2023 IEEE INTERNATIONAL WORKSHOP ON

Metrology for Living Environment

Politecnico di Milano / May 29-31, 2023

WORKSHOP PROCEEDINGS

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Welcome Message from the Conference Chairs

On behalf of the Organizing Committee, we cordially welcome you to the 2023 IEEE International Workshop on Metrology for Living Environment (*MetroLivEnv 2023*).

MetroLivEnv 2023 intends to create an active and stimulating forum where academics, researchers, and industry experts in measurement and data processing techniques for Structural Health, Comfort, Energy, Efficiency, BIM, Pollutions, and Innovative Construction Materials can meet and share new advances and research results.

Attention is paid, but not limited to, on new technologies for metrology assisted solutions for design, construction, efficient, safe, comfortable and healthy operation of the built environment including active and assisted living (AAL). Innovative solutions can be based on the IoT paradigm, BIM, sensors, signal processing, data analytics, artificial intelligence, sensor networks, interoperability standards.
The program is designed to raise the interest of a wide group of researchers, operators and decision makers from metrology and several different research fields, presenting the cutting edge solutions in the living environment from the scientific and technological point of view. The Workshop covers all aspects of the living environment focusing on its design and life cycle, energy efficiency, structural health monitoring, measurement for comfort assessment, indoor pollution, chemical and physical parameters monitoring.

This is the second edition of *MetroLivEnv and it is* hosted by Polytechnic of Milan, Italy, with the support of the Polytechnic of Milan, the Department of Computer Science, Modelling, Electronics and Systems, Università Politecnical delle Marche, CNR, GMEE, GMMT and several international and national research institutes.

The *MetroLivEnv* Technical Program consists of 54 oral presentations scheduled over three days. Presentations are organized in a General Session and 8 Special Sessions. Special Sessions aim to create a focus on specific topics, where researchers can make knowledge, familiarize, exchange ideas, and build cooperation.

The received extended abstracts were submitted to a peer-review process. Relevance, quality, significance, and novelty of the scientific contribution were the main attributes taken into consideration for acceptance and publication in the Proceedings. The Proceedings are going to be submitted for publication in the IEEEXplore Digital Library and indexed by SCOPUS. We would like to thank all the reviewers who actively contributed to the selection and quality improvement of the presented works.
Technically extended versions of presented papers can be submitted to:

- Special Issue on MDPI Sensors.
- Special Issue on MDPI Buildings.
- Special Issue on International Journal of Masonry Research and Innovation (IJMRI).
- Special Issue on ACTA IMEKO

MetroLivEnv 2023 is honoured to have experts in smart structures and living environment as Invited Speakers.

- Prof. Vasilis Sarhosis of *School of Civil Engineering, University of Leeds, United Kindom*, will open MetroLivEnv 2023 with a lecture on “Improve the Resilience of Masonry Infrastructure using Machine Learning and High-Fidelity Models”.

- Prof. Bahman Ghiassi, *University of Birmingham, United Kingdom*, will open the second day of works with a talk about "Textile Reinforced Mortar and Concrete for Low Carbon Repair and Structural Applications".

We are grateful to the Invited Speakers for joining the Workshop.

To recognize the most outstanding paper presented at the annual *IEEE International Workshop on Metrology for Living Environment*, the Best Conference Paper Award sponsored by Alma Software will be assigned. The Best Conference Paper Award is dedicated to the memory of Prof. Domenico Grimaldi, whose passion, enthusiasm, and commitment for science will be of inspiration for all the recipients of this prize.

Other awards will be assigned to the Best Paper second and third classified, sponsored by MDPI Buildings Journal, Best Poster, Best Paper presented by a Young Researcher sponsored by MDPI Sensor Journal, and to the Best Paper Presented by a Woman, to recognize the full engagement of women in all aspects of the Metrology for Living Environment. We sincerely want to thank all the sponsors and the patronages who made this event possible.

The *2023 IEEE International Workshop on Metrology for Living Environment* is about to begin. Metrologists, mathematicians, biologists, physics, chemistries, psychologists, and engineers, enjoy the Workshop!

May 2023

Francesco Lamonaca, *University of Calabria, Italy*
Gabriele Milani, *Politecnico di Milano, Italy*
***MetroLivEnv 2023* General Chairs**

Message from the Technical Program Chairs

Welcome to the *2023 IEEE International Workshop on Metrology for Living Environment MetroLivEnv 2023*, organized by the Politecnico di Milano. *MetroLivEnv 2023* is the second edition of the workshop and wants to confirm itself as an important world forum for discussing the latest advances in metrology for the built environment. A special focus is given to measurement and diagnostic techniques for structural health monitoring, indoor environmental quality and digitalisation, pillars for the practical realization of smart, comfortable, efficient and safe buildings.

The Technical Program of *MetroLivEnv 2023* has 54 papers divided into 12 sessions distributed over the three days of the workshop, among which a general session, and 8 special sessions on specific themes. The general session is divided in two parts. Special sessions aim at creating mini-workshops on specific topics where researchers working on the same area can be aware with each other's contributions to the creation of knowledge beyond the current state of the art. *MetroLivEnv* launched a call for special sessions and received a variety of different proposals from the session chairs.

1. General Session 2.3 and 3.3
2. Exploitation of wearable sensors and non-intrusive measurement systems in the context of living environments: how to effectively enhance comfort and well-being? - 1.1
3. Towards the digital built environment: high-quality measurements to deliver data-driven services - 1.2 - 2.2 - 3.2
4. Fiber optic-based measurement instruments for living environment monitoring - 1.3
5. Measurement Techniques and Procedures for Quick and Emergency Diagnostics of Buildings 2.1
6. Probability and mathematical statistics for living environment and metrology - 3.1
7. Active and Assisted Living Environments - 4.1
8. Safety assessment and long-term behavior of heritage masonry structures with traditional and innovative metrology techniques - 4.2
9. Mathematical models, advanced mechanical modeling, new experimental approaches and data analysis methods for Structural Health Monitoring of structures - 4.3

The Technical Program includes also 2 invited speeches on advanced technologies for structural applications and 3 tutorial sessions on structural monitoring through AI, multidomain thermal comfort measurements and multi-analytical approaches for the materials characterization. Finally, we are pleased to announce two panel sections, one dedicated to forensic metrology and a round table focused on initiatives funded within the italian NextGenerationEU program to support research and innovation in the built environment, ranging from Innovation Ecosystems up to Digital Innovation Hub.

We gratefully acknowledge the hard work of the Technical Program and Organizing Committees in the process of reviewing the papers and helping to shape the program and other activities, such as keynotes and tutorials. The International Program Committee is composed of almost forty internal experts in the area of measurements applied to the built environment. Also, we thank the dozens of reviewers who accepted to review papers in their specific expertise. Finally, we especially thank authors who honored the 2nd edition of *MetroLivEnv*, submitting high-quality contributions with their research results. All these people played an important role in making this Workshop to come through.

2023 IEEE INTERNATIONAL WORKSHOP ON
Metrology for Living Environment

We wish all participants a very enjoyable and professionally fruitful experience at *MetroLivEnv 2023*, where finally we have the opportunity to meet you all in person!!
Thanks to you all for your participation.

May 2023

Marco Arnesano, *eCampus University, Italy*
Gian Marco Revel, *Polytechnic University of Marche, Italy*
Stefano della Torre, *Polytechnic of Milan, Italy*
Luis Carlos Silva, Politecnico di Milano, Italy
MetroLivEnv2023 **Technical Program Chairs**

2023 IEEE INTERNATIONAL WORKSHOP ON Metrology for Living Environment

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Emanuele Zappa, Politecnico di Milano, Italy

Technical Program - Tuesday, May 30

11:00 - 12:00 *Aula Magna*

Session 1.1 - Exploitation of wearable sensors and non-intrusive measurement systems in the context of living environments: how to effectively enhance comfort and well-being?

Chairs: Marco Arnesano, *Università degli Studi di eCampus, Italy*
Gloria Cosoli, *Università Politecnica delle Marche, Italy*

11:00 **Propagation of the Measurement Uncertainty of Wearable Sensors for Thermal Comfort Assessment**
Gloria Cosoli, Università Politecnica delle Marche, Italy
Silvia Angela Mansi, Università Telematica eCampus, Italy
Gian Marco Revel, Università Politecnica delle Marche, Italy
Marco Arnesano, Università Telematica eCampus, Italy

11:15 **Metrological Characterization of Commercial Smartwatches: are these Sensors Suitable for the Assessment of Well-being?**
Luca Antognoli, Università Politecnica delle Marche, Italy
Luna Panni, Università Politecnica delle Marche, Italy
Gloria Cosoli, Università Politecnica delle Marche, Italy
Lorenzo Scalise, Università Politecnica delle Marche, Italy

11:30 **IoT-based indoor air quality monitoring and analysis under different strategies of COVID-19 transmission mitigation: a field experiment**
Nedia Aouani, Univ Gustave Eiffel, CNRS, ESYCOM, France
Armande Hervé, Univ Gustave Eiffel, CNRS, ESYCOM, France
Elyes Nefzaoui, Univ Gustave Eiffel, CNRS, ESYCOM, France

11:45 **Preliminary Results on the Plantar Flexion during Grand-Plié in Ballet Dancing with Inertial Measurement Units**
Davide Paloschi, Politecnico di Milano, Italy
Beatrice Anchisi, Politecnico di Milano, Italy
Luca Zanotto, Politecnico di Milano, Italy
Alex Patten Moorhead, TOP Biomechanics, Italy
Mario Cigada, Politecnico di Milano, Italy
Stefania Ballone, Teatro alla Scala di Milano, Italy
Omar De Bartolomeo, Gruppo Italiano Danza e Medicina, Italy
Alfredo Cigada, Politecnico di Milano, Italy
Paola Saccomandi, Politecnico di Milano, Italy

11:00 - 12:00 *Donatori Hall*

Session 1.2 - Towards the digital built environment: high-quality measurements to deliver data-driven services - Part I

Chairs: Gian Marco Revel, *Università Politecnica delle Marche, Italy*
Elissaios Sarmas, *National Technical University of Athens, Greece*

11:00 **Energy community management system based on real-time measurements and genetic algorithms**
Massimiliano Proietti, Idea-Re S.r.l., Italy
Alberto Garinei, Guglielmo Marconi University, Italy
Federico Bianchi, Idea-Re S.r.l., Italy
Alessandro Vispa, Idea-Re S.r.l., Italy
Andrea Marini, Idea-Re S.r.l., Italy
Stefano Speziali, Idea-Re S.r.l., Italy
Marcello Marconi, Guglielmo Marconi University, Idea-Re S.r.l., Italy
Roberto Ricci, Sistematica S.p.A., Italy
Pierluigi Cernieri, Sistematica S.p.A., Italy
Emanuele Piccioni, Idea-Re S.r.l., Italy

11:15 **From silos to open, federated and enriched Data Lakes for smart building data management**
José L. Hernández, CARTIF Technology Centre, Spain
Susana Martín, CARTIF Technology Centre, Spain
Vangelis Marinakis, National Technical University of Athens, Greece
Ignacio de Miguel, Universidad de Valladolid, Spain

11:30 **Predicting Thermal Comfort in Buildings With Machine Learning and Occupant Feedback**
Panagiotis Skaloumpakas, HOLISTIC IKE, Greece
Elissaios Sarmas, National Technical University of Athens, Greece
Zoi Mylona, HOLISTIC IKE, Greece
Alessio Cavadenti, ASM Terni S.p.A., Italy
Francesca Santori, ASM Terni S.p.A., Italy
Vangelis Marinakis, National Technical University of Athens, Greece

11:45 **Development of a Methodology to Define Data-Driven and Measurement-Based Services for the Built Environment**
Vittoria Cipollone, Università Politecnica delle Marche, Italy
Nicole Morresi, Università Politecnica delle Marche, Italy
Serena Serroni, Università Politecnica delle Marche, Italy
Sara Casaccia, Università Politecnica delle Marche, Italy
Gian Marco Revel, Università Politecnica delle Marche, Italy
Nina Costa, NDConsult Ltd, Italy
Birgitte Holt Andersen, CWARE ApS, Denmark
Diego Arnone, Engineering I.I. Spa, Italy

11:00 - 12:00 *Hall 1/2*

Session 1.3 - Fiber optic-based measurement instruments for living environment monitoring

Chairs: Vikas, *Politecnico di Milano, Italy*
Alfredo Cigada, *Politecnico di Milano, Italy*

11:00 **Fiber Bragg Gratings embedded inside 3D-printed Patches – sensor design and mechanical characterization**
Davide Paloschi, Politecnico di Milano, Italy
Andrea Polimadei, ENEA, Italy

Sanzhar Korganbayev, Politecnico di Milano, Italy
Valerio Orsetti, ENEA, Italy
Alfredo Cigada, Politecnico di Milano, Italy
Michele Caponero, ENEA, Italy
Paola Saccomandi, Politecnico di Milano, Italy

11:15 **U-shaped fiber optic lossy mode resonance sensor for the detection of antibiotics**
Vikas, Politecnico di Milano, Italy
Paola Saccomandi, Politecnico di Milano, Italy

11:30 **Graphene-antimonene coated tapered fiber optic surface plasmon resonance sensor for the detection of Hg2+ heavy metal ions**
Vikas, Politecnico di Milano, Italy
Paola Saccomandi, Politecnico di Milano, Italy

11:45 **SPR fiber optic sensor for simultaneous temperature and humidity measurement using AuNPs**
Qi Zhang, Northeastern University Shenyang, China, Politecnico di Milano, Italy
Taotao Hu, Northeastern University Shenyang, China
Paola Saccomandi, Politecnico di Milano, Italy
Bin Li, Northeastern University Shenyang, China
Fang Wang, Northeastern University Shenyang, China
Tonglei Cheng, Northeastern University Shenyang, China

12:00 - 13:00 *Aula Magna*
Session 2.1 - Measurement Techniques and Procedures for Quick and Emergency Diagnostics of Buildings
Chair: Giulio D'Emilia, *Università of L'Aquila, Italy*

12:00 **Smart Building Digital Twin: Wireless Sensing and Actuation Architecture at Rey Juan Carlos University**
Adrián Zeus Román-García, Rey Juan Carlos University, Spain
Rubén Nieto, Rey Juan Carlos University, Spain
Pablo Villoria Hernandez, Rey Juan Carlos University, Spain
María Cristina Rodriguez-Sanchez, Rey Juan Carlos University, Spain
Micael Gallego Carrillo, Rey Juan Carlos University, Spain

12:15 **Critical use of Terrestrial Laser Scanners for the survey of buildings in emergency conditions**
Luciano Chiominto, University of L'Aquila, Italy
Giulio D'Emilia, University of L'Aquila, Italy
Antonella Gaspari, Polytechnic of Bari, Italy
Stefano Marsella, Ministero dell'Interno, Italy
Marcello Marzoli, Ministero dell'Interno, Italy
Emanuela Natale, University of L'Aquila, Italy

12:30 **RIS Optimal Element Selection for Enhanced Indoor Positioning Systems**
Somayeh Bazin, Lancaster University, UK
Keivan Navaie, Lancaster University, UK

12:45 **Wireless Crack Detection System Based on IoT and Acoustic Emission**
Mohamad Issam Sayyaf, University of Calabria, Italy
Domenico Luca Carnì, University of Calabria, Italy
Francesco Lamonaca, University of Calabria, Italy

12:00 - 13:00 Donatori Hall

Session 2.2 - Towards the digital built environment: high-quality measurements to deliver data-driven services - Part II

Chairs: Nicole Morresi, *Università Politecnica delle Marche, Italy*
Josè Hernandez, *Fundación CARTIF, Spain*

12:00 **A tool for the data notarization with the Blockchain to ensure security and privacy**
Alessandro Rossi, Engineering Ingegneria Informatica SpA, Italy
Andrea Natalini, Engineering Ingegneria Informatica SpA, Italy
Lorenzo Cristofori, Engineering Ingegneria Informatica SpA, Italy
Marzia Mammina, Engineering Ingegneria Informatica SpA, Italy

12:15 **Enhancing the Performance of the Photovoltaic Cells Employing Computer Vision**
Amir Baniamerian, Concordia University, Canada
Ali Bostani, American University of Kuwait, Kuwait

12:30 **Towards Digital Twins of buildings and smart energy networks: Current and future trends**
Tancredi Testasecca, Università degli Studi di Palermo, Italy
Marilena Lazzaro, Engineering Ingegneria Informatica SpA, Italy
Antonino Sirchia, Engineering Ingegneria Informatica SpA, Italy

12:45 **A monitoring platform for the built environment: towards the development of an early warning system in a seismic context**
Adriano Mancini, Università Politecnica delle Marche, Italy
Gloria Cosoli, Università Politecnica delle Marche, Italy
Alessandra Mobili, Università Politecnica delle Marche, Italy
Luca Violini, Università Politecnica delle Marche, Italy
Giuseppe Pandarese, Università Politecnica delle Marche, Italy
Alessandro Galdelli, Università Politecnica delle Marche, Italy
Elisa Blasi, Università Politecnica delle Marche, Italy
Francesca Tittarelli, Università Politecnica delle Marche, Italy
Gian Marco Revel, Università Politecnica delle Marche, Italy

12:00 - 13:00 Hall 1/2

Session 2.3 - General Session - Part I

Chairs: Marco Arnesano, *Università degli Studi di eCampus, Italy*
Francesco Lamonaca, *University of Calabria, Italy*

12:00 **Survey and Research Challenges in Monocular Visual Odometry**
Arman Neyestani, University of Sannio, Italy
Francesco Picariello, University of Sannio, Italy
Amin Basiri, University of Sannio, Italy
Pasquale Daponte, University of Sannio, Italy
Luca De Vito, University of Sannio, Italy

12:15 **Digital Twin for a resilient management of the built environment**
Marianna Rotilio, University of L'Aquila, Italy
Valentina Villa, Politecnico di Torino, Italy
Alessandra Corneli, Polytechnic University of Marche, Italy

12:30 **Blockchain Based Social Commitment System for Regional Environments**
Robert Manthey, Hochschule Mittweida, University of Applied Sciences, Germany
Richard Vogel, Hochschule Mittweida, University of Applied Sciences, Germany
Falk Schmidsberger, Hochschule Mittweida, University of Applied Sciences, Germany
Matthias Baumgart, Hochschule Mittweida, University of Applied Sciences, Germany
Christian Roschke, Hochschule Mittweida, University of Applied Sciences, Germany

Marc Ritter, Hochschule Mittweida, University of Applied Sciences, Germany
Matthias Vodel, Hochschule Mittweida, University of Applied Sciences, Germany

14:30 - 16:00 *Donatori Hall*

Session 3.1 - Probability and Mathematical Statistics for Living Environment and Metrology

Chair: Antonella Iuliano, *University of Basilicata, Italy*

14:45 **Statistical analysis of the riverbed roughness structures**
Nadia Penna, University of Calabria, Italy
Roberto Gaudio, University of Calabria, Italy

15:00 **Regression models as a tool for genome-wide association studies of Environmental Exposures and DNA Methylation**
Annamaria Carissimo, IAC - National Research Council, Italy
Luca De Martino, IAC - National Research Council, Italy
Immacolata Garzilli, IAC - National Research Council, Italy
Biancamaria Pierri, Istituto Zooprofilattico Sperimentale del Mezzogiorno, Italy
Mauro Esposito, Istituto Zooprofilattico Sperimentale del Mezzogiorno, Italy
Claudia Angelini, IAC - National Research Council, Italy

15:15 **Statistical approach and territorial analysis on the Covid-19 emergency: the case study of the municipality of Tito**
Fausto Bisaccia, University of Basilicata, Italy
Valentina Santarsiero, University of Basilicata, Italy
Simone Corrado, University of Basilicata, Italy
Luigi Santopietro, University of Basilicata, Italy
Antonella Iuliano, University of Basilicata, Italy
Beniamino Murgante, University of Basilicata, Italy

15:30 **Measurement of Noise Correlation Through Superconducting Josephson junctions**
Oberlin V. Pountougnigni, University of Yaoundé I, Cameroon
Carlo Barone, University of Salerno, Italy
Giovanni Carapella, University of Salerno, Italy
Veronica Granata, University of Salerno, Italy
Claudio Guarcello, University of Salerno, Italy
Costantino Mauro, University of Salerno, Italy
Sergio Pagano, University of Salerno, Italy
Vincenzo Pierro, University of Sannio, Italy
Clement Tchawoua, University of Yaoundé I, Cameroon
René Yamapi, University of Douala, Cameroon
Giovanni Filatrella, University of Sannio, Italy

15:45 **Information theory to support planning on regionalization issue**
Simone Corrado, University of Basilicata, Italy
Francesco Scorza, University of Basilicata, Italy
Beniamino Murgante, University of Basilicata, Italy

14:30 - 16:00 *Hall 1*

Session 3.2 - Towards the digital built environment: high-quality measurements to deliver data-driven services - Part III

Chairs: Gian Marco Revel, *Università Politecnica delle Marche, Italy*
Serena Serroni, *Università Politecnica delle Marche, Italy*

14:30 **Recent advances on data-driven services for smart energy systems optimization and pro-active management**
Tancredi Testasecca, Università degli Studi di Palermo, Italy
Marilena Lazzaro, Engineering Ingegneria Informatica S.p.A., Italy
Elissaios Sarmas, National Technical University of Athens, Greece
Stathis Stamatopoulos, National Technical University of Athens, Greece

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14:30 - 16:00 Hall 2

Session 3.3 - General Session - Part II

Chairs: Carmelo Scuro, *University of Calabria, Italy*
Marianna Rotilio, *University of L'Aquila, Italy*

14:30 **The Monitoring of the Indoor Environmental Quality of a Straw House in the Village of Pescomaggiore, L'Aquila**
Mariangela De Vita, University of L'Aquila, Italy
Marianna Rotilio, University of L'Aquila, Italy
Gianni Di Giovanni, University of L'Aquila, Italy

14:45 **Experimental Prototype and Measurement Driven Study of Indoor Air Quality**
Shaikha Alkaabi, United Arab Emirates University, United Arab Emirates
Fatema S. Suhail, United Arab Emirates University, United Arab Emirates
Haleema Almansoori, United Arab Emirates University, United Arab Emirates
Asma Alhammadi, United Arab Emirates University, United Arab Emirates
Shriya Kulkarni, University of Waterloo, Canada
Bivin Pradeep, United Arab Emirates University, United Arab Emirates
Parag Kulkarni, United Arab Emirates University, United Arab Emirates

15:00 **Influence of different photovoltaic cooling strategies on its average monthly performance**
Antonino Rollo, University of Calabria, Italy
Jessica Settino, University of Calabria, Italy
Piero Bevilacqua, University of Calabria, Italy
Vittorio Ferraro, University of Calabria, Italy

15:15 **Experimental tests to assess the effects of Phase Change Materials in building envelopes**
Roberto Bruno, University of Calabria, Italy
Vittorio Ferraro, University of Calabria, Italy
Piero Bevilacqua, University of Calabria, Italy
Jessica Settino, University of Calabria, Italy
Antonino Rollo, University of Calabria, Italy

15:30 **Evaluation of Durability and Properties of Construction Materials Through a Multianalytical Approach: Case Study on Industrial Floor**
Chiara Gallo, ISTEMI S.r.l., Italy
Nicolino Messuti, ISTEMI S.r.l., Italy
Carmine Napoli, ISTEMI S.r.l., Italy
Eduardo Caliano, ISTEMI S.r.l., Italy

15:45 **Development and Metrological Characterization of a Multi-sensor Device for Indoor Environmental Quality (IEQ) monitoring**
Arianna Astolfi, Politecnico di Torino, Italy
Alessio Carullo, Politecnico di Torino, Italy
Virginia Fissore, Politecnico di Torino, Italy
Giuseppina Puglisi, Politecnico di Torino, Italy
Giuseppina Arcamone, Politecnico di Torino, Italy
Louena Shtrepi, Politecnico di Torino, Italy
Erica Raviola, Politecnico di Torino, Italy
Alberto Barbaro, Politecnico di Torino, Italy

Gustavo Ramirez Espinosa, Politecnico di Torino, Italy
Pietro Chiavassa, Politecnico di Torino, Italy
Edoardo Giusto, Politecnico di Torino, Italy
Gabriele Piccablotto, Politecnico di Torino, Italy
Fabio Saba, Istituto Nazionale di Ricerca Metrologica, Italy
Davide Paesante, Istituto Nazionale di Ricerca Metrologica, Italy
Giovanni Durando, Istituto Nazionale di Ricerca Metrologica, Italy
Alice Lorenzati, Politecnico di Torino, Italy
Stefano Fantucci, Politecnico di Torino, Italy
Antonio Servetti, Politecnico di Torino, Italy
Bartolomeo Montrucchio, Politecnico di Torino, Italy
Franco Fiori, Politecnico di Torino, Italy
Anna Pellegrino, Politecnico di Torino, Italy
Vincenzo Corrado, Politecnico di Torino, Italy
Simona Paduos, C2R Energy Consulting, Italy
Nicolas Sassoli, Geoside Gruppo Italgas, Italy
Jana Clerici, Politecnico di Torino, Italy

Technical Program - Wednesday, May 31

10:00 - 11:15 *Aula Magna*

Session 4.1 - Active and Assisted Living Environments

Chairs: Gian Marco Revel, *Università Politecnica delle Marche, Italy*
Álvaro Hernández Alonso, *University of Alcala, Spain*

10:00 **Sustainable, assistive, residential architectural units for active ageing**
Giovanni Gibilisco, University of Catania, Italy
Gianluca Rodonò, University of Catania, Italy
Angelo Monteleone, University of Catania, Italy
Vincenzo Sapienza, University of Catania, Italy

10:15 **Estimating Energy Consumption in Households for Non-Intrusive Elderly Monitoring**
Álvaro Hernández, University of Alcala, Spain
Laura de Diego, University of Alcala, Spain
Daniel Pizarro,, University of Alcala, Spain
M. Carmen Pérez-Rubio, University of Alcala, Spain
J. Manuel Villadangos, University of Alcala, Spain
Rubén Nieto, Rey Juan Carlos University, Spain

10:30 **e-VITA Use Cases Configurator: A Tool to Identify the Optimal Configuration of the Sensor Network and Coaching Devices to Enable Older People to Age Well at Home**
Riccardo Naccarelli, Università Politecnica delle Marche, Italy
Sara Casaccia, Università Politecnica delle Marche, Italy
Keiko Homma, National Institute of Advanced Industrial Science and Technology, Japan
Roberta Bevilacqua, IRCCS INRCA, Italy
Gian Marco Revel, Università Politecnica delle Marche, Italy

10:45 **Appliance Identification in NILM Applications by means of a Convolutional Auto-Encoder**
Laura de Diego, University of Alcala, Spain
Álvaro Hernández, University of Alcala, Spain
Daniel Pizarro, University of Alcala, Spain
Rubén Nieto, Rey Juan Carlos University, Spain

11:00 **Localization of Older People in an Indoor Scenario: A Measurement System Based on PIR Sensors Installed in a Social Robot**
Ilaria Ciuffreda, Università Politecnica delle Marche, Italy
Sara Casaccia, Università Politecnica delle Marche, Italy
Gian Marco Revel, Università Politecnica delle Marche, Italy

10:00 - 11:15 *Donatori Hall*

Session 4.2 - Safety assessment and long-term behavior of heritage masonry structures with traditional and innovative metrology techniques

Chair: Gabriele Milani, *Politecnico di Milano, Italy*

10:00 **Global Vipassana Pagoda: Main features and history of construction**
Nandalal Rameshwar Varma, Nandadeep Designers and Valuers Pvt Ltd, India
Radhey Shyam Jangid, Indian Institute of Technology Bombay, India
Siddhartha Ghosh, Indian Institute of Technology Bombay, India
Gabriele Milani, Politecnico di Milano, Italy
Giuseppe Alfredo Cundari, Politecnico di Milano, Italy
Mahesh N Varma, MGM's Jawaharlal Nehru Engineering College, India

10:15 **Global Vipassana Pagoda: Finite Element Thrust Line FETLA analyses**
Mahesh N Varma, MGM's Jawaharlal Nehru Engineering College, India
Radhey Shyam Jangid, Indian Institute of Technology Bombay, India
Siddhartha Ghosh, Indian Institute of Technology Bombay, India
Gabriele Milani, Politecnico di Milano, Italy
Giuseppe Alfredo Cundari, Politecnico di Milano, Italy
Tejaswini Bakliwal, Nandadeep Designers and Valuers Pvt Ltd, India

10:30 **Global Vipassana Pagoda: Exterior Geometry Envelope Extraction Using UAV Photogrammetry**
Samarjeet Salunke, Indian Insitute of Technology Bombay, India
Raaj Ramsankaran, Indian Insitute of Technology Bombay, India
Siddhartha Ghosh, Indian Institute of Technology Bombay, India
Gabriele Milani, Politecnico di Milano, Italy
Bhumik Halani, Indian Institute of Technology Bombay, India
Giuseppe Alfredo Cundari, Politecnico di Milano, Italy
Mahesh N Varma, MGM's Jawaharlal Nehru Engineering College, India
Venkata Santosh Kumar Delhi, Indian Institute of Technology Bombay, India
Nikita Gangurde, Indian Institute of Technology Bombay, India

10:45 **Crack detection in historical masonry structures using efficient image processing: Application on a masonry bridge in Iran**
Morteza Saadatmorad, Babol Noshirvani University of Technology, Iran
Ramazan-Ali Jafari TalookolaeiBabol Noshirvani University of Technology, Iran
Gabriele Milani, Politecnico di Milano, Italy
Samir Khatir, Ghent University, Belgium
Thanh Cuong-Le, Ho Chi Minh City Open University, Vietnam

11:00 **Global Vipassana Pagoda: Medium Term IoT based Structural Health Monitoring**
Siddhartha Ghosh, Indian Institute of Technology Bombay, India
Gabriele Milani, Politecnico di Milano, Italy
Bhumik Halani, Indian Insitute of Technology Bombay, India
Mahesh N Varma, MGM's Jawaharlal Nehru Engineering College, India
Giuseppe Alfredo Cundari, Politecnico di Milano, Italy

10:00 - 11:30 *Hall 1/2*

Session 4.3 - Mathematical models, advanced mechanical modeling, new experimental approaches and data analysis methods for Structural Health Monitoring (SHM) of structures

Chairs: Anna Castellano, *Polytechnic University of Bari, Italy*
Carmelo Scuro, *University of Calabria, Italy*
Francesco Clementi, *Polytechnic University of Marche, Italy*
Domenico Camassa, *Polytechnic University of Bari, Italy*

10:00 **Dynamic identification and automatic updating of the numerical model of a masonry tower**
Georgios Panagiotis Salachoris, Polytechnic University of Marche, Italy
Gianluca Standoli, Polytechnic University of Marche, Italy
Mattia Schiavoni, Polytechnic University of Marche, Italy
Francesco Clementi, Polytechnic University of Marche, Italy

10:15 **Damage identification of a wind turbine blade from interferometric radar tests**
Domenico Camassa, Polytechnic University of Bari, Italy
Anna Castellano, Polytechnic University of Bari, Italy
Gennaro Fraccalvieri, Polytechnic University of Bari, Italy
Aguinaldo Fraddosio, Polytechnic University of Bari, Italy
Silvia Ieva, Polytechnic University of Bari, Italy

Nataliia Pinchuk, National University Yuri Kondratyuk Poltava Polytechnic, Ukraine
Mario Daniele Piccioni, Polytechnic University of Bari, Italy

10:30 **In-situ estimation of axial force in tie rods of masonry structures by radar interferometry**
Domenico Camassa, Polytechnic University of Bari, Italy
Antonio Curri, Polytechnic University of Bari, Italy
Aguinaldo Fraddosio, Polytechnic University of Bari, Italy
Mario Daniele Piccioni, Polytechnic University of Bari, Italy

10:45 **A mathematical model for the propagation of wildfires**
Giuseppe Alì, University of Calabria, Italy
Francesco Demarco, University of Calabria, Italy
Domenico Gaudio, University of Calabria, Italy
Pierpalo Antonio Fusaro, University of Calabria, Italy
Renato Sante Olivito, University of Calabria, Italy
Carmelo Scuro, University of Calabria, Italy

11:00 **Experimental Damage Identification in Masonry Structures by OMA**
David Bru, University of Alicante, Spain
Salvador Ivorra, University of Alicante, Spain
Domenico Camassa, Polytechnic University of Bari, Italy

11:15 **Development and characterization of an IoT cloud platform operating in 5G network for structural health monitoring of civil constructions**
Antonietta Varasano, Polytechnic University of Bari, Italy
Aguinaldo Fraddosio, Polytechnic University of Bari, Italy
Mario Daniele Piccioni, Polytechnic University of Bari, Italy
Gregorio Andria, Polytechnic University of Bari, Italy