

2023 IEEE INTERNATIONAL WORKSHOP ON

Metrology for Living Environment

Politecnico di Milano / May 29-31, 2023

WORKSHOP PROGRAM

www.metrolivenv.org

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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 Politecnica 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 IEEEExplore 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:

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

o Special Issue on ACTA IMEKO

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

- o 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”.
- o 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.

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**

IEEE MetroLivEnv 2023 Committee

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Emiliano Schena, Università Campus Bio-Medico di Roma, Italy
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Marco Tarabini, Politecnico di Milano, Italy

Emanuele Zappa, Politecnico di Milano, Italy

IEEE MetroLivEnv 2023 Keynote Speakers

Plenary Session - Tuesday May 30 - H 10:00



Improve the Resilience of Masonry Infrastructure using Machine Learning and High-Fidelity Models

Vasilis Sarhosis

*SCHOOL OF CIVIL ENGINEERING, UNIVERSITY OF LEEDS
UNITED KINGDOM*

ABSTRACT

Masonry infrastructure, such as bridges, viaducts and tunnels form a significant part of the European's critical infrastructure stock. Most of this infrastructure is ageing and are showing significant signs of deterioration and damage. Weathering, demands of increasing load intensity and axle loads, plus factors such as increased frequency of flood events due to climate change have introduced extreme uncertainty in the long-term performance of such infrastructure assets. Besides, much of our masonry infrastructure has significant heritage and cultural value. Failure of such infrastructure could lead to direct and indirect costs to the economy and society and hamper rescue and recovery efforts. This talk will present state of the art developments towards the inspection and assessment of existing masonry structure. Reference will be made to novel ways for identification of defects and their diagnosis using machine learning and structural inspection using surrogate models developed through high fidelity computations.

SPEAKER BIOGRAPHY

Prof Vasilis Sarhosis holds the Chair in Resilient Structures and Infrastructure at the School of Civil Engineering, University of Leeds. He is also a visiting Professor at Southeast University, Nanjing, China and a CDRI (Coalition for Disaster Resilience Infrastructure) Fellow. Prof Sarhosis is a Chartered Engineer (CEng), Fellow of the Institute of Civil Engineering (FICE), and Fellow of the Higher Education Academy (FHEA) in the UK. He is currently chairing the National Scientific Committee on the Analysis and Restoration of Structures of Architectural Heritage in UK (ISCARSAH-UK) which is part of the ICOMOS-UK. He is currently undertaking research to quantify degradation and understand the long-term behaviour of existing ageing masonry structures subjected to different environmental conditions and loads. He works together with industry to develop technologies and tools to reduce maintenance demands and improve the life-span of ageing masonry infrastructures and buildings.



Textile Reinforced Mortar and Concrete for Low Carbon Repair and Structural Applications

Bahman Ghiassi

*UNIVERSITY OF BIRMINGHAM
 UNITED KINGDOM*

ABSTRACT

The application of textile-reinforced mortar (TRM) and textile-reinforced concrete (TRC) composites to the repair of existing structures or to the development of new thin structural elements has received growing recent attention. These composites are made of lightweight, non-metallic continuous yarns (in the form of fabric or mesh made of glass, basalt, carbon, etc. fibres) embedded in an inorganic matrix. This combination, when properly designed, leads to high mechanical properties, tension stiffening response and distributed cracking under tensile loads. The application of non-metallic reinforcement in the development of these composites allows the reduction of the concrete cover without affecting its durability, making these composites very interesting for lightweight repair or construction applications. With the concerns over the sustainability of constructions, the main ingredients of these composites can also be replaced with low-carbon alternatives an area that we have been highly focused on during the past few years. This lecture presents an overview of the recent developments and advances in this field and on the use of these innovative composites for low-carbon repair of existing structures or for the development of future ones.

SPEAKER BIOGRAPHY

Dr Bahman Ghiassi is an Associate Professor of Sustainable Infrastructure Materials, a Chartered Engineer (MStructE, CEng), and a Fellow of the Higher Education Academy (FHEA) in the School of Engineering at the University of Birmingham. He is also the Materials theme lead of the National Buried Infrastructure Facility (NBIF), a £21.7m one of its kind facility for research, education and training in buried infrastructure-ground interaction and is a part of the UK Collaboratorium for Research on Infrastructure and Cities (UKCRIC). Dr Ghiassi research centres around sustainable repair and construction materials with the main focus on innovative processing, manufacturing, measurement or modelling techniques. In 2019, he was awarded the RILEM Gustavo Colonetti medal for his “outstanding scientific contribution to the field of construction materials and structures”. He is the author of more than 170 peer-reviewed

scientific articles in reputable journals and international conferences. He serves as associate editor in a number of scientific journals including Nature Scientific Reports, Innovative Infrastructure Solutions and ICE Journal of Construction Materials and is an active member of several international scientific committees including RILEM Technical Committee 290-IMC (Durability of inorganic matrix composites used for strengthening of masonry structures) and RILEM Technical Committee 292-MCC (Mechanical Characterization and Structural design of Textile Reinforced Concrete).

IEEE MetroLivEnv 2023 Tutorials

Tutorial Session - Monday May 29 - H 15:30



Structural Health Monitoring of historic buildings via Artificial Intelligence

Eugenio Vocaturo

CNR - NANOTEC - DIMES - University of Calabria, Italy

ABSTRACT

Structural health monitoring (SHM) is a scientific discipline that concentrates on assessing and keeping track of a structure's integrity. Despite SHM systems are not a recent area of study, computational breakthroughs in sensing hardware and the computational capability of embedded devices drive the generation of trustworthy data for constructing robust models for classification and predictive tasks. Due to the effectiveness of emerging technologies real time and on-line inspection in SHM is gradually replacing conventional damage detection techniques. Artificial Intelligence (AI) algorithms are offering the required tools to boost SHM systems' capabilities and provide smart answers to identify damage in structures. Several interesting and effective AI models have been provided in the state of the art literature for various predictive applications, including crack detection, predicting the compressive strength of masonry or repair mortars, potential damage scenarios in heritage buildings, seismic vulnerability assessment, determining the mechanical properties of materials, and identifying superficial damages on the monument's surface caused by weathering effects, material loss, efflorescence, seepage, algae growth, moss and dust deposition. This talk will review the various AI techniques applied to assess the health of heritage buildings and highlights challenges and future research directions in applying AI techniques to heritage buildings, including explainability and cross-modality.

SPEAKER BIOGRAPHY

Eugenio Vocaturo received a Laurea Degree in Management Engineering, a Master Degree in Design and Development of Web and Mobile Applications and a PhD Degree in Information and Communication Technologies at the University of Calabria, Italy. He also received a Master

Degree in Industrial Process Management and a Master Degree in Finance issued by SDA Bocconi.

He has decades of experience as company director, being head of editorial production of important IT publishing houses and co-founding partner of the start-up BigTech. He is currently researcher at CNR-Nanotec and contract professor of Informatics, Process Mining, Data Mining and Information Systems and DataBase at University of Calabria.

His current research interests include Machine Learning, Deep Learning, Optimization, Health Informatics, Process Mining, Cultural Heritage. He is member of Topical Advisory Panel and Editor Reviewer of several international journals and permanent member of the program committee of international conferences, being author of several papers in international journals, conferences and books.

He is a member of SIBIM (Italian Scientific Society of Biomedical Informatics) and of HL7 Italy (formed in 2003 as part of HL7 International), company responsible for the localization of health standards aiming at promoting the modernization of Italian health IT.

Tutorial Session - Monday May 29 - H 16:40

Measuring indoor thermal comfort: a multidomain perspective based on innovative sensors, wearables and machine learning



Gian Marco Revel

Università Politecnica delle Marche, Italy



Marco Arnesano

Università Telematica eCampus, Italy

ABSTRACT

The environment influences the well-being, the physical and emotional health. Uncomfortable conditions lead to non-efficient human behaviours in terms of productivity and energy consumption. For this reason, it is fundamental to accurately measure comfort for the implementation of optimized buildings control and management. Thermal comfort is a complex quantity, resulting from the balance of environmental, physiological, psychological and social quantities. Thus, its measurement is also a complex process which requires the integration of different sensing technologies and data analysis procedures.

This tutorial session will provide insights about the basics and the most recent developments in the field of comfort measurement. Recently, the unceasing progress of machine learning tools and wearables devices is opening the way to the development of new human-centric approaches. Therefore, it will be also discussed the application of those key enabling sensing technologies, that, integrated with standard methods, can be used for the creation of Personal Comfort Models and for the monitoring and control applied in real-life. Practical examples from research projects will be presented and their application will be showed considering also the impact of the measurement uncertainty on the final comfort evaluation. The different technologies and methodologies will be presented with a critical analysis about the actual limitations and the future challenges to be faced by research and industry actors in the field of smart living environments.

SPEAKERS BIOGRAPHY

Gian Marco Revel is Full Professor in Mechanical and Thermal Measurement at Università Politecnica delle Marche, where he also plays the role of Rector Delegate for European Research. Main research interests are in the field of sensor and measurement technologies for industrial applications, with particular focus on the construction sector, building energy efficiency, in-field material characterization and non-destructive testing. He is Coordinator of the Material&Sustainability Committee of ECTP and Coordinator of the Italian Construction Technology Platform. He is author of more than 200 publications and Scientific Responsible for several projects (11 in H2020, 3 in Horizon Europe) in the area of technologies for Energy Efficiency and Materials in Buildings.

Marco Arnesano, PhD in Mechanical and Thermal Measurements from Università Politecnica delle Marche, is an Associate Professor at eCampus University and Coordinator of Industrial Engineering courses (bachelor and master degrees). His research is focused on the development of innovative measurement systems for the built environment: energy and indoor environmental monitoring and control through the application of embedded and IoT sensors, physiological measurements, signal processing and data analysis. Research activities are conducted within European and National projects. He is the author of more than 70 peer-reviewed scientific publications for international journals and conference proceedings.

Tutorial Session - Monday May 29 - H 17:20

Multi-Analytical Approaches for the Characterisation of Artistic Materials Subjected to Time and Environmental Pollution



Vittoria Guglielmi

Università di Milano, Italy

ABSTRACT

The effects of time and environmental conditions are well known to be an issue with respect to works of art and historic buildings. Indeed, the scientific research community has performed many studies in order to find solutions to slow down and solve the unavoidable deterioration of the materials. However, the upward trend of pollutants in the atmosphere has been observed to be observed to be an ever-growing threat to both indoor and outdoor artworks. In addition, several studies have shown that indoor pollution also comes from objects and various materials commonly present in indoor environments, whether they be, for example, museums, private collections, or churches. In this context both some environmental monitoring campaigns' results and the analytical characterisation of products of degradation of different artistic materials, especially by means of non-invasive measurements and portable instruments, will be considered through several case studies. Moreover, the ongoing research that has been devoted to an extensive and systematic study of pigments, binders and statuary marble and their interaction with atmospheric pollutants and particulate matter will be presented. This research seems to be of critical importance when one considers the importance, both educational and economic, of striving to preserve objects of cultural heritage significance which informs communities of science and conservators about degradation issues and the steps toward their remediation.

SPEAKER BIOGRAPHY

Vittoria Guglielmi is an Associate Professor of Analytical Chemistry, SSD CHIM 12 – Chemistry for the environment and for cultural heritage - at the Department of Chemistry at the University of Milan. She obtained her Master's Degree in Chemistry from the University of Milan and her PhD in Chemical Sciences from the same University. The research activity of Vittoria Guglielmi has been devoted to the development and implementation of analytical methods via instrumentation, mainly employing spectroscopic techniques, for the investigation of both

inorganic and organic materials in the field of cultural heritage. Because of the peculiar characteristics of unicity and preciousness of cultural heritage objects, the focus of the research has always been the micro-destructiveness/non-destructiveness - as well as the portability of the techniques. Vibrational micro-spectroscopies were therefore preferred - especially Raman spectroscopy - whose excellent results in the laboratory led to the development and application of portable instrumentation. The scientific activity of Vittoria Guglielmi has been reported in over than 80 scientific publications (papers, book chapters and conferences' proceedings), and about 50 contributions at national and international conferences. She gives lessons for several Bachelors' and Masters' degrees courses at the University of Milan and the Scuola di Restauro di Botticino (Milan).

IEEE MetroLivEnv 2023 Panel Session

Tuesday May 30 - H 16:30

Forensic metrology: is it needed in the construction field?

When safety and sustainability are concerned, construction is a critical field, due to the important role played by structures, materials and construction techniques in ensuring safeness and sustainability of the buildings and infrastructures we use in our everyday life. Structural monitoring and conformity to the numerous Standards issued to set the best practice in construction works and material production have become important players in ensuring safety and sustainability. Good measurements are therefore needed both in the construction and monitoring stage, as well as in investigations following accidents, to understand their causes. Forensic metrology represents, hence, an unavoidable need in the field.

This panel session is aimed at proving this, leaving the floor to technical experts as well as lawyers and judges who refer to forensic metrology at different extents.

Moderator

Prof. Alessandro Ferrero, Politecnico di Milano

Panelists

Alfredo Cigada

When Metrology meets Structural Monitoring

Paola Provenzano

Standards Vs Innovation in Forensic Metrology

Veronica Scotti

Construction Products Assessments: Metrology plays its role!

Giuseppe Gennari

Inside the Courtrooms

IEEE MetroLivEnv 2023 Round Table

Wednesday May 31 - H 11:50

NextGeneration EU research for the built environment

The panel will discuss different 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. The peculiarities related to the digital aspects of the projects will be specifically analysed by experts directly involved in the projects conceptualization and execution.

Moderator

Prof. Gian Marco Revel, *Università Politecnica delle Marche*

Speakers

Gian Marco **Revel**

Università Politecnica delle Marche, EU Research Delegate

Spoke Coordinator "Environmental, economic and social sustainability of living and working environments" of Ecosistema VITALITY

Sabrina **Sarto**

"Sapienza" University of Rome, Vice Rector for Research

Francesco **Lamonaca**

University of Calabria

Responsible for Action 3 "Sensor network for monitoring environmental parameters" of the Project: "Innovative materials and tools to mitigate the climate change impact on the cultural heritage in the marine and coastal areas", Ecosistema TECH4YOU - Technologies for climate change adaptation and quality of life improvement

Lorenzo **Pagliano**

Politecnico di Milano, Ecosistema MUSE - Multilayered Urban Sustainability Action

Alberto **Pavan**

Politecnico di Milano, DIHCUBE - Digital Italian Hub for Construction and Built Environment

IEEE MetroLivEnv 2023 Venue

IEEE MetroLivEnv 2023 will be held at the
Politecnico di Milano - *Leonardo* Campus - Building 1 - Rectorate (Edificio 1 - Rettorato)



Registrations, Tutorials and Plenary Sessions will be held in the **Aula Magna - First Floor**.



ADDRESS

Piazza Leonardo Da Vinci, 32
Milano

Use the QRCode to open the location on *Google Maps*

IEEE MetroLivEnv 2023 Social Events

WELCOME PARTY

Monday May 29 - H 18:30

The Welcome Party will be held at the **Politecnico di Milano - Rectorate Building** on **Monday, May 29 - 18.30**.



GALA DINNER

Tuesday May 30 - H 20:00

The Gala Dinner will be held at "**Mamma Rosa**" restaurant on **Tuesday May 30 - 20.00**.



Mamma Rosa
Ristoratori dal 1986



ADDRESS

Mamma Rosa
Piazza Cincinnato, 4
Milano

Use the QRCode to open the location on *Google Maps*

IEEE MetroLivEnv 2023 Patronages



IEEE MetroLivEnv 2023 Sponsors



Program Schedule - Monday, May 29

MONDAY - MAY 29, 2023	
15:00 - 18:00	Registrations
15:30 - 16:10	Tutorial Session #1 - Rectorate Building - Aula Magna Structural Health Monitoring of historic buildings via Artificial Intelligence Eugenio Vocaturo, CNR - NANOTEC - DIMES - University of Calabria, Italy
16:10 - 16:40	COFFEE BREAK
16:40 - 17:20	Tutorial Session #2 - Rectorate Building - Aula Magna Measuring indoor thermal comfort: a multidomain perspective based on innovative sensors, wearables and machine learning Gian Marco Revel, Università Politecnica delle Marche, Italy - Marco Arnesano, Università Telematica eCampus, Italy
17:20 - 18:00	Tutorial Session #3 - Rectorate Building - Aula Magna Multi-Analytical Approaches for the Characterisation of Artistic Materials Subjected to Time and Environmental Pollution Vittoria Guglielmi, Università di Milano, Italy
18:30 - 20:30	WELCOME PARTY

Program Schedule - Tuesday, May 30

TUESDAY - MAY 30, 2023			
08:30 - 18:00	Registrations		
09:00 - 10:00	OPENING CEREMONY - WELCOME ADDRESSES		
10:00 - 10:40	Keynote Speaker #1 - Rectorate Building - Aula Magna Improve the Resilience of Masonry Infrastructure using Machine Learning and High-Fidelity Models Vasilis Sarhosis, University of Leeds, UK		
10:40 - 11:00	COFFEE BREAK		
	Aula Magna	Donatori Hall	Room 1+2
11:00 - 12:00	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?	Session 1.2 - Towards the digital built environment: high-quality measurements to deliver data-driven services - Part I	Session 1.3 - Fiber optic-based measurement instruments for living environment monitoring
12:00 - 13:00	Session 2.1 - Measurement Techniques and Procedures for Quick and Emergency Diagnostics of Buildings	Session 2.2 - Towards the digital built environment: high-quality measurements to deliver data-driven services - Part II	Session 2.3 - General Session - Part I
13:00 - 14:30	LUNCH		
	Donatori Hall	Room 1	Room 2
14:30 - 16:00	Session 3.1 - Probability and Mathematical Statistics for Living Environment and Metrology	Session 3.2 - Towards the digital built environment: high-quality measurements to deliver data-driven services - Part III	Session 3.3 - General Session - Part II
16:00 - 16:30	COFFEE BREAK		
16:30 - 18:00	Panel Session - Donatori Hall Forensic metrology: is it needed in the construction field?		
20:00	GALA DINNER		

Program Schedule - Wednesday, May 31

WEDNESDAY - MAY 31, 2023			
08:30 - 13:00	Registrations		
09:20 - 10:00	Keynote Speaker #2 - Rectorate Building - Aula Magna Textile Reinforced Mortar and Concrete for Low Carbon Repair and Structural Applications Bahman Ghiassi, University of Birmingham, UK		
	Aula Magna	Donatori Hall	Room 1+2
10:00 - 11:30	Session 4.1 - Active and Assisted Living Environments	Session 4.2 - Safety assessment and long-term behavior of heritage masonry structures with traditional and innovative metrology techniques	Session 4.3 - Mathematical models, advanced mechanical modeling, new experimental approaches and data analysis methods for Structural Health Monitoring (SHM) of structures
11:30 - 11:50	COFFEE BREAK		
11:50 - 13:10	Round Table - Rectorate Building - Aula Magna NextGeneration EU research for the built environment		
13:10 - 13:30	Closing and Award Ceremony - Rectorate Building - Aula Magna		
13:30 - 14:30	LUNCH		

Technical Program - Monday, May 29

15:00 - 18:00	<i>Aula Magna</i> REGISTRATIONS
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15:30 - 16:10	<i>Aula Magna</i> Tutorial Session #1 Chairs: Marco Arnesano, <i>Università degli Studi di eCampus, Italy</i> Francesco Lamonaca, <i>University of Calabria, Italy</i>
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Structural Health Monitoring of historic buildings via Artificial Intelligence

Eugenio Vocaturo, *CNR - NANOTEC - DIMES - University of Calabria, Italy*

16:10 - 16:40	<i>Rectorate Building</i> COFFEE BREAK
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16:40 - 17:20	<i>Aula Magna</i> Tutorial Session #2 Chairs: Marco Arnesano, <i>Università degli Studi di eCampus, Italy</i> Francesco Lamonaca, <i>University of Calabria, Italy</i>
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Measuring indoor thermal comfort: a multidomain perspective based on innovative sensors, wearables and machine learning

Gian Marco Revel, *Università Politecnica delle Marche, Italy*

Marco Arnesano, *Università Telematica eCampus, Italy*

17:20 - 18:00

Aula Magna

Tutorial Session #3

Chairs: Marco Arnesano, *Università degli Studi di eCampus, Italy*

Francesco Lamonaca, *University of Calabria, Italy*

**Multi-Analytical Approaches for the Characterisation of Artistic Materials
Subjected to Time and Environmental Pollution**

Vittoria Guglielmi, *Università di Milano, Italy*

18:30

Rectorate Building - Politecnico di Milano

WELCOME PARTY

Technical Program - Tuesday, May 30

08:30 - 18:00

Aula Magna

REGISTRATIONS

09:00 - 10:00

Aula Magna

OPENING CEREMONY - WELCOME ADDRESSES

10:00 - 10:40

Aula Magna

PLENARY SESSION - KEYNOTE SPEAKER

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

Francesco Lamonaca, *University of Calabria, Italy*

Improve the Resilience of Masonry Infrastructure using Machine Learning and High-Fidelity Models

Vasilis Sarhosis, *University of Leeds, UK*

10:40 - 11:00

Rectorate Building

COFFEE BREAK

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**
 Nedja 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 Schmidberger, 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
- 12:45 Fast Deployment, Marine Environments Early Warning Autonomous System**
 Eduardo De Francesco, Setel Group

13:00 - 14:30 Rectorate Building
LUNCH

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*

- 14:30 [INVITED] AI for living healthy: methods for actionability for medical digital twins**
 Pietro Liò, University of Cambridge, UK
- 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

14:45 [Invited] Moderate Project

Philipp Mascherbauer

15:15 [Round Table] Towards the Digital Built Environment: High-Quality Measurements to Deliver Data-Driven Services

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

16:00 - 16:30	Rectorate Building COFFEE BREAK
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16:30 - 18:00	Donatori Hall PANEL SESSION Moderator: Alessandro Ferrero, <i>Politecnico di Milano, Italy</i>
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Forensic metrology: is it needed in the construction field?

20:00	Mamma Rosa Restaurant GALA DINNER
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Technical Program - Wednesday, May 31

08:30 - 13:00 *Aula Magna*
REGISTRATIONS

09:20 - 10:00 *Aula Magna*
PLENARY SESSION - KEYNOTE SPEAKER
Chairs: Gabriele Milani, *Politecnico di Milano, Italy*
Francesco Lamonaca, *University of Calabria, Italy*

Textile Reinforced Mortar and Concrete for Low Carbon Repair and Structural Applications

Bahman Ghiassi, *University of Birmingham, UK*

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 Institute of Technology Bombay, India
Raaj Ramsankaran, Indian Institute 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 Talookolaei Babol 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
 Bhumi Halani, Indian Institute 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
 Aguinardo 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
 Aguinardo 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 Ali, 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
 Aguinardo Fraddosio, Polytechnic University of Bari, Italy
 Mario Daniele Piccioni, Polytechnic University of Bari, Italy
 Gregorio Andria, Polytechnic University of Bari, Italy

11:30 - 11:50	<i>Rectorate Building</i> COFFEE BREAK
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11:50 - 13:10	<i>Aula Magna</i> ROUND TABLE Moderator: Gian Marco Revel, <i>Università Politecnica delle Marche, Italy</i>
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NextGeneration EU research for the built environment

13:10 - 13:30	<i>Aula Magna</i> CLOSING AND AWARD CEREMONY
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13:30 - 14:30	<i>Rectorate Building</i> LUNCH
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