Final Program
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Welcome to the 1st IEEE International Workshop on Metrology for Industry 4.0 and IoT

On behalf of the organizing committee, we wish to welcome you to the 2018 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 two plenary lectures, two tutorials, and 10 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 61 abstracts from all over the world, from Japan to the South America.

The technical program encompasses several events and activities.

The keynote speeches will be held by experts in the field of metrology and industry with a common view on the ongoing industrial revolution: Bert van der Linden, from ATS Applied Tech Systems B.V., Netherlands, will talk about *The missing "Thing" in Internet of Things*; the title of the speech of Diego Galar, from Luleå University of Technology, Sweden, is “*Virtual assets and virtual commissioning: Digitization in Industry 4.0*”.

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 to young researchers and woman in engineering.

The social program includes a welcome cocktail in the historical center of Brescia and the Conference dinner in a wine cellar, so please enjoy the hospitality of Brescia and surroundings.

The First International Workshop on Metrology for Industry 4.0 and IoT is about to begin.

If there is anything that we may do for you, please contact one of us and we will be happy to try to accommodate your needs.

Pasquale Daponte, General co-Chair
Alessandra Flammini, General co-Chair
Emilio Sardini, General co-Chair
MetroInd4.0&IoT 2018 Committee

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Pasquale Daponte, University of Sannio, Italy
Alessandra Flammini, University of Brescia, Italy
Emilio Sardini, University of Brescia, Italy

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Oscar Casas, Castelldefels School of Technology, Spain
Nicola Paone, Università Politecnica delle Marche, Italy
Diego Galar, Luleå University of Technology, Sweden
Hugo Silva, PLUX - Wireless Biosignals, S.A., Portugal
Georg Brasseur, Graz University of Technology, Austria
Marija Cundeva-Blajer, Ss. Cyril and Methodius University in Skopje, R. Macedonia
Tatjana Sibalija, Metropolitan University, Serbia
Michele Magno, ETH Zürich, Switzerland
Vedran Bilas, University of Zagreb, Croatia
Dennis Brandão, Universidade de São Paulo, Brasil
Mariolino De Cecco, Università di Trento, Italy
Paolo Castellini, *Università Politecnica delle Marche, Italy*
Giulio D'Emilia, *Università de L’Aquila, Italy*
Sara Foresti, *Università di Milano, Italy*
Leopoldo Angrisani, *Università di Napoli Federico II, Italy*
Silverio Bolognani, *Università di Padova, Italy*
Giovanna Sansoni, *Università di Brescia, Italy*
Franco Docchio, *Università di Brescia, Italy*

**LOCAL COMMITTEE**
Stefano Rinaldi, *University of Brescia, Italy*
Michela Borgheti, *University of Brescia, Italy*
Francesco Gringoli, *University of Brescia, Italy*
Bianchini Devis, *University of Brescia, Italy*

**LOCAL ARRANGEMENTS**

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**ATHENA SRL**
Business and technology consulting
The missing "Thing" in Internet of Things

Bert van der Linden

ATS APPLIED TECH SYSTEMS B.V., NETHERLANDS

ABSTRACT. Do we need to change our focus or strategy from digitisation/connectivity to automatic control (automation)? We work hard to develop a flexible infrastructure of "Things" at this moment. This flexible infrastructure consists of sensors - for example in a mesh network - that are connected to IoT platforms, like Amazon Web Services (AWS), IBM Watson or Microsoft Azure IoT Hub. These platforms make it possible to integrate not only sensors but also actuators and controllers.

Why? We develop these complete infrastructures to serve humans to reach their goals. Humans can share the whole world via IoT!

So, we have a flexible infrastructure of shared resources (capacities, services), but on the other hand we have the goals and needs of the users. Resources are the means to realise the end results. But what happens if we need to share a resource? Is it possible that the (human) goals are going to compete? And how do we solve this shared resource problem in the IoT infrastructure. Do we need coordination or negotiation? And can we automate this kind of control?
Keynote Wednesday, April 18, 2018

Virtual assets and virtual commissioning: Digitization in Industry 4.0

Diego Galar

LULEA UNIVERSITY OF TECHNOLOGY / TECNALIA

Dr. Diego Galar is Professor of Condition Monitoring in the Division of Operation and Maintenance Engineering at LTU, Luleå University of Technology where he is coordinating several H2020 projects related to different aspects of cyber physical systems, Industry 4.0, IoT or industrial Big Data. He was also involved in the SKF UTC centre located in Lulea focused on SMART bearings and also actively involved in national projects with the Swedish industry or funded by Swedish national agencies like Vinnova.

He is also principal researcher in Tecnalia (Spain), heading the Maintenance and Reliability research group within the Division of Industry and Transport.

He has authored more than five hundred journal and conference papers, books and technical reports in the field of maintenance, working also as member of editorial boards, scientific committees and chairing international journals and conferences and actively participating in national and international committees for standardization and R&D in the topics of reliability and maintenance. In the international arena, he has been visiting Professor in the Polytechnic of Braganza (Portugal), University of Valencia and NIU (USA) and the Universidad Pontificia Católica de Chile. Currently, he is visiting professor in University of Sunderland (UK), University of Maryland (USA), and Chongqing University in China.

ABSTRACT. For complex assets, much information needs to be captured and mined to assess the overall condition of the whole system including the one from design and manufacturing which obviously contains the physical knowledge. Therefore, the integration of asset information during the entire lifecycle is required to get an accurate health assessment of the whole system.

Moreover, the lack of data on advanced degraded states due to early replacements and "black swans" makes the data-driven approach vulnerable to such situations. The risk related to these scenarios, despite their low latency, is not acceptable, especially for assets for which safety is a must. Therefore, there is a need to augment datasets before training data-driven algorithms. For this purpose, data covering a wider range of scenarios can be obtained by synthetic data generated by physics-based models. These models need to be realistic and provide meaningful and comparable information about the behavior of asset.

New technologies involving big data, cloud computing, IoT etc. can help the use / owner / maintainer / designer to perform a virtual commissioning of the asset where it is digitized and virtualized combining the existing physical models with the data collected from the field and produce a digital twin containing both data driven and physical information. This virtualization allows the user to produce data regarding situations and scenarios which didn’t happen yet or are very rare. These new data sets can be blindly fused to obtain a hybrid model and go one step beyond the digital twins. This talk will discuss the possibilities that lie within applying the analytics concept by the means of virtualization i.e virtual commissioning of the assets through hybrid data fusion and integration from a systems perspective.
Awards

Best Conference Paper Award

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

The Best Paper Award will be selected on the basis of the review process and on the paper presentation during the workshop. The final assessment and selection criteria will be based on several key parameters, including: technical quality of the paper, authors' knowledge of the field, presentation effectiveness and clarity, engagement in substantive question & answer, etc.

Best Paper Presented by a Woman

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

Basis for Judging: Technical merit, originality, potential impact on the field, clarity of the written paper, and quality of the oral or other presentation.

Best Paper Presented by a Young Researcher

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

Basis for Judging: Technical merit, originality, potential impact on the field, clarity of the written paper, and quality of the oral or other presentation.

IEEE Student Contest

The Instrumentation and Measurement Italy Chapter and the IEEE Student Branch of Brescia organize an IEEE Student Contest to be held during the Workshop, in the form of a virtual poster session. The three best posters will be awarded with the MetroInd4.0&IoT 2018 IEEE Student Best Poster Award, funded by the IEEE Italy Section.
Social Functions

Welcome Reception

We are happy to invite MetroInd4.0&IoT attendees to the Welcome Reception on Monday April 16, 2018.

The Welcome Reception will be organized at the “Hotel Vittoria”, Via X Giornate, 20, Brescia.

Gala Dinner

We are happy to invite MetroInd4.0&IoT attendees to the Welcome Party on Tuesday April 17, 2018.

The Gala Dinner will be held at “Al Rocol” restaurant, Ome (Brescia).
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>13:00 - 17:30</td>
<td>Registration - University of Brescia</td>
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<tr>
<td>14:00 - 14:30</td>
<td>Welcome Addresses - &quot;Sala Consiliare&quot; Hall</td>
<td>&quot;Sala Consiliare&quot; Hall</td>
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<tr>
<td>14:30 - 15:50</td>
<td>Special Session on Perception Methods to Enhance the role of the Man in the Loop</td>
<td>&quot;AulaN. 8&quot; Hall</td>
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<td>Special Session on Embedded vision methods and systems for edge-computing and IoT applications</td>
<td>Exposition Hall</td>
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<td>15:50 - 16:15</td>
<td>Coffee Break</td>
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<td>16:15 - 17:30</td>
<td>TUTORIAL - SESSION 1 Measurement Science and Sensing Technologies: the Backbone Underlying Industry 4.0</td>
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<td>TUTORIAL - SESSION 2 Big Data and Industry 4.0: the Role of Data Exploration</td>
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<tr>
<td>17:45 - 18:45</td>
<td>Tour of Brescia</td>
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<tr>
<td>18:45 - 20:45</td>
<td>Welcome Cocktail - Hotel Vittoria</td>
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### Program Schedule – Tuesday April 17, 2018

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Location</th>
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<tr>
<td>08:00 - 17:00</td>
<td>Registration - University of Brescia</td>
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<tr>
<td>09:00 - 10:00</td>
<td>Plenary Talk - Bert van der Linden &quot;The missing &quot;Thing&quot; in Internet of Things&quot;</td>
<td>&quot;Sala Consiliare&quot; Hall - University of Brescia</td>
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<td>10:00 - 10:30</td>
<td>Coffee Break</td>
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<tr>
<td>10:30 - 12:30</td>
<td>Industrial Session &amp; Visit to Laboratory</td>
<td>&quot;Sala Consiliare&quot; Hall - University of Brescia</td>
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<tr>
<td>12:30 - 14:00</td>
<td>Lunch</td>
<td>&quot;Sala Consiliare&quot; Hall - University of Brescia</td>
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<tr>
<td>12:30 - 14:00</td>
<td>&quot;Sala Consiliare&quot; Hall</td>
<td>&quot;AulaN. 8&quot; Hall</td>
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<tr>
<td>14:00 - 16:00</td>
<td>Special Session on Smart Measurement Systems for on-line Quality Control</td>
<td>Special Session on Synchronization for Internet of Things</td>
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<td>16:00 - 16:30</td>
<td>Coffee Break</td>
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<tr>
<td>16:30 - 18:10</td>
<td>Special Session on Measurement Systems and Approaches for Smart Manufacturing</td>
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<tr>
<td>19:30 - 22:30</td>
<td>GALA DINNER</td>
<td>AL ROCOL Restaurant</td>
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# Program Schedule – Wednesday April 18, 2018

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</table>
| 09:00 - 10:00 | Plenary Talk - Diego Galar "Virtual assets and virtual commissioning: Digitization in Industry 4.0"  
"Sala Consiliare" Hall - University of Brescia |                                  |
| 10:00 - 10:30 | Coffee Break                                                                                     | "Sala Consiliare" Hall  
"AulaN. 8" Hall  
Exposition Hall |
| 10:30 - 12:30 | Special Session on Measurement Systems in the Industrial IoT Era - PART I  
Special Session on Standards and Technologies for CyberSecurity of IoT and Industry 4.0 (SecStandards) | Exhibitors                      |
| 12:30 - 14:00 | Lunch                                                                                           |                                  |
| 14:00 - 16:00 | Special Session on Measurement Systems in the Industrial IoT Era - PART II  
General Session | Exhibitors                      |
| 16:00 - 16:30 | Closing and Award Ceremony "Sala Consiliare" Hall - University of Brescia |                                  |
Monday, April 16 - Technical Sessions

13:00 - 17:30
REGISTRATION
*Place:* University of Brescia

14:00 - 14:30
**Welcome Addresses**
*Room:* “Sala Consiliare” Hall, University of Brescia

14:30 - 15:50
**Special Session on Perception Methods to Enhance the role of the Man in the Loop**
*Chairs:* Mariolino De Cecco, *University of Trento, Italy*
    Hirokazu Kato, *Nara Institute of Science and Technology, Japan*
*Room:* “Sala Consiliare” Hall, University of Brescia

14:30  *Kinect-based micro-behavior sensing system for learning the smart assistance with human subjects inside their homes*
    Teruhiro Mizumoto, *Nara Institute of Science and Technology, Japan*
    Alberto Fornaser, *University of Trento, Italy*
    Hirohiko Suwa, *Nara Institute of Science and Technology, Japan*
    Keiichi Yasumoto, *Nara Institute of Science and Technology, Japan*
    Mariolino De Cecco, *University of Trento, Italy*

14:50  *Efficient In-Situ Creation of Augmented Reality Tutorials*
    Alexander Plopsi, *Nara Institute of Science and Technology, Japan*
    Varunyu Fuvattanasip, *Nara Institute of Science and Technology, Japan*
    Jarkko Poldi, *Nara Institute of Science and Technology, Japan*
    Takafumi Taketomi, *Nara Institute of Science and Technology, Japan*
    Christian Sandor, *Nara Institute of Science and Technology, Japan*
    Hirokazu Kato, *Nara Institute of Science and Technology, Japan*
15:10  An Augmented Reality virtual assistant to help mild cognitive impaired users in cooking
J. D’Agostini, University of Trento, Italy
L. Bonetti, University of Trento, Italy
A. Salem, University of Trento, Italy
L. Passerini, University of Trento, Italy
G. Fiacco, University of Trento, Italy
P. Lavanda, University of Trento, Italy
E. Motti, University of Trento, Italy
M. Stocco, University of Trento, Italy
K. T. Gashay, University of Trento, Italy
E. G. Abebe, University of Trento, Italy
S. M. Alemu, University of Trento, Italy
R. Haghani, University of Trento, Italy
A. Voltolini, University of Trento, Italy
C. Strobbe, University of Trento, Italy
N. Covre, University of Trento, Italy
G. Santolini, University of Trento, Italy
M. Armellini, University of Trento, Italy
T. Sacchi, University of Trento, Italy
D. Ronchese, University of Trento, Italy
C. Furlan, University of Trento, Italy
F. Facchinato, University of Trento, Italy
L. Maule, University of Trento, Italy
P. Tomasin, University of Trento, Italy
A. Fornaser, University of Trento, Italy
M. De Cecco, University of Trento, Italy

15:30  Multimodal computer vision framework for human assistive robotics
Eugenio Ivorra, Universitat Politècnica de València, Spain
Mario Ortega, Universitat Politècnica de València, Spain
Mariano Alcaniz, Universitat Politècnica de València, Spain
Nicolas García-Aracil, Universidad Miguel Hernández de Elche, Spain
14:30 - 15:50
Special Session on Embedded vision methods and systems for edge-computing and IoT applications

**Chairs:** Giovanna Sansoni, *University of Brescia, Italy*
Diego R. C. Silva, *Universidade Federal do Rio Grande do Norte, Brazil*

**Room:** “Aula N. 8” Hall, University of Brescia

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14:30 **Academic FabLab at University of Naples Federico II: New Research and Development Opportunities in the Fields of IoT and Industry 4.0**
Leopoldo Angrisani, *University of Naples Federico II, Italy*
Pasquale Arpaia, *University of Naples Federico II, Italy*
Francesco Bonavolontà, *University of Naples Federico II, Italy*
Rosario Schiano Lo Moriello, *University of Naples Federico II, Italy*

14:50 **Deep Learning based Machine Vision: first steps towards a hand gesture recognition set up for Collaborative Robots**
Cristina Nuzzi, *University of Brescia, Italy*
Simone Pasinetti, *University of Brescia, Italy*
Matteo Lancini, *University of Brescia, Italy*
Franco Docchio, *University of Brescia, Italy*
Giovanna Sansoni, *University of Brescia, Italy*

15:10 **Development and characterization of a safety system for robotic cells based on multiple Time of Flight (TOF) cameras and point cloud analysis**
Simone Pasinetti, *University of Brescia, Italy*
Cristina Nuzzi, *University of Brescia, Italy*
Matteo Lancini, *University of Brescia, Italy*
Giovanna Sansoni, *University of Brescia, Italy*
Franco Docchio, *University of Brescia, Italy*
Alberto Fornaser, *University of Trento, Italy*

15:30 **IoT enabling measurement applications in Industry 4.0: platform for remote programming ATEs**
Leopoldo Angrisani, *University of Naples Federico II, Italy*
Umberto Cesaro, *University of Naples Federico II, Italy*
Mauro D’Arco, *University of Naples Federico II, Italy*
Domenicantonio Grillo, *University of Naples Federico II, Italy*
Alessandro Tocchi, *University of Naples Federico II, Italy*
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<td>15:50 - 16:15</td>
<td>COFFEE BREAK</td>
<td>Place: <em>University of Brescia</em></td>
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</table>
| 16:15 - 17:30 | TUTORIAL - SESSION 1                                      | **Measurement science and sensing technologies: the backbone underlying Industry 4.0**  
Nicola Paone, *Università Politecnica delle Marche, Italy*  
Paolo Castellini, *Università Politecnica delle Marche, Italy*  
**Chair:** Emilio Sardini, *University of Brescia, Italy*  
**Room:** “Sala Consiliare” Hall, University of Brescia |
| 16:15 - 17:30 | TUTORIAL - SESSION 2                                      | **Big Data and Industry 4.0: the role of data exploration**  
Devis Bianchini, *University of Brescia, Italy*  
**Chair:** Alessandra Flammini, *University of Brescia, Italy*  
**Room:** “Aula N. 8” Hall, University of Brescia |
| 17:45 - 18:45 | TOUR OF BRESCIA                                           |                                                                        |
| 18:45 - 20:45 | WELCOME RECEPTION                                         | Hotel Vittoria, Via X Giornate, 20, Brescia                             |
Tuesday, April 17 - Technical Sessions

08:00 - 17:00  
REGISTRATION  
Place: University of Brescia

09:00 - 10:00  
PLENARY SPEAKER  
"The missing "Thing" in Internet of Things"  
Bert van der Linden  
Chair: Giorgio Sberveglieri, University of Brescia, Italy  
Room: “Sala Consiliare” Hall, University of Brescia

10:00 - 10:30  
COFFEE BREAK  
Place: University of Brescia

10:30 - 12:00  
INDUSTRIAL SESSION  
Chair: Leopoldo Angrisani, University of Naples Federico II, Italy  
Room: “Sala Consiliare” Hall, University of Brescia

10:30  "Energy Monitoring and Management: Easy Measurement with Cloud Integration"  
Matteo Malara, Siemens

10:50  "Where are the goods?"  
Luigi Wilmo Franceschetti, Saccheria Franceschetti SpA

11:00  "Increasing a SME productivity and complexity output through organizational innovations",  
Michele Bonetti, OMB Saleri SpA
11:10 "The Power to Manage"
Angelo Baronchelli, AB Holding SpA

11:20 Talking with the experts
Industrial Session participants talk about the role of industrial research in the next years; special guest Prof. Giovanni Moroni from Politecnico of Milan.

12:00 Visit to eLUX Laboratory
Chair: Alessandra Flammini, University of Brescia

12:00 Short presentation of Brescia IEEE Student Branch

12:05 Short presentation of eLUX Laboratory, energy Laboratory as University eXpo

12:10 Visit to eLUX Laboratory

12:30 - 14:00 LUNCH
Place: “I Silvani” Restaurant

14:00 - 16:00
Special Session on Smart Measurement Systems for on-line Quality Control
Chairs: Nicola Paone, Università Politecnica delle Marche, Italy
Mahsa Mohammadikaji, Karlsruhe Institute of Technology, Germany
Room: “Sala Consiliare” Hall, University of Brescia

14:00 Distributed Human Machine Interface with localization functionalities: a real test bench
Paolo Bellagente, University of Brescia, Italy
Federico Bonafini, University of Brescia, Italy
Claudio Crema, University of Brescia, Italy
Alessandro Depari, University of Brescia, Italy
14:25 Inspection Planning for Optimized Coverage of Geometrically Complex Surfaces
Mahsa Mohammadikaji, Karlsruhe Institute of Technology, Germany
Stephan Bergmann, Karlsruhe Institute of Technology, Germany
Stephan Irgenfried, Karlsruhe Institute of Technology, Germany
Jurgen Beyerer, Karlsruhe Institute of Technology, Germany
Carsten Dachsbacher, Karlsruhe Institute of Technology, Germany
Heinz Worn, Karlsruhe Institute of Technology, Germany

14:50 High-accuracy dimensional measurement of cylindrical components by an automated test station based on confocal chromatic sensor
Paolo Chiariotti, Università Politecnica delle Marche, Italy
Matteo Fitti, Università Politecnica delle Marche, Italy
Paolo Castellini, Università Politecnica delle Marche, Italy
Saverio Zitti, Zannini srl, Italy
Marco Zannini, Zannini srl, Italy
Nicola Paone, Università Politecnica delle Marche, Italy

15:15 Home Automation Architecture based on IoT Technologies
Judson Costa, Universidade Federal do Rio Grande do Norte, Brazil
Daniel Araujo, Universidade Federal do Rio Grande do Norte, Brazil
Diego R. C. Silva, Universidade Federal do Rio Grande do Norte, Brazil
Marcelo B. Nogueira, Universidade Federal do Rio Grande do Norte, Brazil
Marconi C. Rodrigues, Universidade Federal do Rio Grande do Norte, Brazil

15:40 Array of Semiconductor Nanowires Gas Sensor for IoT in Wastewater Management
Matteo Soprani, University of Brescia, Italy
Giorgio Duina, NASYS srl, Italy
Maura Malgaretti, A2A Ciclo idrico, Italy
Marco Abbatangelo, University of Brescia, Italy
Elisabetta Comini, University of Brescia, Italy
Veronica Sberveglieri, CNR-IBBR, NASYS srl, Italy
Estefanía Núñez-Carmona, University of Brescia, Italy
Manohar Prasad Bhandari, *University of Brescia, Italy*
Daniele Bolpagni, *A2A Ciclo idrico, Italy*
Giorgio Sberveglieri, *University of Brescia, Italy*

**14:00 - 16:00**

**Special Session on Synchronization for Internet of Things**

*Chairs:* Francesco Lamonaca, *University of Sannio, Italy*
Paolo Francesco Sciammarella, *University of Calabria, Italy*

*Room:* “Aula N. 8” Hall, University of Brescia

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**14:00**  **Low Cost Field Test Measurement Method and Prototype Measurement Device Implementation for Timing Accuracy Evaluation of IEEE 1588 Solutions**

Tamás Kovácszázy, *Budapest University of Technology and Economics, Hungary*
Ádám Erik Hollós, *Budapest University of Technology and Economics, Hungary*

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**14:25**  **Low-cost Implementation of an Active Phasor Data Concentrator for Smart Grid**

Paolo Castello, *University of Cagliari, Italy*
Carlo Muscas, *University of Cagliari, Italy*
Paolo Attilio Pegoraro, *University of Cagliari, Italy*
Sara Sulis, *University of Cagliari, Italy*

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**14:50**  **Time Synchronization Based on CMTS: a Performance Analysis in Industry Scenarios**

Domenico Capriglione, *University of Salerno, Italy*
Gianni Cerro, *University of Cassino and Southern Lazio, Italy*
Luigi Ferrigno, *University of Cassino and Southern Lazio, Italy*
Vincenzo Paciello, *University of Cassino and Southern Lazio, Italy*

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**15:15**  **Synchronization of IoT layers for Structural Health Monitoring**

Francesco Lamonaca, *University of Sannio, Italy*
Paolo Francesco Sciammarella, *University of Calabria, Italy*
Carmelo Scuro, *University of Calabria, Italy*
Domenico Luca Carnì, *University of Calabria, Italy*
Renato Olivito, *University of Calabria, Italy*
15:40  Internet of Things for Structural Health Monitoring
Francesco Lamonaca, University of Sannio, Italy
Carmelo Scuro, University of Calabria, Italy
Paolo Francesco Sciammarella, University of Calabria, Italy
Domenico Luca Carni, University of Calabria, Italy
Renato Olivito, University of Calabria, Italy

16:00 - 16:30  COFFEE BREAK
Place: University of Brescia

16:30 - 18:10  Special Session on Measurement Systems and Approaches for Smart Manufacturing
Chairs: Giulio D’Emilia, L’Aquila University, Italy
Khurram Shahzad, Mid Sweden University, Sweden
Room: “Sala Consiliare” Hall, University of Brescia

16:30  Condition Monitoring in Industry 4.0 - Design Challenges and Possibilities: A Case Study
Khurram Shahzad, Mid Sweden University, Sweden
Mattias O’Nils, Mid Sweden University, Sweden

16:50  Measurements for Smart Manufacturing in an Industry 4.0 scenario
Giulio D’Emilia, University of L’Aquila, Italy
Antonella Gaspari, University of L’Aquila, Italy
Emanuela Natale, University of L’Aquila, Italy

17:10  Data validation techniques for measurements systems operating in a Industry 4.0 scenario
Giulio D’Emilia, University of L’Aquila, Italy
Antonella Gaspari, University of L’Aquila, Italy

17:30  Additive manufacturing as a reshoring enabler
Luciano Fratocchi, University of L’Aquila, Italy
17:50  On the use of IoT Sensors for Indoor Conditions Assessment and Tuning of Occupancy Rates Models
Stefano Rinaldi, University of Brescia, Italy
Alessandra Flammini, University of Brescia, Italy
Lavinia Chiara Tagliabue, University of Brescia, Italy
Angelo Luigi Camillo Ciribini, University of Brescia, Italy

19:30 - 22:30
GALA DINNER

Al Rocol Restaurant, Ome (Brescia)
Wednesday, April 18 - Technical Sessions

08:30 - 15:00
REGISTRATION
Place: University of Brescia

09:00 - 10:00
PLENARY SPEAKER
"Virtual assets and virtual commissioning: Digitization in Industry 4.0"

Diego Galar

Chair: Paolo Ferrari, University of Brescia, Italy
Room: “Sala Consiliare” Hall, University of Brescia

10:00 - 10:30
COFFEE BREAK
Place: University of Brescia

10:30 - 12:30
Special Session on Measurement Systems in the Industrial IoT Era - PART I

Chairs: Emiliano Sisinni, University of Brescia, Italy
Dennis Brandão, Universidade de São Paulo, Brazil
Room: “Sala Consiliare” Hall, University of Brescia

10:30 IoT-based Measurement System for Wine Industry
Gianluca Masetti, University of Modena and Reggio Emilia, Italy
Francesco Marazzi, University of Modena and Reggio Emilia, Italy
Luca Di Cecilia, University of Modena and Reggio Emilia, Italy
Luigi Rovati, University of Modena and Reggio Emilia, Italy
A preliminary study of a Cyber Physical System for Industry 4.0: Modelling and Co-Simulation of an AGV for smart factories
Luca Cavanini, Polytechnic University of Marche, Italy
Paolo Cicconi, Polytechnic University of Marche, Italy
Alessandro Freddi, Polytechnic University of Marche, Italy
Michele Germani, Polytechnic University of Marche, Italy
Sauro Longhi, Polytechnic University of Marche, Italy
Andrea Monteriù, Polytechnic University of Marche, Italy
Emanuele Pallotta, Polytechnic University of Marche, Italy
Mariorosario Prist, Polytechnic University of Marche, Italy

Performance comparison between OPC UA and MQTT for data exchange
Murilo Silveira Rocha, University of São Paulo, Brazil
Guilherme Serpa Sestito, University of São Paulo, Brazil
Andre Luis Dias, University of São Paulo, Brazil
Afonso Celso Turcato, University of São Paulo, Brazil
Dennis Brandão, University of São Paulo, Brazil

THD measurement system of home energy signal based on IoT
Iran Macedo B. Neto, Universidade Federal do Rio Grande do Norte, Brazil
Amanda I. Lopes, Universidade Federal do Rio Grande do Norte, Brazil
Maria Alice de M. Sousa, Universidade Federal do Rio Grande do Norte, Brazil
Mateus M. de Assis Brito, Universidade Federal do Rio Grande do Norte, Brazil
Diego R. C. Silva, Universidade Federal do Rio Grande do Norte, Brazil
Marcelo B. Nogueira, Universidade Federal do Rio Grande do Norte, Brazil
Marconi C. Rodrigues, Universidade Federal do Rio Grande do Norte, Brazil

Telemetry for domestic water consumption based on IoT and open standards
Sayonara A. C. Tavares, Universidade Federal do Rio Grande do Norte, Brazil
Ricardo J. B. V. M. Cavalcanti, Universidade Federal do Rio Grande do Norte, Brazil
Diego R. C. Silva, Universidade Federal do Rio Grande do Norte, Brazil
Marcelo B. Nogueira, Universidade Federal do Rio Grande do Norte, Brazil
Marconi C. Rodrigues, Universidade Federal do Rio Grande do Norte, Brazil
10:30 - 12:30

Special Session on Standards and Technologies for CyberSecurity of IoT and Industry 4.0 (SecStandards)

**Chairs:** Raphael Machado, *Inmetro, Brazil*
Francesco Gringoli, *University of Brescia, Italy*

**Room:** “Aula N. 8” Hall, University of Brescia

10:30  **Coverage-based Heuristics for Selecting Assessment Items from Security Standards: a core set proposal**
Ferrucio de Franco Rosa, *CTI Renato Archer, FEEC-UNICAMP, Brazil*
Mario Jino, *FEEC-UNICAMP, Brazil*
Paulo Marcos Siqueira Bueno, *CTI Renato Archer, FEEC-UNICAMP, Brazil*
Rodrigo Bonacin, *CTI Renato Archer, FACCAMP, Brazil*

10:55  **Building Reference Datasets to Support Socialbots Detection**
Carla Pacheco, *Military Institute of Engineering, Brazil*
Alex Garcia, *Military Institute of Engineering, Brazil*
Raphael Machado, *INMETRO, Brazil*
Ronaldo Salles, *Military Institute of Engineering, Brazil*

11:20  **Evaluation on Passive System Identification and Covert Misappropriation attacks in Large Pressurized Heavy Water Reactors**
Alan Oliveira de Sá, *Brazilian Navy, Federal University of Rio de Janeiro, Brazil*
Luiz F. R. da C. Carmo, *National Institute of Metrology, Quality and Technology, Federal University of Rio de Janeiro, Brazil*
Raphael C. S. Machado, *National Institute of Metrology, Quality and Technology, Federal University of Rio de Janeiro, Brazil*

11:45  **Implementation of cybersecurity procedures in remote calibration for PNT services**
Leonardo C. Ribeiro, *Inmetro, Brazil*
Luiz V. G. Tarelho, *Inmetro, Brazil*
Giovanni D. Rovera, *Observatoire de Paris, France*
Luiz P. Damaceno, *University of São Paulo, Brazil*
Daniel V. Magalhães, *University of São Paulo, Brazil*
Guilherme A. Garcia, *Inmetro, Brazil*
Raphael C. S. Machado, *Inmetro, Brazil*
12:10  True random number generators for batch control sampling in Smart Factories
Leonardo Costa Ribeiro, Inmetro, Brazil
Desiree S. Gonçalves, Inmetro, Brazil
Wladmir A. Chapetta, Inmetro, Brazil
Ana C. O. Marcelino, Inmetro, Brazil
Luiz V. G. Tareliho, Inmetro, Brazil
Raphael C. S. Machado, Inmetro, PPCIC-CEFET/RJ, Brazil
Leandro P. Correa, Inmetro, Brazil
Guilherme A. Garcia, Inmetro, Brazil
Alan de Oliveira Sá, UFRJ, Brazil

12:30 - 14:00  LUNCH
Place: “I Silvani” Restaurant

14:00 - 16:00
Special Session on Measurement Systems in the Industrial IoT Era - PART II

Chairs: Emiliano Sisinni, University of Brescia, Italy
        Dennis Brandão, Universidade de São Paulo, Brazil

Room: “Sala Consiliare” Hall, University of Brescia

14:00  Challenges of Securing the Industrial Internet of Things Value Chain
Stefan Forsstrom, Mid Sweden University, Sweden
Ismail Butun, Mid Sweden University, Sweden
Mohamed Eldefrawy, Mid Sweden University, Sweden
Ulf Jennehag, Mid Sweden University, Sweden
Mikael Gidlund, Mid Sweden University, Sweden

14:25  Evaluation of communication delay in IoT applications based on OPC UA
Paolo Ferrari, University of Brescia, Italy
Alessandra Flammini, University of Brescia, Italy
Stefano Rinaldi, University of Brescia, Italy
Emiliano Sisinni, University of Brescia, Italy
Davide Maffei, Siemens Spa
Matteo Malara, Siemens Spa
14:50  A Flexible Framework for Debugging IoT Wireless Applications
Francesco Gringoli, University of Brescia, Italy
Nahla Ali, University of Brescia, Italy
Fabrizio Guerrini, University of Brescia, Italy
Paul Patras, University of Edinburgh, Scotland

15:15  Comparison Between MQTT and WebSocket Protocols for IoT Applications Using ESP8266
Guilherme M. B. Oliveira, Universidade Federal do Rio Grande do Norte, Brazil
Danielly C. M. Costa, Universidade Federal do Rio Grande do Norte, Brazil
Ricardo J. B. V. M. Cavalcanti, Universidade Federal do Rio Grande do Norte, Brazil
Josiel P. P. Oliveira, Universidade Federal do Rio Grande do Norte, Brazil
Diego R. C. Silva, Universidade Federal do Rio Grande do Norte, Brazil
Marcelo B. Nogueira, Universidade Federal do Rio Grande do Norte, Brazil
Marconi C. Rodrigues, Universidade Federal do Rio Grande do Norte, Brazil

15:40  Implementation of A Production-Control System using Integrated AutomationML and OPC UA
Xun Ye, Hanyang University, Republic of Korea
Tae Yang Park, Hanyang University, Republic of Korea
Seung Ho Hong, Hanyang University, Republic of Korea
Yuemin Ding, Tianjin University of Technology, China
Aidong Xu, Chinese Academy of Sciences, China

14:00 - 16:00
General Session
Chairs: Mauro Serpelloni, University of Brescia, Italy
        Alessandro Pozzebon, University of Siena, Italy
Room: “Aula N. 8” Hall, University of Brescia

14:00  A test bench for evaluating communication delays in LoRaWAN applications
Dhiego F. Carvalho, University of Brescia, Italy
Paolo Ferrari, University of Brescia, Italy
Alessandra Flammini, University of Brescia, Italy
Emiliano Sisinni, University of Brescia, Italy
14:25 Experimental Characterization of Long Term Evolution Multiple Input Multiple Output Performance in Urban Propagation Scenarios  
Stefano Avallone, Università degli Studi di Napoli Federico II, Italy  
Nicola Pasquino, Università degli Studi di Napoli Federico II, Italy  
Giorgio Ventre, Università degli Studi di Napoli Federico II, Italy  
Stefania Zinno, Università degli Studi di Napoli Federico II, Italy  

14:50 Lightweight synchronization algorithm with self-calibration for Industrial LoRa Sensor Networks  
Luca Tessaro, University of Trento, Italy  
Cristiano Raffaldi, Adige S.P.A., BLM Group, Italy  
Maurizio Rossi, University of Trento, Italy  
Davide Brunelli, University of Trento, Italy  

15:15 Study for the integration of a measuring system to an automated platform for monitoring the growth of bacterial cultures  
Michele Bona, University of Brescia, Italy  
Paolo Bellitti, University of Brescia, Italy  
Emilio Sardini, University of Brescia, Italy  
Mauro Serpelloni, University of Brescia, Italy  

15:40 An IoT framework for the pervasive monitoring of chemical emissions in industrial plants  
Alessandro Pozzebon, University of Siena, Italy  
Tommaso Addabbo, University of Siena, Italy  
Ada Fort, University of Siena, Italy  
Marco Mugnaini, University of Siena, Italy  
Lorenzo Parri, University of Siena, Italy  
Stefano Parrino, University of Siena, Italy  
Valerio Vignoli, University of Siena, Italy  

16:00 - 16:30 CLOSING AND AWARD CEREMONY  
Room: “Sala Consiliare” Hall, University of Brescia
"Smart Street" Pilot Site: a RAMS Analysys for a Scale-up Configuration
Enrico Petritoli, Università degli Studi "Roma Tre", Italy
Fabio Leccese, Università degli Studi "Roma Tre", Italy
Martina Botticelli, Università Politecnica delle Marche, Italy
Stefano Pizzuti, ENEA, Italy
Francesco Pieroni, ENEA, Italy

In-line monitoring of laser welding using a smart vision system
Simone Pasinetti, University of Brescia, Italy
Giovanna Sansoni, University of Brescia, Italy
Franco Docchio, University of Brescia, Italy

Innovative methodology for detecting of possible harmful compounds for wastewater treatment
Massimo Blonda, CNR-IRSA, Italy
Angelantonio Calabrese, CNR-IRSA, Italy
Angelo Cardellicchio, Politecnico di Bari, Italy
Barbara Casale, CNR-IRSA, Italy
Giuseppe Dentamaro, Politecnico di Bari, Italy
Vincenzo Di Lecce, Politecnico di Bari, Italy
Antonietta Dimucci, Omnitech Srl, Italy
Cataldo Guaragnella, Politecnico di Bari, Italy
Diego Matrino, Secure to Future Srl, Italy
Dian Palagachev, Politecnico di Bari, Italy
Domenico Petruzzelli, Politecnico di Bari, Italy
Tiziano Politi, Politecnico di Bari, Italy
Maria Rizzi, Politecnico di Bari, Italy
Vincenzo Sarcina, Omnitech Srl, Italy
Vito Felice Uricchio, CNR-IRSA, Italy

Indoor localization for evacuation management in emergency scenarios
Alessandro Depari, University of Brescia, Italy
Alessandra Flammini, University of Brescia, Italy
Daniela Fogli, University of Brescia, Italy
Paola Magrino, University of Brescia, Italy
Evaluation of Open Data Models for the Exchange of Sensor Data in Cognitive Building
Markus Scheffer, Ruhr Universitat Bochum, Germany
Markus Konig, Ruhr Universitat Bochum, Germany
Tabea Engelmann, Ruhr Universitat Bochum, Germany
Lavinia Chiara Tagliabue, University of Brescia, Italy
Angelo Luigi Camillo Ciribini, University of Brescia, Italy
Stefano Rinaldi, University of Brescia, Italy
Marco Pasetti, University of Brescia, Italy

A Survey of Measurement Applications based on IoT
Pasquale Daponte, University of Sannio, Italy
Luca De Vito, University of Sannio, Italy
Francesco Lamonaca, University of Sannio, Italy
Gianluca Mazzilli, University of Sannio, Italy
Francesco Picariello, University of Sannio, Italy
Ioan Tudosa, University of Sannio, Italy
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