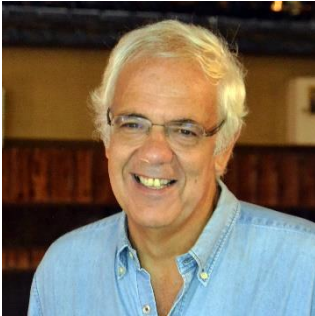
LOCAL COMMITTEE

Simone Caldarella, *University of Brescia, Italy*
Rosario Catelli, *University of Naples Federico II, Italy*
Mauro D'Angelo, *Perlatecnica, Italy*
Stefano Marrone, *University of Naples Federico II, Italy*
Nunzia Molinaro, *Università Campus Bio-Medico di Roma, Italy*
Francesco Orefice, *University of Naples Federico II, Italy*

LOCAL ARRANGEMENTS



MetroInd4.0&IoT 2019 Keynote Speakers



Keynote - Tuesday, June 4, 2019

The Future is Now! Robotics, AI and Automation

Bruno Siciliano

University of Naples Federico II, PRISMA LAB

ABSTRACT. Robotics research has advanced in the last two decades through an intensive collaboration with other disciplines and research communities. Multi-disciplinary approaches are more successful in addressing the combined issues of cognition (perception, awareness and mental models), and physical attributes (safety, dependability and dexterity) in the world of robotics. Previously separated from humans behind a fence, the new advanced robots (or cobots) are sharing our workspace and collaborating with us. Increasingly sophisticated built-in sensors enable them to see and feel the presence of humans, and avoid accidental contact. The perception of robotics technology is improving, as we experience more ways it can improve our lives. The social and medical benefits of robots, in particular, are starting to get more attention. The advent of Industry 4.0 has created a paradigm shift beyond the stereotype that jobs will be lost to Automation. In this scenario, the terms AI and Robotics are liberally used, and frequently interchanged today. However, the physical nature of a robotic system distinguishes it from the pure abstraction of AI. The future of Robotics, AI and Automation will rapidly evolve from the context of Information Technology to that of Interaction Technology. This talk will also discuss the ethical, legal, societal and economic implications of designing, realizing and using robots in our society.



Keynote - Wednesday, June 5, 2019

**Augmented (and a bit of Virtual Reality) as enabler for
the Factory 4.0**

Marco Sacco

CNR-STIIMA, EUROVR

ABSTRACT. Interactive technologies such as Augmented (AR) and Virtual Reality (VR) are set to transform the ways in which people communicate, interact and share information on the internet and beyond.

This will directly impact a larger number of European industries ranging from manufacturing, data life cycle, healthcare, engineering, to education, entertainment, media and culture, enabling new business opportunities.

Manufacturing sector transformation (the so call Factory 4.0) requires the introduction of advanced tools for both the knowledge representation and simulation. For over 10 years, Virtual Reality and Augmented Reality have generated benefits in several sectors thanks to the potentialities offered by these visualization technologies able to provide an added value to the contents and data enrichment.

The challenge is to create tools and services which AR (VR) as advanced user interfaces will enable a better interaction for the users while improving manufacturing processes and personnel training. Manufacturing companies, thanks to the reduction of cost and a widespread of devices, could now take advantage integrating AR technologies.

Some example developed at CNR-STIIMA will be presented.



Keynote - Thursday, June 6, 2019

Who owns the information generated by sensors?

Max Felser

Bern University of Applied Sciences, Switzerland

ABSTRACT. Up to now sensors have been sold to deliver a measured value. But in the era of Industrial IoT and Industry 4.0 everything is changing, including such a simple paradigm. Today sensors have more information available, which allow to deliver additional "services" that, in turn, someone could sell as supplementary add on. But, who is the provider of these extra services?

How do you ensure that this will not be abused by the user by using the information by himself? How this data is secured and identified? Does an end user allow sensor manufacturer to access the sensor in his plant to offer this service? Can we even imagine we do not own the sensors? And finally, what does this imply for the security and the existing industrial protocols?

The keynote will explore possible scenarios regarding the ownership/protection of sensor data, discussing the impact of IoT architecture when they are mapped to the industrial context.

MetroInd4.0&IoT 2019 Tutorial



Tuesday, June 4, 2019

ST's technologies enabling IoT and Industry4.0

Adriano Basile

IoT Technical Marketing in STMicroelectronics, Italy

ABSTRACT. The ballooning IoT phenomena today encompasses wide ranging application scenarios in many sectors, including Smart Home and Cities, Smart Things, Industry 4.0 and Smart Mobility. The key elements behind this growth story include the miniaturized and more intelligent sensing and processing hardware based on silicon technologies, several robust and reliable connectivity protocols, and highly refined signal conditioning and power and energy management.

Industry 4.0, also named Smart Industry, is a real revolution adding new scopes and goals to this segment: to produce more efficiently and environmentally friendly, to respond to flexibility and customization demands, to increase safer human experience and to efficient supply chain. Within this scenario the concept of Predictive Maintenance is a hot topic. This technology involves the diagnosis of key symptomatic indicators to allow advanced planning of costly machine care and maintenance, in order to reduce unnecessary or untimely downtime and avoid unrecoverable failures.

ST is well positioned to address these markets with state-of-the-art technologies and a wide range of products, thanks to its profound understanding of the building blocks associated with each of these ecosystems.

TOPICS

- Wired / Wireless Connectivity including Bluetooth w/o mesh topology
- MEMS Motion and Environment Sensor
- Artificial Intelligence and Deep Learning
- ...the building blocks of utility ecosystems

Adriano Basile received the degree in computer science engineering and the Ph.D. degree in electronic and control engineering from the University of Catania, Catania, Italy, in 2000, in 2004, respectively. His scientific interests include nonlinear systems and their application to image, bio-inspired robotics, complex dynamics, mechatronic and human system interaction. He has more than 30 publications, including papers in academic journals and conference proceedings.

He is now with STMicroelectronics, where he is Technical Marketing Manager for Consumer, Smart Things and Healthcare segments.

Awards and Distinctions

Best Conference Paper Award

Description: To recognize the most outstanding paper presented at the annual IEEE International Workshop on Metrology for Industry 4.0 and IoT.

The Best Conference Paper Award is sponsored by **Sensors Journal**. The award will consist of a certificate and a prize money amounting to 500 CHF.



sensors

an Open Access Journal by MDPI

Best Paper Presented by a Young Researcher

The Award has been established in memory of Prof. Massimo D'Apuzzo.

The Award is to encourage a promising early-career scientist who excels in some of Prof. D'Apuzzo's most remarkable qualities as, for example, scientific rigor and an inquisitive mind.

Description: An exclusive plaque will be given for the best paper authored and presented by a researcher younger than 35 years in age.

Best Paper Presented by a Woman

Description: An exclusive plaque will be given for the best paper authored and presented by a woman.

Best Paper of the Poster Session

Description: An exclusive plaque will be given for the best poster presented.

Best Live Demonstration

Description: To highlight the importance of the Demo Session, an exclusive plaque will be given for the best demo.

Location

POLYTECHNIC AND BASIC SCIENCES SCHOOL
UNIVERSITY OF NAPLES "FEDERICO II"
PIAZZALE TECCHIO - NAPLES, ITALY

The conference venue will be the School of Polytechnic and Basic Sciences of University of Naples "Federico II", located in Piazzale Tecchio, 80 in the Fuorigrotta district.



MAP



Social Functions

WELCOME PARTY

We are happy to invite MetroInd4.0&IoT 2019 attendees to the **Welcome Reception** on Tuesday, June 4, 2019 - H 18.40.

The Welcome Party will be held at Polytechnic and Basic Sciences of University of Naples "Federico II" - Piazzale Tecchio 80, Naples, Italy.



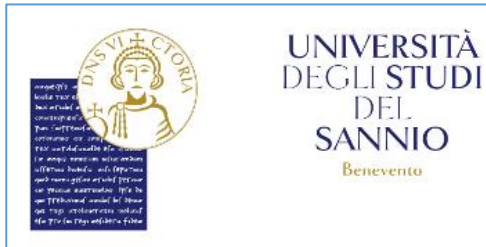
GALA DINNER

We are happy to invite MetroInd4.0&IoT 2019 attendees to the **Gala Dinner** on Wednesday, June 5, 2019 - H 20.00.

The Gala Dinner will be held at "**La Bersagliera**" Restaurant - Borgo Marinari, 10/11 Banchina Santa Lucia 80132, Naples, Italy.



MetroInd4.0&IoT 2019 Supports





Program Schedule – Tuesday, June 4

METROLOGY FOR INDUSTRY 4.0 & IoT TUESDAY, JUNE 4		
08:30 - 18:00	Registration	
09:30 - 10:00	Opening Session Great Hall - Aula Magna "Leopoldo Massimilla" - Polytechnic and Basic Sciences School	
10:00 - 10:50	Plenary Talk - Bruno Siciliano The Future is Now! Robotics, AI and Automation Great Hall - Aula Magna "Leopoldo Massimilla" - Polytechnic and Basic Sciences School	
10:50 - 11:20	COFFEE BREAK	
	Great Hall - Aula Magna "Leopoldo Massimilla" Polytechnic and Basic Sciences School	Sala delle Lauree "Scipione Bobbio" Polytechnic and Basic Sciences School
11:20 - 13:00	Session #1 - General Session - PART I	Session #2 - Special Session on Measurement Science and Design for Additive Manufacturing
13:00 - 14:20	LUNCH	
14:20 - 16:00	Session #3 - Special Session on Smart Measurement Systems for on-line Quality Control in Industry 4.0 era	Session #4 - Special Session on Models and Methods for the Integrated Design of Smart Mechanical Systems - PART I
16:00 - 16:20	COFFEE BREAK	
16:20 - 17:40	Session #5 - Special Session on IoT for Smart Grids: Scientific Challenges and Perspectives	Session #6 - Special Session on Models and Methods for the Integrated Design of Smart Mechanical Systems - PART II
17:40 - 18:20	TUTORIAL - ST's technologies enabling IoT and Industry4.0 Adriano Basile, STMicroelectronics, Italy Great Hall - Aula Magna "Leopoldo Massimilla"	
18:40 - 20:00	WELCOME PARTY Polytechnic and Basic Sciences School - Piazzale Tecchio, 80	

Program Schedule – Wednesday, June 5

METROLOGY FOR INDUSTRY 4.0 & IoT WEDNESDAY, JUNE 5			
09:00 - 10:00	Plenary Talk - Marco Sacco - CNR-STIIMA (Subsidiary of Lecco, Italy) Augmented (and a bit of Virtual Reality) as enabler for the Factory 4.0 Great Hall - Aula Magna "Leopoldo Massimilla" - Polytechnic and Basic Sciences School		IEEE Student Hackathon Registration
	Great Hall - Aula Magna "Leopoldo Massimilla" Polytechnic and Basic Sciences School	Sala delle Lauree "Scipione Bobbio" Polytechnic and Basic Sciences School	First Floor Polytechnic and Basic Sciences School
10:00 - 11:20	Session #7 - GENERAL SESSION - PART II	Session #8 - Special Session on Metrology, sensors and data management for Healthcare 4.0 - PART I	METROIND4.0&IOT 2019 IEEE STUDENT HACKATHON Challenge #1 - Roobopoli Challenge #2 - Minidrone Competition Challenge #3 - An EtherCAT Network of Raspberry Pi Computers
11:20 - 11:40	COFFEE BREAK		
11:40 - 13:00	POSTER SESSION - LIVE DEMO SESSION		
13:00 - 14:20	LUNCH		
14:20 - 16:00	Session #9 - Special Session on Wireless solutions for IoT based measurements in mobile and wide area scenarios	Session #10 - Special Session on Metrology, sensors and data management for Healthcare 4.0 - PART II	
16:00 - 16:20	COFFEE BREAK		
16:20 - 17:40	Session #11 - Special Session on Sensor systems and trends for additive manufacturing: towards Industry 4.0	Session #12 - Special Session on Measurements and Virtual Measurements for Industry 4.0	
20:00 - 23:00	GALA DINNER <i>La Bersagliera Restaurant</i> <i>Borgo Marinari, 10/11 Banchina Santa Lucia - Naples</i>		

Program Schedule – Thursday, June 6

METROLOGY FOR INDUSTRY 4.0 & IoT THURSDAY, JUNE 6			
09:00 - 10:00	Plenary Talk - Max Feiser Who owns the information generated by sensors? Great Hall - Aula Magna "Leopoldo Massimilla" - Polytechnic and Basic Sciences School	Seminar Hall - First Floor Polytechnic and Basic Sciences School	First Floor Polytechnic and Basic Sciences School
10:00 - 11:40	Great Hall - Aula Magna "Leopoldo Massimilla" Polytechnic and Basic Sciences School	Sala delle Lauree "Scipione Bobbio" Polytechnic and Basic Sciences School	METROIND4.0&IOT 2019 IEEE STUDENT HACKATHON Challenge #1 - Roobopoli Challenge #2 - Minidrone Competition Challenge #3 - An EtherCAT Network of Raspberry Pi Computers
11:40 - 12:00	Session #13 - Special Session on Human motion capture sensors, technologies and techniques for Industry 4.0 and IoT	Session #14 - Special Session on Measurement systems in the Industrial IoT era	Session #15 - Special Session on CyberSecurity of IoT and Industry 4.0
12:00 - 12:30	COFFEE BREAK		
16:30 - 17:00	CLOSING AND AWARD CEREMONY Great Hall - Aula Magna "Leopoldo Massimilla" - Polytechnic and Basic Sciences School		
	IEEE STUDENT HACKATHON CLOSING AND AWARD CEREMONY		

Technical Program - Tuesday, June 4

08:30 - 18:00

REGISTRATION

Polytechnic and Basic Sciences School

09:30 - 10:00

WELCOME ADDRESSES

OPENING CEREMONY

Room: *Great Hall - Aula Magna "Leopoldo Massimilla"*

10:00 - 10:50

PLENARY TALK

Chair: *Emilio Sardini, University of Brescia, Italy*

Room: *Great Hall - Aula Magna "Leopoldo Massimilla"*

Bruno Siciliano

University of Naples Federico II, PRISMA LAB

The Future is Now! Robotics, AI and Automation

10:50 - 11:20

COFFEE BREAK

Polytechnic and Basic Sciences School

11:20 - 13:00

Session #1 - General Session - PART I

Chairs: Mauro D'Arco, *University of Naples Federico II, Italy*

Rosario Schiano Lo Moriello, *University of Naples Federico II, Italy*

Room: *Great Hall - Aula Magna "Leopoldo Massimilla"*

11:20 Radio-frequency Identification Based on Textile, Wearable, Chipless Tags for IoT Applications

Laura Corchia, *University of Salento, Italy*

Egidio De Benedetto, *University of Salento, Italy*

Giuseppina Monti, *University of Salento, Italy*

Andrea Cataldo, *University of Salento, Italy*

Leopoldo Angrisani, *University of Naples Federico II, Italy*

Pasquale Arpaia, *University of Naples Federico II, Italy*

Luciano Tarricone, *University of Salento, Italy*

11:40 An Uncertainty Analysis for the Calibration of GNSS-Based Vehicle Speed Meters

Adolfo Martucci, *CIRA, Italy*

Marco Laracca, *University of Cassino and Southern Lazio, University of Molise, Italy*

Giovanni Cerasuolo, *CIRA, Italy*

Orsola Petrella, *CIRA, Italy*

12:00 MEMS based Transducer for Zero-Energy Standby Application

R. La Rosa, *STMicroelectronics*

C. Trigonay, *University of Catania, Italy*

B. Ando, *University of Catania, Italy*

S. Baglio, *University of Catania, Italy*

12:20 An opportunity to enhance the value of metrological traceability in digital systems

B. D. Hall, *Measurement Standards Lab, New Zealand*

12:40 Multivariate Analysis of LTE Radio-Layer Parameters based on a Partitional Clustering Approach

Nicola Pasquino, *University of Naples, Italy*

Giorgio Ventre, *University of Naples, Italy*

Stefania Zinno, *University of Naples, Italy*

Sofia Petrocelli, *University of Naples, Italy*

11:20 - 13:00

Session #2 - Special Session on Measurement Science and Design for Additive Manufacturing

Chairs: Massimo Martorelli, *University of Naples Federico II, Italy*

Antonio Gloria, *National Research Council of Italy*

Room: *Sala delle Lauree "Scipione Bobbio"*

11:20 Towards Adaptive Switches through implementation of visual feedback in assistive devices

Francesco Davide Cascone, *University of Naples, Italy*

Massimo Martorelli, *University of Naples, Italy*

Antonio Gloria, *National Research Council, Italy*

Stefano Papa, *University of Naples, Italy*

Antonio Lanzotti, *University of Naples, Italy*

11:45 Skull base reconstruction after endoscopic endonasal surgery: new strategies for raising the dam

Domenico Solari, *University of Naples, Italy*

Luigi M Cavallo, *University of Naples, Italy*

Paolo Cappabianca, *University of Naples, Italy*

Ilaria Onofrio, *University of Naples, Italy*

Ida Papallo, *University of Naples, Italy*

Arturo Brunetti, *University of Naples, Italy*

Lorenzo Ugga, *University of Naples, Italy*

Renato Cuocolo, *University of Naples, Italy*

Antonio Gloria, *National Research Council, Italy*

Giovanni Improta, *University of Naples, Italy*

Massimo Martorelli, *University of Naples, Italy*

Teresa Russo, *National Research Council, Italy*

12:10 Reverse Engineering and Additive Manufacturing towards the design of 3D advanced scaffolds for hard tissue regeneration

Pierpaolo Fucile, *University of Naples, Italy*

Ida Papallo, *University of Naples, Italy*

Giovanni Improta, *University of Naples, Italy*

Roberto De Santis, *National Research Council, Italy*

Antonio Gloria, *National Research Council, Italy*

Vincenzo D'Antò, *University of Naples, Italy*

Ilaria Onofrio, *University of Naples, Italy*

Saverio Maietta, *University of Naples, Italy*

Teresa Russo, *National Research Council, Italy*

12:35 Additive manufacturing and tissue engineering to improve outcomes in breast reconstructive surgery

Nicola Rocco, *G.RE.T.A., Italy*

Maurizio Bruno Nava, *G.RE.T.A., Italy*

Giuseppe Catanuto, *G.RE.T.A., Italy*

Antonello Accurso, *University Hospital Federico II, Italy*

Massimo Martorelli, *University of Naples, Italy*

Olimpia Oliviero, *University of Naples, Italy*

Giovanni Improta, *University of Naples, Italy*

Ida Papallo, *University of Naples, Italy*

Roberto De Santis, *National Research Council, Italy*

Antonio Gloria, *National Research Council, Italy*

Domenico Speranza, *University of Cassino and Southern Lazio, Italy*

13:00 - 14:20

LUNCH

Polytechnic and Basic Sciences School

14:20 - 16:00

Session #3 - Special Session on Smart Measurement Systems for on-line Quality Control in Industry 4.0 era

Chairs: Paolo Castellini, *Università Politecnica delle Marche, Italy*

Paolo Chiariotti, *Università Politecnica delle Marche, Italy*

Room: *Great Hall - Aula Magna "Leopoldo Massimilla"*

14:20 Smart portable laser triangulation system for assessing gap and flush in car body assembly line

Elisa Minnetti, *Università Politecnica delle Marche, Italy*

Paolo Chiariotti, *Università Politecnica delle Marche, Italy*

Paolo Castellini, *Università Politecnica delle Marche, Italy*

Luca Violini, *Università Politecnica delle Marche, Italy*

Gisela Garcia, *Volkswagen Autoeuropa, Lda, Portugal*

Helder Vicente, *Volkswagen Autoeuropa, Lda, Portugal*

Nicola Paone, *Università Politecnica delle Marche, Italy*

14:40 Inline Image Vision Technique for Tires Industry 4.0: Quality and Defect Monitoring in Tires Assembly

Alessandro Massaro, *Dyrecta Lab, Italy*

Ivano Manfredonia, *Dyrecta Lab, Italy*

Angelo Galiano, *Dyrecta Lab, Italy*

Nicola Contuzzi, *Dyrecta Lab, Italy*

15:00 FlexSight - A Flexible and Accurate System for Object Detection and Localization for Industrial Robots

Daniele Evangelista, *University of Padova, Italy*

Marco Imperoli, *Sapienza University of Rome, Italy*

Emanuele Menegatti, *University of Padova, Italy*

Alberto Pretto, *FlexSight S.r.l., Italy*

15:20 Advanced Process Defect Monitoring Model and Prediction Improvement by Artificial Neural Network in Kitchen Manufacturing Industry: a Case of Study

Alessandro Massaro, *Dyrecta Lab, Italy*

Ivano Manfredonia, *Dyrecta Lab, Italy*

Angelo Galiano, *Dyrecta Lab, Italy*

Benny Xhahysa, *Dyrecta Lab, Italy*

15:40 Sensing and Quality Monitoring Facilities Designed for Pasta Industry Including Traceability, Image Vision and Predictive Maintenance

Alessandro Massaro, *Dyrecta Lab, Italy*

Ivano Manfredonia, *Dyrecta Lab, Italy*

Angelo Galiano, *Dyrecta Lab, Italy*

Leonardo Pellicani, *Dyrecta Lab, Italy*

Vitangelo Birardi, *Dyrecta Lab, Italy*

14:20 - 16:00

Session #4 - Special Session on Models and Methods for the Integrated Design of Smart Mechanical Systems – PART I

Chairs: Salvatore Gerbino, *University of Campania, Italy*

Ferdinando Vitolo, *University of Naples, Italy*

Room: *Sala delle Lauree "Scipione Bobbio"*

14:20 Biomechanical-based torque reconstruction of the human shoulder joint in industrial tasks

Teodorico Caporaso, *University of Naples, Italy*

Stanislao Grazioso, *University of Naples, Italy*

Stefano Nardella, *University of Naples, Italy*

Benedetta Maria Vita Ostuni, *University of Naples, Italy*

Giuseppe Di Gironimo, *University of Naples, Italy*

Antonio Lanzotti, *University of Naples, Italy*

14:37 Evaluation of human joint angles in industrial tasks using OpenSim

Dario Panariello, *University of Naples, Italy*
Stanislao Grazioso, *University of Naples, Italy*
Teodorico Caporaso, *University of Naples, Italy*
Angela Palomba, *University of Campania Luigi Vanvitelli, Italy*
Giuseppe Di Gironimo, *University of Naples, Italy*
Antonio Lanzotti, *University of Naples, Italy*

14:54 Line Balancing Assessment Enhanced by IoT and Simulation Tools

Marcello Fera, *University of Campania Luigi Vanvitelli, Italy*
Alessandro Greco, *University of Campania Luigi Vanvitelli, Italy*
Mario Caterino, *University of Campania Luigi Vanvitelli, Italy*
Salvatore Gerbino, *University of Campania Luigi Vanvitelli, Italy*
Francesco Caputo, *University of Campania Luigi Vanvitelli, Italy*

15:11 Assessment of upper limb muscle synergies for industrial overhead tasks: a preliminary study

Stanislao Grazioso, *University of Naples, Italy*
Teodorico Caporaso, *University of Naples, Italy*
Angela Palomba, *University of Campania Luigi Vanvitelli, Italy*
Stefano Nardella, *University of Naples, Italy*
Benedetta Ostuni, *University of Naples, Italy*
Dario Panariello, *University of Naples, Italy*
Giuseppe Di Gironimo, *University of Naples, Italy*
Antonio Lanzotti, *University of Naples, Italy*

15:28 Integrated wearable devices for evaluating the biomechanical overload in manufacturing

Alessandro Greco, *University of Campania Luigi Vanvitelli, Italy*
Marianosaria Muoio, *University of Campania Luigi Vanvitelli, Italy*
Monica Lamberti, *University of Campania Luigi Vanvitelli, Italy*
Salvatore Gerbino, *University of Campania Luigi Vanvitelli, Italy*
Francesco Caputo, *University of Campania Luigi Vanvitelli, Italy*
Nadia Miraglia, *University of Campania Luigi Vanvitelli, Italy*

15:45 The anthropometric basis for the designing of collaborative workplaces

Castrese Di Marino, *University of Bergamo, Italy*
Andrea Rega, *University of Naples, Italy*
Ferdinando Vitolo, *University of Naples, Italy*
Stanislao Patalano, *University of Naples, Italy*
Antonio Lanzotti, *University of Naples, Italy*

16:00 - 16:20

COFFEE BREAK

Polytechnic and Basic Sciences School

16:20 - 17:40

Session #5 - Special Session on IoT for Smart Grids: Scientific Challenges and Perspectives

Chairs: Francesco Bonavolontà, *University of Naples Federico II, Italy*

Annalisa Liccardo, *University of Naples Federico II, Italy*

Room: *Great Hall - Aula Magna "Leopoldo Massimilla"*

16:20 Use of COMTRADE Fault Current Data to Test Inductive Current Transformers

Alessandro Mingotti, *University of Bologna, Italy*

Lorenzo Peretto, *University of Bologna, Italy*

Roberto Tinarelli, *University of Bologna, Italy*

Junhao Zhang, *Hunan University, China*

16:45 An electrical DC Motor Equivalent Circuit testbed for the battery Prognostic Health and Management

Silvestro Vespoli, *University of Naples, Italy*

Guido Guizzi, *University of Naples, Italy*

Giuseppe Converso, *University of Naples, Italy*

Valentina Popolo, *University of Naples, Italy*

Annarita Tedesco, *University of Naples, Italy*

17:10 Protection of MV smart grid based on IoT technology

Francesco Bonavolontà, *University of Naples, Italy*

Chiara Caputi, *University of Naples, Italy*

Annalisa Liccardo, *University of Naples, Italy*

Alessandro Teotino, *University of Naples, Italy*

16:20 - 17:40

Session #6 - Special Session on Models and Methods for the Integrated Design of Smart Mechanical Systems – PART II

Chairs: Salvatore Gerbino, *University of Campania, Italy*
Ferdinando Vitolo, *University of Naples, Italy*

Room: **Room:** *Sala delle Lauree "Scipione Bobbio"*

16:20 A Generalised Multi-Attribute Task Sequencing Approach for Robotics Optical Inspection Systems

Ferdinando Vitolo, *University of Naples, Italy*
Pasquale Franciosa, *University of Warwick, United Kingdom*
Darek Ceglarek, *University of Warwick, United Kingdom*
Stanislao Patalano, *University of Naples, Italy*
Massimiliano De Martino, *University of Naples, Italy*

16:40 A Sensor Data Fusion-Based Locating Method for Reverse Engineering Scanning Systems

Andrea Rega, *University of Naples, Italy*
Stanislao Patalano, *University of Naples, Italy*
Ferdinando Vitolo, *University of Naples, Italy*
Salvatore Gerbino, *University of Campania Luigi Vanvitelli, Italy*

17:00 A Decision Making Process Model based on a Multilevel Control Platform Suitable for Industry 4.0

Nicola Contuzzi, *Dyrecta Lab IT Research Institute, Italy*
Alessandro Massaro, *Dyrecta Lab IT Research Institute, Italy*
Ivano Manfredonia, *Dyrecta Lab IT Research Institute, Italy*
Angelo Galiano, *Dyrecta Lab IT Research Institute, Italy*
Benny Xhahysa, *Dyrecta Lab IT Research Institute, Italy*

17:20 Design and development of jigless assembly process: the case of complex aeronautical systems

Rocco Mozzillo, *University of Naples, Italy*
Paola Iaccarino, *LAER group S.p.A, Italy*
Ferdinando Vitolo, *University of Naples, Italy*
Pasquale Franciosa, *University of Warwick, United Kingdom*

17:40 - 18:20

TUTORIAL

Chair: Egidio De Benedetto, *University of Salento, Italy*

Room: *Great Hall - Aula Magna "Leopoldo Massimilla"*

Adriano Basile
STMicroelectronics, Italy

ST's technologies enabling IoT and Industry4.0

09:30 - 10:00

WELCOME PARTY

Polytechnic and Basic Sciences School - Piazzale Vincenzo Tecchio, 80

Technical Program - Wednesday, June 5

08:30 - 17:00

REGISTRATION

Polytechnic and Basic Sciences School

09:00 - 10:00

PLENARY TALK

Chair: Pasquale Arpaia, *University of Naples Federico II, Italy*

Room: *Great Hall - Aula Magna "Leopoldo Massimilla" – Polytechnic and Basic Sciences School*

*Marco Sacco
CNR-STIIMA, EUROVR*

Augmented (and a bit of Virtual Reality) as enabler for the Factory 4.0

10:00 - 11:20

Session #7 - GENERAL SESSION – PART II

Chairs: Paolo Ferrari, *University of Brescia, Italy*

Mario Luiso, *University of Campania "Luigi Vanvitelli", Italy*

Room: *Great Hall - Aula Magna "Leopoldo Massimilla" – Polytechnic and Basic Sciences School*

10:00 Application of a Modular Wearable System to Track Workers' Fingers Movement in Industrial Environments

Paolo Bellitti, *University of Brescia, Italy*

Michele Bona, *University of Brescia, Italy*

Michela Borghetti, *University of Brescia, Italy*

Emilio Sardini, *University of Brescia, Italy*

Mauro Serpelloni, *University of Brescia, Italy*

10:20 A technique for the correction of long-term magnetic flux integrator drift

Maria Amodeo, *CERN, Switzerland, University of Naples, University of Turin, Italy*

Pasquale Arpaia, *CERN, Switzerland, University of Naples, Italy*

Marco Buzio, *CERN, Switzerland*

10:40 Hardware Security in IoT era: the Role of Measurements and Instrumentation

Ioan Tudosa, *University of Sannio, Italy*

Francesco Picariello, *University of Sannio, Italy*

Eulalia Balestrieri, *University of Sannio, Italy*

Luca De Vito, *University of Sannio, Italy*

Francesco Lamonaca, *University of Sannio, Italy*

11:00 A fine-grained controlled set-up to execute time synchronization protocol tests in a distributed environment

Gianni Cerro, *University of Cassino and Southern Lazio, Italy*

Luigi Ferrigno, *University of Cassino and Southern Lazio, Italy*

Gianfranco Miele, *University of Cassino and Southern Lazio, Italy*

Domenico Capriglione, *University of Salerno, Italy*

Francesco Lamonaca, *University of Sannio, Italy*

Domenico Luca Carnì, *University of Calabria, Italy*

10:00 - 11:20

Session #8 - Special Session on Metrology, sensors and data management for Healthcare 4.0 - PART I

Chairs: Luca Vollero, *Università Campus Bio-Medico di Roma, Italy*

Emiliano Schena, *Università Campus Bio-Medico di Roma, Italy*

Room: **Room:** *Sala delle Lauree "Scipione Bobbio"*

10:00 Force monitoring during Peripheral Nerve Blocks: design and feasibility assessment of a new noninvasive system

Emiliano Schena, *Università Campus Bio-Medico di Roma, Italy*

Carlo Massaroni, *Università Campus Bio-Medico di Roma, Italy*

Sara Iacoponi, *Università Campus Bio-Medico di Roma, Italy*

Alessandro Bertè, *Università Campus Bio-Medico di Roma, Italy*

Arianna Leone, *Università Campus Bio-Medico di Roma, Italy*

Sara Musicco, *Università Campus Bio-Medico di Roma, Italy*

Domenico Formica, *Università Campus Bio-Medico di Roma, Italy*

Luigi Raiano, *Università Campus Bio-Medico di Roma, Italy*

Massimiliano Carassiti, *Università Campus Bio-Medico di Roma, Italy*

Paola Palermo, *Università Campus Bio-Medico di Roma, Italy*

Aurelio De Filippis, *Università Campus Bio-Medico di Roma, Italy*

Chiara Valenti, *Università Campus Bio-Medico di Roma, Italy*

10:20 Development and Evaluation of Tri-Axial Fiber Bragg Grating in a Measurement Module for Catheterization

Dongjoo Shin, *University Suwon, Republic of Korea*
Hyeong-U Kim, *University Suwon, Republic of Korea*
Taesung Kim, *University Suwon, Republic of Korea*

10:40 Design And Development Of An Innovative Sensor System For Non-Invasive Monitoring Of Athletic Performances

Anna Sabatini, *University Campus Bio-Medico di Roma, Italy*
Alessandro Zompanti, *University Campus Bio-Medico di Roma, Italy*
Simone Grasso, *University Campus Bio-Medico di Roma, Italy*
Antonio Gianfelici, *CONI, Italy*
Andrea Di Castro, *CONI, Italy*
Bruno Donatucci, *CONI, Italy*
Giorgio Pennazza, *University Campus Bio-Medico di Roma, Italy*
Marco Santonico, *University Campus Bio-Medico di Roma, Italy*

11:00 Single-plane neck movements and respiratory frequency monitoring: a smart system for computer workers

Daniela Lo Presti, *University Campus Bio-Medico di Roma, Italy*
Carlo Massaroni, *University Campus Bio-Medico di Roma, Italy*
Joshua Di Tocco, *University Campus Bio-Medico di Roma, Italy*
Emiliano Schena, *University Campus Bio-Medico di Roma, Italy*
Arianna Carnevale, *University Campus Bio-Medico di Roma, Italy*
Umile Giuseppe Longo, *University Campus Bio-Medico di Roma, Italy*
Jessica D'Abbraccio, *The Biorobotics Institute, Scuola Superiore Sant'Anna, Italy*
Luca Massari, *The Biorobotics Institute, Scuola Superiore Sant'Anna, Italy*
Calogero Maria Oddo, *The Biorobotics Institute, Scuola Superiore Sant'Anna, Italy*
Michele Arturo Caponero, *ENEA, Italy*

11:20 - 11:40

COFFEE BREAK

Polytechnic and Basic Sciences School

11:40 - 13:00

POSTER SESSION

LIVE DEMO SESSION

Chairs: Francesco Bonavolontà, *University of Naples Federico II, Italy*

Mauro D'Arco, *University of Naples Federico II, Italy*

PS1 - A Preliminar Research Industry Project: a Case of Study defining Requirements for Knowledge Base Gain and Technological Upgrade in Industry Working in Train Parts Processing and Testing

Alessandro Massaro, *Dyrecta Lab IT, Italy*

Nicola Contuzzi, *Dyrecta Lab IT, Italy*

Angelo Galiano, *Dyrecta Lab IT, Italy*

Ivano Manfredonia, *Dyrecta Lab IT, Italy*

Benny Xhahysa, *Dyrecta Lab IT, Italy*

PS2 - Low Power Contacless Voltage Sensor for IoT Applications

Antonio Delle Femine, *University of Campania "Luigi Vanvitelli", Italy*

Daniele Gallo, *University of Campania "Luigi Vanvitelli", Italy*

Carmine Landi, *University of Campania "Luigi Vanvitelli", Italy*

Alessandro Lo Schiavo, *University of Campania "Luigi Vanvitelli", Italy*

Mario Luiso, *University of Campania "Luigi Vanvitelli", Italy*

PS3 - Quality Study using TeraHertz (THz) Technology of Surface Bonded Fiber Optic Sensors

Orsola Petrella, *CIRA, Italy*

Monica Ciminello, *CIRA, Italy*

Adolfo Martucci, *CIRA, Italy*

Ilaria Catapano, *IREA-CNR, Italy*

Giovanni Ludeno, *IREA-CNR, Italy*

Francesco Soldovieri, *IREA-CNR, Italy*

PS4 - Test Bed Characterization for the Interfacial Pressure vs. Temperature Measurements in MV Cable-Joints

Raffaella Di Sante, *University of Bologna, Italy*

Abbas Ghaderi, *University of Bologna, Italy*

Alessandro Mingotti, *University of Bologna, Italy*

Lorenzo Peretto, *University of Bologna, Italy*

Roberto Tinarelli, *University of Bologna, Italy*

PS5 - Takagi-Sugeno Discrete Fuzzy Modeling: an IoT Controlled ABS for UAV

Enrico Petritoli, *Università degli Studi "Roma Tre", Italy*

Fabio Leccese, *Università degli Studi "Roma Tre", Italy*

Marco Cagnetti, *Università degli Studi "Roma Tre", Italy*

PS6 - A Framework for Uniformization of Security, Network and Management in IoT Applications.

Ricardo J. B. de V. M. Cavalcanti, *UFRN, Brazil*

Danielly C. M. Costa, *UFRN, Brazil*

Mohamad S. A. Ali, *UFRN, Brazil*

Josiel P. P. Oliveira, *UFRN, Brazil*

Diego R. C. Silva, *UFRN, Brazil*

Marcelo B. Nogueira, *UFRN, Brazil*
Marconi C. Rodrigues, *UFRN, Brazil*

PS7 - Monitoring Restaurants in Real-Time

Isaac Danilo Santos Batista, *Univ. Federal de Rio Grande do Norte, Brazil*
Idalmis Milian Sardina, *Univ. Federal de Rio Grande do Norte, Brazil*
Rummenigge Rudson Dantas, *Univ. Federal de Rio Grande do Norte, Brazil*

PS8 – RADON project: an innovative system to manage gas radon in civil buildings

Alberto Amato, *Politecnico di Bari, Italy*
Roberto Calienno, *Politecnico di Bari, Italy*
Rita Dario, *Politecnico di Bari, Italy*
Vincenzo Di Lecce, *Politecnico di Bari, Italy*
Cataldo Guaragnella, *Politecnico di Bari, Italy*
Cristoforo Marzocca, *Politecnico di Bari, Italy*
Marina Popolizio, *Politecnico di Bari, Italy*
Alessandro Quarto, *myHermes Srl, Italy*
Ivano Recchia, *Politecnico di Bari, Italy*
Domenico Soldo, *myHermes Srl, Italy*
Maria Rizzi, *Politecnico di Bari, Italy*

PS9 - An MII-Aware SoA Editor for the Industrial Internet of Things

Mahdi Saeedi Nikoo, *Spark Calibration Services, Turkey*
M. Cagri Kaya, *University Ankara, Turkey*
Michael L. Schwartz, *Cal Lab Solutions, Inc., USA*
Halit Oguztuzun, *University Ankara, Turkey*

PS10 - Cyber-Physical Manufacturing Systems for Industry 4.0: Architectural Approach and Pilot Case

Mariorosario Prist, *Università Politecnica delle Marche, Italy*
Andrea Monteriù, *Università Politecnica delle Marche, Italy*
Alessandro Freddi, *Università Politecnica delle Marche, Italy*
Emanuele Pallotta, *Università Politecnica delle Marche, Italy*
Paolo Cicconi, *Università Politecnica delle Marche, Italy*
Federico Giuggioloni, *Syncode S.c.ar.l., Italy*
Eduard Caizer, *Syncode S.c.ar.l., Italy*
Carlo Verdini, *Syncode S.c.ar.l., Italy*
Sauro Longhi, *Università Politecnica delle Marche, Italy*

PS11 - Geometrical Analysis of a Bacterial Cellulose-Based Sensing Element

Giovanna Di Pasquale, *University of Catania, Italy*
Salvatore Graziani, *University of Catania, Italy*
Antonio Licciulli, *University of Lecce, Italy*
Rossella Nisi, *BioFaber, Italy*
Antonino Pollicino, *University of Catania, Italy*

Carlo Trigona, *University of Catania, Italy*

PS12 - Controller Interface for Industry 4.0 based on RAMI 4.0 and OPC UA

Pablo Felipe Soares de Melo, *Sao Paulo State University, Brazil*

Eduardo Paciencia Godoy, *Sao Paulo State University, Brazil*

PS13 - In-situ Monitoring Hydrodynamic Pressure Distribution during Chemical Mechanical Polishing

Eungchul Kim, *University Suwon, South Korea*

Gunhoo Woo, *University Suwon, South Korea*

Taesung Kim, *University Suwon, South Korea*

PS14 - Using photogrammetric 3D body reconstruction for the design of patient-tailored assistive devices

Stanislao Grazioso, *University of Naples, Italy*

Teodorico Caporaso, *University of Naples, Italy*

Mario Selvaggio, *University of Naples, Italy*

Dario Panariello, *University of Naples, Italy*

Roberta Ruggiero, *University of Naples, Italy*

Giuseppe Di Gironimo, *University of Naples, Italy*

PS15 - Energy consumption consideration of 3D printing

Valeria Annibaldi, *University of L'Aquila, Italy*

Marianna Rotilio, *University of L'Aquila, Italy*

PS16 - Preliminary Study on a Strain Sensor Printed on 3D-plastic Surfaces for Smart Devices

Michela Borghetti, *University of Brescia, Italy*

Edoardo Cantù, *University of Brescia, Italy*

PS17 - A Flexible DAQ Hardware Architecture using SoCs for IoT based Structural Health Monitoring Systems

Ioan Tudosa, *University of Sannio, Italy*

Francesco Picariello, *University of Sannio, Italy*

Eulalia Balestrieri, *University of Sannio, Italy*

Domenico Luca Carni, *University of Calabria, Italy*

Francesco Lamonaca, *University of Sannio, Italy*

PS18 - IoT System for Remote Monitoring of Bridges: Measurements for Structural Health and Vehicular Traffic Load

Eulalia Balestrieri, *University of Sannio, Italy*

Luca De Vito, *University of Sannio, Italy*

Francesco Picariello, *University of Sannio, Italy*

Ioan Tudosa, *University of Sannio, Italy*

PS19 - An Overview of Embedded A-to-D Converters Technologies in IoT based Measurement Systems

Eulalia Balestrieri, *University of Sannio, Italy*

Luca De Vito, *University of Sannio, Italy*

Francesco Picariello, *University of Sannio, Italy*

Sergio Rapuano, *University of Sannio, Italy*

Ioan Tudosa, *University of Sannio, Italy*

PS20 - Feasibility Study to Preserve the Health of an Industry 4.0 Worker: a Radar System for Monitoring the Sitting-Time

Emanuele Cardillo, *University of Messina, Italy*

Alina Caddemi, *University of Messina, Italy*

PS21 - A wearable inertial device based on biomechanical parameters for sports performance analysis in race-walking: preliminary results

Teodorico Caporaso, *University of Naples, Italy*

Stanislao Grazioso, *University of Naples, Italy*

Dario Panariello, *University of Naples, Italy*

Giuseppe Di Gironimo, *University of Naples, Italy*

Antonio Lanzotti, *University of Naples, Italy*

PS22 - Feasibility of cardiovascular risk assessment through non-invasive measurements

Pasquale Arpaia, *University of Naples, Italy*

Renato Cuocolo, *University of Naples, Italy*

Francesco Donnarumma, *ISTC-CNR, Italy*

Dario D'Andrea, *University of Naples, Italy*

Antonio Esposito, *Politecnico di Torino, Italy*

Nicola Moccaldi, *University of Naples, Italy*

Angela Natalizio, *University of Naples, Italy*

Roberto Prevete, *University of Naples, Italy*

PS23 - A Pulse Oximetry IoT System Based on Powerline Technology

Giovanni Bucci, *University of L'Aquila, Italy*

Fabrizio Ciancetta, *University of L'Aquila, Italy*

Edoardo Fiorucci, *University of L'Aquila, Italy*

Andrea Fioravanti, *University of L'Aquila, Italy*

Alberto Prudenzi, *University of L'Aquila, Italy*

PS24 - Smart distributed energy monitoring for industrial applications

Alberto Prudenzi, *University of L'Aquila, Italy*

Andrea Fioravanti, *University of L'Aquila, Italy*

Fabrizio Ciancetta, *University of L'Aquila, Italy*

DEMO#1 - Breaching security of distributed measurement and control systems

Paolo Ferrari, *University of Brescia, Italy*

DEMO#2 - HEREMOS A wearable system for clinical monitoring

Marco Sabatini, Giuseppe Marcello Guarino, Felice Del Mauro, Alessandro Di Tomaso, Carlo Massaroni, Emiliano Schena, Massimiliano Carassiti, Luca Vollero, Giulia Di Tomaso

DEMO#3 - POLYTILE: Self-Compensating IMU Exploiting Redundant Configuration on Regular POLYhedron of SensorTILES

Giorgio de Alteriis, Domenico Accardo, Rosario Schiano Lo Moriello, Raffaele Ruggiero

DEMO#4 - Lora-based Logic Selectivity for Fault Protection

Chiara Caputi, Annalisa Liccardo, Francesco Bonavolontà, Rosario Schiano Lo Moriello

13:00 - 14:20

LUNCH

Polytechnic and Basic Sciences School

14:20 - 16:00

Session #9 - Special Session on Wireless solutions for IoT based measurements in mobile and wide area scenarios

Chairs: Paolo Ferrari, *University of Brescia, Italy*

Diego Silva, *Federal University of Rio Grande do Norte, Brazil*

Room: Room: *Great Hall - Aula Magna "Leopoldo Massimilla"*

14:20 Sensors calibration for Metrology 4.0

Roberto Benitez Mr., *ETALONS, Mexico*

Roberto Benitez Jr., *ETALONS, Mexico*

Cesar Ramirez, *ETALONS, Mexico*

Jose A. Vazquez, *ETALONS, Mexico*

14:40 Evaluating indoor and outdoor localization services for LoRaWAN in Smart City applications

Federico Bonafini, *University of Brescia, Italy*

Dhiego Carvalho Fernandes, *University of Brescia, Italy*

Alessandro Depari, *University of Brescia, Italy*

Paolo Ferrari, *University of Brescia, Italy*

Alessandra Flammini, *University of Brescia, Italy*

Marco Pasetti, *University of Brescia, Italy*
Stefano Rinaldi, *University of Brescia, Italy*
Emiliano Sisinni, *University of Brescia, Italy*

15:00 Enabling ESP32-based IoT Applications in Building Automation Systems

Carlo Guarnieri Calo Carducci, *RWTH Aachen University, Germany*
Antonello Monti, *RWTH Aachen University, Germany*
Markus Hans Schraven, *RWTH Aachen University, Germany*
Markus Schumacher, *RWTH Aachen University, Germany*
Dirk Mueller, *RWTH Aachen University, Germany*

15:20 Black Powder Flow Monitoring in Pipelines by Means of Multi-Hop LoRa Networks

Andrea Abrardo, *University of Siena, Italy*
Ada Fort, *University of Siena, Italy*
Elia Landi, *University of Siena, Italy*
Marco Mugnaini, *University of Siena, Italy*
Enza Panzardi, *University of Siena, Italy*
Alessandro Pozzebon, *University of Siena, Italy*

15:40 A novel experimental-based tool for the design of LoRa networks

Susanna Spinsante, *University of Marche, Italy*
Luca Gioacchini, *Polytechnic of Turin, Italy*
Lorenzo Scalise, *Polytechnic University of Marche, Italy*

14:20 - 16:00

Session #10 - Special Session on Metrology, sensors and data management for Healthcare 4.0 - PART II

Chairs: Eduardo Palermo, *Sapienza University of Rome, Italy*

Carlo Massaroni, *Università Campus Bio-Medico di Roma, Italy*

Room: **Room:** *Sala delle Lauree "Scipione Bobbio"*

14:20 Methodology for the Evaluation of Magneto-Inertial Orientation Filters in SO(3)

Jacopo Tosi, *Università Campus Bio-Medico di Roma, Italy*
Fabrizio Taffoni, *Università Campus Bio-Medico di Roma, Italy*
Asif Hussain, *Nanyang Technological University, Singapore*
Domenico Campolo, *Nanyang Technological University, Singapore*
Domenico Formica, *Università Campus Bio-Medico di Roma, Italy*

14:45 A wearable low-cost device for measurement of human exposure to transmitted vibration on motorcycle

Marco Carratu, *University of Salerno, Italy*
Antonio Pietrosanto, *University of Salerno, Italy*
Paolo Sommella, *University of Salerno, Italy*
Vincenzo Paciello, *University of Cassino and Southern Lazio, Italy*

15:10 A preliminary investigation of the effect of contact pressure on the accuracy of heart rate monitoring by wearable PPG wrist band

Leonardo D'Acquisto, *University of Palermo, Italy*
Francesco Scardulla, *University of Palermo, Italy*
Nicola Montinaro, *University of Palermo, Italy*
Salvatore Pasta, *Ri.Med Foundation, Italy*
Daniele Zangla, *University of Palermo, Italy*
Diego Bellavia, *IRCCS-ISMETT, Italy*

15:35 A Wearable Platform to Identify Workers Unsafety Situations

Luca Faramondi, *University Campus Bio-Medico di Roma, Italy*
Paolo Bragatto, *INAIL, Italy*
Camilla Fioravanti, *University Campus Bio-Medico di Roma, Italy*
Maria Grazia Gnoni, *University of Salento, Italy*
Simone Guarino, *University Campus Bio-Medico di Roma, Italy*
Roberto Setola, *University Campus Bio-Medico di Roma, Italy*

16:00 - 16:20

COFFEE BREAK

Polytechnic and Basic Sciences School

16:20 - 17:40

Session #11 - Special Session on Sensor systems and trends for additive manufacturing: towards Industry 4.0

Chairs: Giuseppe Ferri, *University of L'Aquila, Italy*
Gianluca Barile, *University of L'Aquila, Italy*

Room: **Room:** *Great Hall - Aula Magna "Leopoldo Massimilla"*

16:20 A build time estimator for Additive Manufacturing

Luca Di Angelo, *University of L'Aquila, Italy*
Paolo Di Stefano, *University of L'Aquila, Italy*
Emanuele Guardiani, *University of L'Aquila, Italy*

16:40 Print On Air: FDM 3D Printing Without Supports

Gianfranco Fazzini, *R&D srl, Italy*
Paola Paolini, *R&D srl, Italy*
Romina Paolucci, *R&D srl, Italy*
Daniela Chiulli, *R&D srl, Italy*
Gianluca Barile, *University of L'Aquila, Italy*
Alfiero Leoni, *University of L'Aquila, Italy*
Mirco Muttillio, *University of L'Aquila, Italy*
Leonardo Pantoli, *University of L'Aquila, Italy*
Giuseppe Ferri, *University of L'Aquila, Italy*

17:00 FDM 3D Printing of high performance composite materials

Anna Costanza Russo, *R&D srl, Italy*
Giustiniano Andreassi, *R&D srl, Italy*
Achille Di Girolamo, *R&D srl, Italy*
Silvio Pappadà, *CETMA, Italy*
Giuseppe Buccoliero, *CETMA, Italy*
Gianluca Barile, *University of L'Aquila, Italy*
Francesco Vegliò, *University of L'Aquila, Italy*
Vincenzo Stornelli, *University of L'Aquila, Italy*

17:20 Acoustically shaped laser light as an enabling technology for Industry 4.0

Salvatore Surdo, *Nanophysics, Italy*
Alessandro Zunino, *Nanophysics, University of Genoa, Italy*
Alberto Diaspro, *Nanophysics, Italy*
Marti Duocastella, *Nanophysics, Italy*

16:20 - 17:40

Session #12 - Special Session on Measurements and Virtual Measurements for Industry 4.0

Chairs: Antonella Gaspari, *Università dell'Aquila, Italy*

Alessandro Schiavi, *CNR - INRiM, Italy*

Room: Room: *Sala delle Lauree "Scipione Bobbio"*

16:20 Integration of model and sensor data for smart condition monitoring in mechatronic devices

Giulio D'Emilia, *University of L'Aquila, Italy*
Antonella Gaspari, *University of L'Aquila, Italy*
Emanuela Natale, *University of L'Aquila, Italy*

16:40 Metrological traceability for digital sensors in smart manufacturing: calibration of MEMS accelerometers and microphones at INRiM

Andrea Prato, *INRiM, Italy*

Fabrizio Mazzoleni, *INRiM, Italy*

Alessandro Schiavi, *INRiM, Italy*

17:00 Do Industry 4.0 technologies matter when companies evaluate reshoring decisions?

Luciano Fratocchi, *University of L'Aquila, Italy*

Cristina Di Stefano, *University of L'Aquila, Italy*

17:20 The role of measurement and simulation in additive manufacturing within the frame of Industry 4.0

Giulio D'Emilia, *University of L'Aquila, Italy*

Antoniamaria Di Ilio, *University of L'Aquila, Italy*

Antonella Gaspari, *University of L'Aquila, Italy*

Emanuela Natale, *University of L'Aquila, Italy*

Roberta Perilli, *University of L'Aquila, Italy*

Antonios G. Stamopoulos, *University of L'Aquila, Italy*

20:00 - 23:00

GALA DINNER

"La Bersagliera" Restaurant

Borgo Marinari, 10/11 Banchina Santa Lucia - Naples

Technical Program - Thursday, June 6

08:30 - 12:00

REGISTRATION

Polytechnic and Basic Sciences School

09:00 - 10:00

PLENARY TALK

Chair: Leopoldo Angrisani, *University of Naples Federico II, Italy*

Room: *Great Hall - Aula Magna "Leopoldo Massimilla" – Polytechnic and Basic Sciences School*

Max Felser

Bern University of Applied Sciences, Switzerland

Who owns the information generated by sensors?

10:00 - 11:40

Session #13 - Special Session on Human motion capture sensors, technologies and techniques for Industry 4.0 and IoT

Chairs: Eduardo Palermo, *Sapienza University of Rome, Italy*

Simona Crea, *Scuola Superiore Sant'Anna, Italy*

Room: *Room: Great Hall - Aula Magna "Leopoldo Massimilla"*

10:00 Assessing ergonomics and biomechanical risk in manual handling of loads through a wearable system

Ilaria Conforti, *Sapienza University of Rome, Italy*

Ilaria Mileti, *Sapienza University of Rome, Italy*

Zaccaria Del Prete, *Sapienza University of Rome, Italy*

Eduardo Palermo, *Sapienza University of Rome, Italy*

10:20 Automatic identification and counting of repetitive actions related to an industrial worker

Juri Taborri, *University of Tuscia, Italy*

Marco Bordignon, *ErgoCert, Italy*

Francesco Marcolin, *ErgoCert, Italy*

Marco Donati, *Motustech, Italy*
Stefano Rossi, *University of Tuscia, Italy*

10:40 Towards methodology and metrics for assessing lumbar exoskeletons in industrial applications

Lorenzo Grazi, *The BioRobotics Institute, Italy*
Baojun Chen, *The BioRobotics Institute, Italy*
Francesco Lanotte, *The BioRobotics Institute, Italy*
Nicola Vitiello, *The BioRobotics Institute, Italy*
Simona Crea, *The BioRobotics Institute, Italy*

11:00 A biofeedback-based posture correction system for working environments

Francesca Cordella, *Campus Bio-Medico University of Rome, Italy*
Francesco Scotto di Luzio, *Campus Bio-Medico University of Rome, Italy*
Clemente Lauretti, *Campus Bio-Medico University of Rome, Italy*
Francesco Draicchio, *INAIL, Italy*
Loredana Zollo, *Campus Bio-Medico University of Rome, Italy*

11:20 Design and Development of Large-Area FBG-Based Sensing Skin for Collaborative Robotics

Jessica D'Abbraccio, *The BioRobotics Institute, Italy*
Andrea Aliperta, *The BioRobotics Institute, Italy*
Calogero Maria Oddo, *The BioRobotics Institute, Italy*
Martina Zaltieri, *Sapienza University of Rome, Italy*
Eduardo Palermo, *Sapienza University of Rome, Italy*
Luca Massari, *University of Venice, Italy*
Giuseppe Terruso, *University of Venice, Italy*
Edoardo Sinibaldi, *Center for Micro-BioRobotics, Italy*
Magdalena Kowalczyk, *University of Technology, Poland*
Emiliano Schena, *Campus Bio-Medico University of Rome, Italy*

10:00 - 11:40

Session #14 - Special Session on Measurement systems in the Industrial IoT era

Chairs: Paolo Ferrari, *University of Brescia, Italy*

Diego Silva, *Federal University of Rio Grande do Norte, Brazil*

Room: Room: *Sala delle Lauree "Scipione Bobbio"*

10:00 Wireless Power Sensors to Renovate Energy Metering in IIoT Converted Factories

Jessica
Francesco Benzi, *University of Pavia, Italy*
Ezio Bassi, *University of Pavia, Italy*
Arnold Jr. Ako, *University of Pavia, Italy*
Luigi Borghi, *Didelme Sistemi srl, Italy*
Daniela Greco, *Didelme Sistemi srl, Italy*

10:20 Performance evaluation of full-cloud and edge-cloud architectures for Industrial IoT anomaly detection based on deep learning

Paolo Ferrari, *University of Brescia, Italy*
Stefano Rinaldi, *University of Brescia, Italy*
Emiliano Sisinni, *University of Brescia, Italy*
Fabio Colombo, *40Factory Srl, Italy*
Filippo Ghelfi, *40Factory Srl, Italy*
Davide Maffei, *Siemens Spa, Italy*
Matteo Malara, *Siemens Spa, Italy*

10:40 Digitalization of Manufacturing Processes: Proposal and Experimental Results

Rodrigo Pita Rolle, *UNESP, Brazil*
Vinícius de O. Martucci, *UNESP, Brazil*
Eduardo P. Godoy, *UNESP, Brazil*

11:00 Performance Evaluation of an Edge OBD-II Device for Industry 4.0

Gabriel Signoretti, *PPgEEC, Federal University of Rio Grande do Norte, Brazil*
Marianne Silva, *PPgEEC, Federal University of Rio Grande do Norte, Brazil*
Alexandre Dias, *Federal University of Rio Grande do Norte, Brazil*
Ivanovitch Silva, *PPgEEC, Federal University of Rio Grande do Norte, Brazil*
Diego Silva, *Federal University of Rio Grande do Norte, Brazil*
Paolo Ferrari, *University of Brescia, Italy*

11:20 Control as a Service: A Microservice Approach to Industry 4.0

Jeferson A. Bigheti, *SENAI, Brazil*
Michel M. Fernandes, *UNESP, Brazil*
Eduardo P. Godoy, *UNESP, Brazil*

10:00 - 11:40

Session #15 - Special Session on CyberSecurity of IoT and Industry 4.0

Chairs: Raphael Machado, *Inmetro, Brazil*

Lucila Maria de Souza Bento, *Federal University of Rio de Janeiro, Brazil*

Room: **Room:** *Seminar Hall - First Floor*

10:00 Securing connection between IT and OT: the Fog Intrusion Detection System prospective

Riccardo Colelli, *University of Roma Tre, Italy*
Stefano Panziera, *University of Roma Tre, Italy*
Federica Pascucci, *University of Roma Tre, Italy*

10:20 HTTPS Keys in the Mediterranean

Diogo Pereira, *LNCC, Brazil*
Matheus Aranha, *COPPE/UFRJ, Brazil*
Fábio Borges, *LNCC, Brazil*

10:40 Countermeasure for Identification of Controlled Data Injection Attacks in Networked Control Systems

Alan Oliveira de Sá, *University of Rio de Janeiro, Brazil*

Luiz Fernando Rust da C. Carmo, *University of Rio de Janeiro, Brazil*

Raphael C. Santos Machado, *Federal Center for Technological Education, Brazil*

11:00 Trade-off between Performance and Security for Coding and Ring Learning With Errors-based Diffie-Hellman Cryptosystems

Claudio Téllez, *Universidade Anhembi Morumbi, Brazil*

Diogo Pereira, *LNCC, Brazil*

Fábio Borges, *LNCC, Brazil*

11:20 Measuring randomness in IoT products

Daniel Chicayban Bastos, *Universidade Federal Fluminense, Brazil*

Luis Antonio Brasil Kowada, *Universidade Federal Fluminense, Brazil*

Raphael C. Santos Machado, *Universidade Federal Fluminense, Brazil*

11:40 - 12:00

COFFEE BREAK

Polytechnic and Basic Sciences School

12:00 - 12:30

CLOSING AND AWARD CEREMONY

Great Hall - Aula Magna "Leopoldo Massimilla" – Polytechnic and Basic Sciences School

16:30 - 17:00

IEEE STUDENT HACKATHON CLOSING AND AWARD CEREMONY
