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2024 IEEE INTERNATIONAL CONFERENCE ON

Metrology for eXtended Reality, Artificial Intelligence and Neural Engineering

ST ALBANS - LONDON, UK / OCTOBER 21-23, 2024

[FINAL PROGRAM]

IEEE METROXRAINE St Albans 2024

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Welcome Message from the General Chairs and Technical Program Chairs

On behalf of the Organizing Committee, we wish to welcome you to the 2024 IEEE International Conference on Metrology for eXtended Reality, Artificial Intelligence, and Neural Engineering (IEEE MetroXRAINE 2024). MetroXRAINE 2024 promotes synergies among experts in emerging technologies highly influencing frontier applications: eXtended Reality, Brain-Computer Interface, and Artificial Intelligence, with special attention to the measurement and its quality on the field (applied metrology).

As we transition from Industry 4.0 to Industry 5.0, we find ourselves at the intersection of advanced technological evolution and human-centric innovation. In this new paradigm, the focus is on human well-being and sustainability, ensuring a balanced approach to technological progress. In healthcare, the shift towards Health 5.0 follows a similar path. Digital technologies such as Artificial Intelligence, Extended Reality, and Brain-Computer Interfaces are being used to create more personalized and secure healthcare systems. These innovations support a healthcare environment where technology aids in decision-making and patient care. However, this transition also brings new challenges. The ethical, security, and privacy implications must be carefully navigated to ensure these technologies are harnessed responsibly. Together, at this conference, we aim to explore how Industry and Health 5.0 can be developed and deployed in ways that are not only innovative but also aligned with our shared values for a more sustainable future.

The organization of this third edition of the Conference is coordinated by the University of Hertfordshire, the University of Naples Federico II, the University of Salento, Polytechnics of Milan, the National Research Council of Italy - STIIMA, and the University of Bath.

IEEE MetroXRAINE 2024 Technical Program consists of 135 oral presentations and more than 85 poster presentations scheduled over three days. Oral presentations are organized in six Plenary (four scientific Keynote speeches and two Tutorials from companies), two General Sessions, and 21 Special Sessions. Special Sessions aim to create a focus on specific topics, where researchers can make knowledge, familiarize, exchange ideas, and build cooperation. Poster presentations are organized in three main sessions. They also involve an “Industry poster session” with financed projects as part of the *ID4MetroXrAi* special event, as well as a Youth Forum being part of the *Youth Program*. Overall, four Special Events are hosted: *ID4MetroXrAi* on Industry 5.0, *BCI and Virtual Reality-EEG* on the integration of brain-computer interface and virtual reality, *PsychoBit* on digital psychology, and the *Youth Program*. In addition, four Panels Sessions, a student contest, three demo sessions, and interactive company exhibitions are hosted within

the Conference. Finally, as a matter of facts, many scientific contributions are related to the biomedical field: therefore, a significant space was reserved within the Technical Program to oral and poster presentations concerning the usage of metrology, extended reality, artificial intelligence, and neural engineering in the biomedical field.

The received extended abstracts were submitted to a peer-review process. Relevance, quality, significance, and novelty of the scientific contribution were the main attributes for acceptance and publication in the Proceedings. The Proceedings are published in the IEEEXplore Digital Library. 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 the Special Issues of the Journals:

- MDPI - Information;
- IOPscience - Journal of Neural Engineering.
- MDPI - Robotics;
- MDPI - Sensors;

MetroXRAINE 2024 is honored to have well-claimed experts in eXtended Reality, Artificial Intelligence, and Neural Engineering as Plenary Keynote Speakers:

- Prof. Angelo Cangelosi, from the Alan Turing Institute, University of Manchester, United Kingdom, will present “Developmental Robotics for Language Learning, Trust and Theory of Mind” on October 21;
- Prof. Mariska Vansteensel, from University Medical Center Utrecht, the Netherlands - President of BCI Society, will give a talk on “Implanted Brain-Computer Interfaces for Communication: Into the Real World” on October 21;
- Dr. Giorgio Metta, from Italian Institute of Technology (IIT), Italy, will present “Peripersonal space - Multisensory Integration & the iCub robot” on October 22;
- Dr. Sundeep Bandhari, Chief Digital Innovation Officer and Head of Digital Innovation - National Physical Laboratory, United Kingdom, will present “Providing confidence in the digital age: the need for a fit-for-purpose measurement infrastructure in a digital world” on October 23.

We are grateful to the Keynote Speakers for joining the Conference.

To recognize the most outstanding paper presented at the annual *2024 IEEE International Conference on Metrology for eXtended Reality, Artificial Intelligence, and Neural Engineering*, the Best Conference Paper Award will be assigned. Furthermore, the Best Graphical Abstract sponsored by Animate Your Science will be assigned. Other awards sponsored by ST Microelectronics will be assigned to the Best Poster, the Best contribution by Young Researcher, and the Best Demo.

We sincerely want to thank all the sponsors and the patronages who made this event possible.

The *2024 IEEE International Conference on Metrology for eXtended Reality, Artificial Intelligence, and Neural Engineering* is about to begin. Scientists, technologists, and companies please enjoy the Conference!

October 2024

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IEEE MetroXRAINE 2024 Keynote Speakers

Plenary Session - Monday October 21 - H 11:00

Developmental Robotics for Language Learning, Trust and Theory of Mind

Angelo **Cangelosi**
University of Manchester - Alan Turing Institute, UK

ABSTRACT

Growing theoretical and experimental research on action and language processing and on number learning and gestures clearly demonstrates the role of embodiment in cognition and language processing. In psychology and neuroscience, this evidence constitutes the basis of embodied cognition, also known as grounded cognition (Pezzulo et al. 2012). In robotics and AI, these studies have important implications for the design of linguistic capabilities in cognitive agents and robots for human-robot collaboration, and have led to the new interdisciplinary approach of Developmental Robotics, as part of the wider Cognitive Robotics field (Cangelosi & Schlesinger 2015; Cangelosi & Asada 2022). During the talk we will present examples of developmental robotics models and experimental results from iCub experiments on the embodiment biases in early word acquisition and grammar learning (Morse et al. 2015; Morse & Cangelosi 2017) and experiments on pointing gestures and finger counting for number learning (De La Cruz et al. 2014). We will then present a novel developmental robotics model, and experiments, on Theory of Mind and its use for autonomous trust behavior in robots (Vinanzi et al. 2019, 2021). The implications for the use of such embodied approaches for embodied cognition in AI and cognitive sciences, and for robot companion applications will also be discussed.

SPEAKER BIOGRAPHY

Angelo Cangelosi is Professor of Machine Learning and Robotics at the University of Manchester (UK) and co-director and founder of the Manchester Centre for Robotics and AI. He was selected for the award of the European Research Council (ERC) Advanced grant (funded by UKRI). His research interests are in cognitive and developmental robotics, neural networks, language grounding, human robot-interaction and trust, and robot companions for health and social care. Overall, he has secured over £38m of research grants as coordinator/PI, including the ERC Advanced eTALK, the UKRI TAS Trust Node and CRADLE Prosperity, the US AFRL project THRIVE++, and numerous Horizon and MSCAs grants. Cangelosi has produced more than 300

scientific publications. He is Editor-in-Chief of the journals Interaction Studies and IET Cognitive Computation and Systems, and in 2015 was Editor-in-Chief of IEEE Transactions on Autonomous Development. He has chaired numerous international conferences, including ICANN2022 Bristol, and ICDL2021 Beijing. His book "Developmental Robotics: From Babies to Robots" (MIT Press) was published in January 2015, and translated in Chinese and Japanese. His latest book "Cognitive Robotics" (MIT Press), coedited with Minoru Asada, was recently published in 2022.

Plenary Session - Monday October 21 - H 15:40

Implanted Brain-Computer Interfaces for Communication: Into the Real World

Mariska **Vansteensel**

University Medical Center Utrecht, the Netherlands
President of BCI Society

ABSTRACT

The last years have witnessed promising demonstrations of the potential of implanted Brain-Computer Interfaces for alleviating the communication impairment of people with late-stage amyotrophic lateral sclerosis and brainstem stroke. An important next step before this technology can be clinically applied is the validation of this technology in settings of daily living of end-users. I will discuss results of the Utrecht Neural Prosthesis (UNP) study, which aimed to accomplish independent home use of an electrocorticography (ECoG)-based BCI by people with severe motor and communication impairment. Using data of the participants of this study, I will illustrate the value of this technology, as well as the significant challenges associated with real-world implementation of BCIs for communication, including 24/7 efficacy and the effect of etiology on the neural signals for BCI control.

SPEAKER BIOGRAPHY

Mariska Vansteensel, PhD, is an Assistant Professor at the UMC Utrecht Brain Center in Utrecht, The Netherlands. She is also the current President of the International BCI Society. Her main research goal is to use the wealth of neuroscientific knowledge directly for the benefit of people with disease or disability. The main focus of her research since 2007 has been the development and validation of implantable electrocorticography (ECoG)-based Brain-Computer Interfaces

(BCI) for communication in individuals with severe motor and speech impairment. She has conducted research on the proof of concept, working with epilepsy patients who receive ECoG electrodes for diagnostic purposes and on the first worldwide investigation of the use of fully implantable BCIs in settings of daily living of people with severe motor impairment. In her current research, she utilizes the detailed organization of the sensorimotor areas to accomplish higher-dimensional ECoG-BCI control and faster and more efficient BCI-based communication. She believes that BCI research and development should take a user-centered approach, so that the developed devices match the actual needs and requirements of end-users and their caregivers. In addition, she aims to contribute to responsible clinical implementation of BCIs by drawing attention to a need for standardized reporting, by trying to increase the involvement of clinicians and other BCI stakeholders in the development of this technology and by engaging in discussions related to important ethical dilemma's related to implanted BCIs for people with severe motor impairment. Finally, she recently established a research line to assess the potential of implanted BCI technology for pediatric populations with motor and speech impairment.

Plenary Session - Tuesday October 22 - H 11:00

Peripersonal space

Multisensory Integration & the iCub robot

Giorgio **Metta**

Italian Institute of Technology (IIT), Italy

ABSTRACT

The iCub is a humanoid robot designed to support research in embodied AI. At 104 cm tall, the iCub has the size of a five-year-old child. It can crawl on all fours, walk, and sit up to manipulate objects. Its hands have been designed to support sophisticate manipulation skills. The iCub is distributed as Open Source following the GPL licenses (http://www.iCub.org). More than 50 robots have been built so far which are available in laboratories across Europe, US, Korea, Singapore, and Japan. It is one of the few platforms in the world with a sensitive full-body skin to deal with the physical interaction with the environment including possibly people. In this talk, I will speak about embodied intelligence – in the brain and machines alike, visuo-tactile integration and, more specifically, on some past work on iCub's concept of peripersonal space.

SPEAKER BIOGRAPHY

Giorgio Metta is the scientific director of the Italian Institute of Technology (IIT).
He holds an MSc with honors (1994) and a PhD (2000) in electrical engineering from the University of Genoa. From 2001 to 2002, he was a postdoctoral associate at the prestigious AI-Lab at the Massachusetts Institute of Technology (MIT). He worked at the University of Genoa and was Professor of Cognitive Robotics at the University of Plymouth (UK) from 2012 to 2019. From 2020 to 2021 he was Visiting Professor at the University of Manchester, UK.
He managed the relationships with funding bodies and international relations on behalf of IIT, and in this role he was a member of the board of directors of euRobotics aisbl, the umbrella association for European robotics. Giorgio Metta served as deputy scientific director of IIT from 2016 to 2019. He has coordinated participation in two of the Ministry of Economic Development's competence centers for Industry 4.0 (ARTES4.0, START4.0), for which he has served as a member of the Board of Directors and the Executive Board, respectively, until October 2023. He was one of the three Italian representatives at the 2018 G7 forum on Artificial Intelligence and, more recently, one of the authors of the Italian Strategic Agenda on Artificial Intelligence; he is a member of the Governing Board of Digital Innovation Hub Liguria, of the Scientific Council of Humane Technology Lab of the Catholic University, Scientific Advisor of A*STAR Singapore, member of the BoD of RAISE Scarl (a project funded by PNRR), of the Executive Board for Digital Next Generation of the Liguria Region, of the Scientific Technical Board of RINA S.p.A. and on the BoD of Gefran S.p.A. and the Board of Directors of Industrie De Nora S.p.A..
Giorgio Metta's research activities are in the field of bioinspired systems and humanoid robotics, with a focus on the design of machines that can learn from experience; he has authored or co-authored more than 300 scientific publications and worked as PI on about a dozen international and industrial research projects. He has coordinated the development of the iCub robot for more than a decade, making it the de facto platform of choice for research in AI; there are currently more than 50 robots in the world, in research labs as far as as Japan, China, Singapore, Germany, Spain, the UK and the US.

Plenary Session - Wednesday October 23 - H 11:00

Providing confidence in the digital age: the need for a fit-for-purpose measurement infrastructure in a digital world

Sundeep **Bhandari**

Chief Digital Innovation Officer // Head of Digital Innovation
National Physical Laboratory, United Kingdom

ABSTRACT

As society in the 21st century undergoes significant digital transformation it could be considered incumbent upon the metrology community to rise to the emerging challenges this brings.
For many decades we have enabled others (and ourselves) to innovate, invest, make, manufacture, trade and travel through the confidence we provide.
What does this look like in a digital world? What does this mean for us?
This talk makes the case that measurement and metrology are the invisible infrastructure technology that underpin everything from blue sky R&D to commercial activity.
However, the quality infrastructure (that exists for physical assets) is not in place for end to end digital systems, processes and the applications that sit on top of them.
In a world where everything is becoming 'driven by data, at the speed of AI', traceability, auditability and uncertainty quantification are critical, especially where there is a high value or business/safety critical decision to be made, even more so if this is done autonomously.
Sunny will share the NPL's perspectives, approach and activities to start addressing some of this need, describing a journey which started a few years ago. Growing over time NPL has looked at how to take the entire organisation, together, forwards step by step. You will hear about some highlights, challenges and considerations that have been experienced along the way and future directions – setting a high level scene for the subsequent sessions.

SPEAKER BIOGRAPHY

Sundeep (Sunny) works at the National Physical Laboratory (NPL) the UK's National Measurement Institute, responsible for measurement strategy and delivery in the UK. NPL develops and maintains the national primary measurement standards and is a Public Corporation owned by the Department for Science, Innovation and Technology (DSIT). Sunny's work focuses on shaping the evolution of physical metrology and measurement into the new

digital world, embedding measurement and traceability into processes using digital and data sciences to deliver confidence in the intelligent and effective use of data. NPL's more recent work address' research and development in measurement standards that provide traceability and confidence in end-end digital process', as well as develop the assets required in the future to underpin and enable economies and societies to have confidence in 'data driven decision making at the speed of AI'.

Sunny sits on multiple cross-government and departmental steering boards and coordination groups that cover digital technologies and digital technology standards as well as being a member of several external steering and advisory boards. He has led NPL's involvement in the partnership tasked with establishing the UK Governments AI Standards Hub.

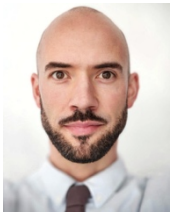
IEEE MetroXRAINE 2024 Tutorials

Tutorial Session - Tuesday October 22 - H 12:00

Multi-modal solutions for data-rich brain-machine interfaces (BMIs)

Martijn **Schreuder**

CEO (ANT Neuro GmbH) & COO (Neuromotion)



Andrew **Hanson**

Scientific Account Manager (ANT Neuro UK)

ABSTRACT

Since its establishment in 1997, ANT Neuro has been devoted to providing cutting-edge solutions and high quality, state-of-the-art products for a global audience of expert customers. Through constant innovation and collaboration, we are committed to advancing neurotechnology that enables and inspires scientists and clinicians to make new discoveries, with the goal of improving human life.

In this tutorial, we will introduce the use of multi-modal neurophysiological solutions and their benefits within BMIs. In covering the technology within our portfolio that makes this possible, as well as the science and motivation behind the many thriving partnerships we have developed with market- and thought leaders, we will invite you to consider how high-density, multi-modal neurophysiological approaches could be used to advance your future BMI breakthroughs.

SPEAKERS BIOGRAPHY

Dr. Martijn Schreuder has extensive experience in real-time brain data analysis using machine learning. He holds a PhD in Computer Science/Neuroscience from Technische Universität Berlin and has a strong background in developing innovative medical and research products. Martijn

is passionate about leveraging technology to investigate cognitive and physical performance, as well as to better address the treatment of brain and mental disorders. He currently holds several executive positions with entities in the neuromotion group of companies. These roles have enabled him to make a significant impact on the global medical research markets where he continues to drive innovative product development and growth within the sector.

Dr. Andrew Hanson has over a decade of experience in academic EEG research and scientific consultancy. He holds a PhD in Computational Neuroscience from Newcastle University, where he independently developed semi-automated analysis pipelines for EEG data quality assessment. Andrew has a strong background in EEG experimental design across a wide range of fields (visual, auditory, cognitive, and clinical). Passionate about multi-modal research, he is strong advocate for EEG-VR research and is passionate about multi-modal EEG research approaches. Currently, Andrew is a Scientific Account Manager at ANT Neuro, where he combines his expertise in EEG technology with a consultancy mindset to support and expand EEG and neuro- navigation research portfolios across the UK.

Tutorial Session - Wednesday October 23 - H 12:00

Building Cross Platform, Cross Reality Social Experiences Using XR

Alessio **Regalbuto**
XR Specialist, Magnopus

Sol **Roger**
Global Director of Innovation, Magnopus

ABSTRACT

For over a decade, Magnopus has been pushing the boundaries of what's possible in the realm of spatial experiences. Leveraging insights gained from collaborations with major brands and businesses, Magnopus is now developing a solution that enables others to seamlessly create cross-reality interoperable experiences.
In this session, Alessio will delve into the hard-won wisdom gained from working with spatial hardware and software and developing industry solutions. He will share valuable insights into how Magnopus has created foundational tools, and how developers can use these in the development of their own mixed-reality and multi-user experiences.

SPEAKERS BIOGRAPHY

Alessio Regalbuto is a passionate software engineer with extensive experience in real-time VR and AR technologies. After completing his PhD with applied knowledge of C# and graphics programming for VR using Unity, Alessio joined Ncam Technologies. There, he contributed to the development of a suite of plug-ins for Epic Games' Unreal Engine, enabling its use in professional AR applications for broadcast and film.
With over eight years dedicated to XR technologies, Alessio has developed photorealistic 3D web-based VR tours, VR games, and Unity projects utilizing 3D displays. At Magnopus, Alessio works on XR technologies and cross-platform projects using Unreal Engine and Unity.
Alessio's personal motto is: "If it doesn't exist, build it!"

As Global Director of Innovation at Magnopus, **Sol Rogers** helps brands, businesses, and governments unlock new possibilities in the physical-meets-digital space.
Previously, he founded REWIND, the UK's leading immersive spatial design and innovation agency delivering projects for The BBC, Universal Pictures, HBO, and many more. As CEO, he led the company to a successful acquisition by Magnopus in 2021 – forming a global team of world-class talent, tech and expertise set to shape the future of immersive experiences.
Before REWIND, Sol was a senior university lecturer for 15 years in digital animation, VFX and emerging technology. He taught more than 1,300 students, wrote undergraduate and Masters degrees, and supervised PHDs during his tenure. Sol is also Chairman of BAFTA's Immersive Entertainment Advisory Group and The Innovate UK Immersive Tech Network.

IEEE MetroXRAINE 2024 Special Events

Special Event - Tuesday October 22 - H 14:00

BCI and Virtual Reality-EEG Workshop

ORGANIZED BY

Slobodan Tanackovic, *g.tec Medical Engineering*

Participants will learn about brain-computer interface techniques. We will cover all related topics, from the most basic and easy BCI to the cutting-edge showcasing "instantaneous" BCI achieved with invasive electrodes.
A practical session is an excellent opportunity to link theoretical knowledge with a personal hands-on experience in several examples. Participants will have several devices at their disposal, so everyone can practice preparing a subject, conducting an experiment and seeing the entire closed-loop circuit in different applications.
We will also show a simple virtual reality game scenario linked with EEG. This will be an excellent opportunity to learn about linking both techniques and, hopefully, give participants ideas for developing their own solutions.

PROGRAM

14:00 - 14:30 - Quick intro into the Brain-Computer Interfaces
We will address BCI basics, modalities, processing steps, different techniques and possible applications.

14:00 - 14:30 - Quick intro into the Brain-Computer Interfaces
We will address BCI basics, modalities, processing steps, different techniques and possible applications.

16:10 - 16:40 - The full power of BCI
We will present invasive BCI applications which allow quick passive brain function mapping, enhance epilepsy diagnosis, aDBS which improves treatment of Parkinson Disease in patients. UHD EEG advantages: more precision.

16:40 - 17:10 - COFFEE BREAK

17:10 - 18:00 - BCI in neurorehabilitation
Live demonstration of how "motor imagery" task helps chronic stroke patients. Attendees will have an opportunity to learn what are challenges when applying BCIs to the patient population.

Special Event - Tuesday October 22 - H 17:10

ID4MetroXRAI

ORGANIZED BY

Loredana Cristaldi, *Politecnico di Milano, Italy*

The basic concept of a sustainable and resilient digital factory establishes a trustworthy human-machine coevolution relationship through AI, digital technologies, and collaborative robotics. In digitalization and the circular economy, a significant challenge for policymakers and managers is to use profitable technologies and simultaneously ensure while safeguarding human well-being. This concept synthesizes the Industry 5.0 paradigm, leveraging the integration of digital technologies and automation to strategies centered around digital twins and Human Digital Twin in future manufacturing systems. The discussion of the ID4MetroXRAI event will focus on the role of measurement science and the challenge to the researchers involved in characterizing measurement apparatus equipped with AI algorithms fed by smart sensors and devoted to supporting the digital and human digital twins.

SPONSORED BY

IEEE PRO COMM Professional Communication Society Italy Chapter

Special Event - Wednesday October 23 - H 09:00 / 14:30

PsychoBit

ORGANIZED BY

Nicola Milano, *University of Naples Federico II, Italy*
Maria Luongo, *University of Naples Federico II, Italy*
Monica Casella, *University of Naples Federico II, Italy*
Roberta Simeoli, *University of Naples Federico II, Italy*

In a digital era, the technology impacts, influences, assists and improve our life at different levels. The fields of psychology are increasingly facing the main issues concerned with evolving of technology at the service of human life. Specifically, psychological research has proposed a broad spectrum of different methodologies aimed at improving the general living conditions of people in various socio-economical contexts, i.e. work, family, school, interpersonal relations, health. This grounded set of scientific knowledge, professional practice and methodologies of intervention can be purposefully applied to the design and development of technologies that support the human psychological needs and compatible with everyone's characteristics.

PsychoBit 2024 aims at presenting psychological theories and models that revolve around the improvement of the psychological and relational life of every individual. Specifically, the symposium focuses on technological solutions, mainly employing IT, software and hardware solutions to meet psychological needs.

Special Event - Wednesday October 23 - H 09:00 / 16:10

Youth Program

ORGANIZED BY

Giuseppe Cesarelli, *University of Naples Federico II, University of Naples "Parthenope", Italy*
Leandro Donisi, *University of Campania Luigi Vanvitelli, Italy*
Alessandra Angelucci, *Politecnico di Milano, Italy*

The Youth Program is a double-event which will be during IEEE MetroXRAINE 2024 for the youngest attendees of the Conference. The participation to each event will give the possibility to compete to win conference awards.
The first event will be a Contest for MSc students, PhD students and young researchers (under 36 years old) who want to test their skills. The context winner/winning team will be awarded a certificate and the STEVAL- MKBOXPRO (market value ≅ 100€) electronic board from STMicroelectronics. Please stay tuned to be updated on this event!
The second event is the Youth Forum, a poster session where PhD students and young researchers will present their research themes and topics. This is an opportunity to exchange ideas with your peers, expand your networks and introduce your research to international students and researchers. Participants will also compete for the Best Poster Award.

IEEE MetroXRAINE 2024 Panels

Panel - Monday October 21 - H 17:10

Standardization to support companies and protect consumers in the expanding BCI market

ORGANIZED AND CHAIRED BY

Pasquale Arpaia, *Director of CIRMIS, University of Naples Federico II*

The growth in bio-sensing modalities, end effectors, applications, and the variety of potential user populations has necessitated a more interoperable ecosystem of neurotechnologies. Additionally, the potential deployment and commercialization of BCI-based solutions for human users require researchers, manufacturers, and regulatory agencies to ensure these devices meet well-defined safety and effectiveness criteria.

PANELISTS

Yuntao Yu (Chair of Brain-Computer Interfaces - ISO/IEC JTC 1/SC 43)

Mariska Vanstensel (President of the BCI Society)

Reinhold Scherer (Board member and Standards Committee member of the International BCI Society)

Nicola Moccaldi (Chair of CEI/TC 324 Brain Computer Interface - IT)

World's leading BCI manufacturers

- Aequilibria Health (MT)
- ANT Neuro (NL)
- Cephalgo (FR)
- g.tec (AT)

Panel - Tuesday October 22 - H 09:00

AI: sustainable innovation in compliance with law & ethics

The European Union has introduced new legislation on artificial intelligence: the EU AI Act. This Act is set to be the first comprehensive regulation on AI by a major regulator and could become a global standard, similar to how the GDPR revolutionized data protection.
Its goal? To ensure AI positively impacts our lives by promoting safety, transparency, ethical standards, environmental sustainability, and fostering innovation while aligning with international norms.
This legislation mentions various tools to ensure AI systems are accurate, robust, and secure throughout their lifecycle. Among these, significant attention is placed on MEtrology – the science of measurement – which helps guarantee transparency and fairness in AI deployments. For this reason, MetroXRAINE, where Metrology and AI represent two fundamental pillars, will host a panel where experts in ethics, law, sociology, and AI can share their points of view.

MODERATOR

Vincenzo Marchese, *VMTC Limited, UK*

PANELIST

Lucilla Gatt (Suor Orsola Benincasa University)
Veronica Scotti (Polytechnic of Milan)
Andrea Aliverti (Polytechnic of Milan)
Alessandra Castellani (Brera Academy)
P. Paolo Benanti, TOR

Panel - Wednesday October 23 - H 09:00

AI and Gender Equality: an Open Challenge

The panel aims to explore the dual facets of AI's impact on gender equality, focusing on its potential to bridge and inadvertently widen the gender gap.
The first topic delves into how AI technologies can be harnessed to promote gender equality, from enhancing access to education and career opportunities to improving healthcare outcomes for women and LGBTQIA+ people. By leveraging data-driven insights, AI can help dismantle barriers and create more inclusive environments. The second topic addresses the critical issue of gender bias in AI algorithms. The panel will examine how biases in training data and algorithm design can perpetuate stereotypes and inequalities, and discuss strategies to mitigate these biases.
Join us for an engaging discussion with experts from diverse fields as we navigate the challenges and opportunities AI presents in the quest for gender equality.

ORGANIZED BY

Valentina Bello, *University of Pavia, Italy*
Nagham Saeed, *University of West London, UK*

PANELISTS

Letizia Tanca, *Politecnico di Milano, Italy*
Julie Wall, *University of West London, UK*
Luigi Lavorgna, *University of Campania "Luigi Vanvitelli", Italy*
Carol Marsh, *Celestia Technologies Group UK*

IEEE MetroXRAINE 2024 Venue

IEEE MetroXRAINE 2024 will be held at **The Alban Arena - St. Albans - London**.

The Alban Arena is a well-established entertainment venue with a busy programme of national touring shows, rock and pop concerts, Comedy, Films, Exhibitions and the region's most popular Christmas Pantomime.

ADDRESS

Civic Centre, St Peter's St
St Albans - London
Use the QRCode to open the location on *Google Maps*

HOW TO REACH US

By Car

The nearest car park is the Civic Centre Car Park to the rear of The Alban Arena. The satnav postcode for the car-park is AL1 3JX. For car parking, follow sign to Civic Centre Car Park, just off Bricket Road.Walk up Civic Close towards the city and the Arena will be on your right.

By Train

St Albans is approximately 20 minutes from Kings Cross St Pancras International station, and a 5 minute walk from the station. The station is situated on the City Thameslink and therefore has great links to Luton, Harpenden Bedford and even Brighton.

When leaving St Albans station, walk west down Victoria Street until the road meets Chequer St. Turn right along the main high street in St Albans, Civic Close will be on you right and the Arena in front of you.

IEEE MetroXRAINE 2024 Social Events

Welcome Party - Monday, October 21

The IEEE MetroXRAINE **Welcome Party** will be held at "*The Saint and Sinner*" Pub on Monday, October 21 - 19:30.



Conference Dinner - Tuesday, October 22

The IEEE MetroXRAINE **Conference Dinner** will be held at "*The Alban Arena*" on Tuesday, October 22 - 20:30.

Wine and Cheese Tasting Party - Wednesday, October 23

On Wednesday, October 23 - 18:40, after the Closing Ceremony, there will be the "**Wine and Cheese Tasting Party**" at the Alban Arena.

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Program Schedule - Monday, October 21

MONDAY, OCTOBER 21				
	Alban Arena AUDITORIUM	Alban Arena BASEMENT ROOM	Alban Arena CIRCLE ROOM	The Saint & Sinner Pub
09.30 - 10.30	Foyer - REGISTRATION / WELCOME COFFEE / DEMO SESSION #1 / POSTER SESSION #1			
10.30 - 11.00	Auditorium - OPENING CEREMONY			
11.00 - 12.00	Auditorium - Keynote - Angelo Cangelosi, University of Manchester - Alan Turing Institute, UK Developmental Robotics for Language Learning, Trust and Theory of Mind			
12.00 - 13.00	Foyer - DEMO SESSION #1 / POSTER SESSION #1 (continue)			
13.00 - 14.00	LUNCH / DEMO SESSION #1 / POSTER SESSION #1 (continue)			
14.00 - 15.40	Session 1.1 - Wearable devices and data for physiological, activity and environmental monitoring	Session 1.2 - Exploring the Human Factor: Measurements in Mixed Reality, Virtual Reality, and Augmented Reality	Session 1.3 - Artificial intelligence, complex networks and computational models to explore brain cognitive functions and neurological disorders	Session 1.4 - Creative XR
15.40 - 16.40	Auditorium - Keynote - Mariska Van Steensel, University Medical Center Utrecht, the Netherlands - President of BCI Society Implanted Brain-Computer Interfaces for Communication: Into the Real World			
16.40 - 17.10	Foyer - COFFEE BREAK / DEMO SESSION #1 / POSTER SESSION #1 (continue)			
17.10 - 18.50	Session 2.1 - AI-Powered Virtual Sensors	Session 2.2 - eXtended Reality as a gateway to the Metaverse: Practices, Theories, Technologies and Applications	Session 2.3 - Trends and perspectives in artificial intelligence for neural signal and image processing	PANEL - Standardization to support companies and protect consumers in the expanding BCI market
19:30	"The Saint and Sinner" Pub - WELCOME PARTY			

Program Schedule - Tuesday, October 22

TUESDAY, OCTOBER 22				
	Alban Arena AUDITORIUM	Alban Arena BASEMENT ROOM	Alban Arena CIRCLE ROOM	The Saint & Sinner Pub
09.00 - 10.40	Session 3.1 - Integrated, multimodal, and multiscale approaches to explore the human brain and neuromuscular system	Session 3.2 - Adaptive and personalized human-machine interfaces	Session 3.3 - Leveraging XR and AI in innovative industrial applications	PANEL - AI: sustainable innovation in compliance with law & ethics
10.40 - 11.00	COFFEE BREAK / DEMO SESSION #2 / POSTER SESSION #2 & INDUSTRY			
11.00 - 12.00	Keynote - Giorgio Metta, Italian Institute of Technology (IIT), Italy Peripersonal space - Multisensory Integration & the iCub robot			
12.00 - 13.00	Tutorial - AntNEURO Multi-modal solutions for data-rich brain-machine interfaces (BMIs)			
13.00 - 14.00	LUNCH / DEMO SESSION #2 / POSTER SESSION #2 & INDUSTRY (continue)			
14.00 - 15.00	DEMO SESSION #2 / POSTER SESSION #2 (continue)			BCI and Virtual Reality-EEG Workshop - Part I
15.00 - 16.40	Session 4.1 - Sensors, Extended Reality and Artificial Intelligence for Human Behavior Analysis	Session 4.2 - Artificial Intelligence, Biometrics and Extended Reality for Criminal Investigation and Digital Forensic	Session 4.3 - Assistive technologies for human-machine interactions in harsh environments	
16.40 - 17.10	COFFEE BREAK / DEMO SESSION #2 / POSTER SESSION #2 & INDUSTRY (continue)			
17.10 - 18.50	Session 5.1 - Artificial Intelligence and Generative Models for Health	Session 5.2 - Metrology for eXtended Reality in precision tasks	SPECIAL EVENT - ID4MetroXRAI	17:10 - 18:00 BCI and Virtual Reality-EEG Workshop - Part II
20:30	CONFERENCE DINNER (Alban Arena) & AWARD CEREMONY			

Program Schedule - Wednesday, October 23

WEDNESDAY, OCTOBER 23				
	Alban Arena AUDITORIUM	Alban Arena BASEMENT ROOM	Alban Arena CIRCLE ROOM	The Saint & Sinner Pub
09.00 - 10.40	Session 6.1 - Perspectives of Explainable Artificial Intelligence and Data Mining in Medical applications	Session 6.2 - SPECIAL EVENT - PsychoBit pt .1	PANEL - AI and Gender Equality: an Open Challenge	Youth Program pt. 1
10.40 - 11.00	Foyer - COFFEE BREAK / DEMO SESSION #3 / POSTER SESSION #3			
11.00 - 12.00	Auditorium - Keynote - Sundeep Bhandari, Chief Digital Innovation Officer // Head of Digital Innovation - National Physical Laboratory, United Kingdom Providing confidence in the digital age: the need for a fit-for-purpose measurement infrastructure in a digital world			Youth Program pt. 2
12.00 - 13.00	Auditorium - Tutorial - Magnopus Building Cross Platform, Cross Reality Social Experiences Using XR			
13.00 - 13.45	LUNCH / DEMO SESSION #3 / POSTER SESSION #3 (continue)			
13.45 - 14.30	Foyer - DEMO SESSION #3 / POSTER SESSION #3 (continue)			
14.30 - 16.10	Session 7.1 - Medical Image Digital Transformation	Session 7.2 - SPECIAL EVENT - PsychoBit pt .2	Session 7.3 - Bio-Inspired and Neuromorphic Applications of Memristive Devices	Session 7.4 - General #1
16.10 - 16.30	COFFEE BREAK / DEMO SESSION #3 / POSTER SESSION #3 (continue) & Youth Forum			
16.30 - 18.10	Session 8.1 - Passive and active BCI	Session 8.2 - Metrology and Machine Learning in Medical Applications	Session 8.3 - Empowering the Aging Society in the Digital Era. AI-Powered Social and Assistive Robotics	Session 8.4 - General #2
18.10 - 18.40	Auditorium - Closing & Award Ceremony			
18:40 - 19:00	Foyer - Wine and Cheese Tasting Party			

Technical Program - Monday, October 21

09:30 - 18:00	*The Alban Arena - Foyer* **REGISTRATIONS - WELCOME COFFEE**

09:30 - 10:30	*The Alban Arena - Foyer* **DEMO SESSION #1** **Chair:** Nicola Moccaldi, *University of Naples Federico II, Italy*
DEMO #1.1	**Training and Validation in Sign Language through SONAR-ISENSE: First day of class** Enrique Yeguas Bolívar, University of Cordoba, Spain
DEMO #1.2	**AR guided surgical template placement based on Virtual Reality** Gabriele Vanni, University of Pisa, Italy

09:30 - 10:30	*The Alban Arena - Foyer* **POSTER SESSION #1** **Session Coordinators:** Marco Recenti, *Reykjavik University, Iceland* Selene Tomassini, *University of Trento, Italy*

PS01 **Towards an Accurate Measure of Emotional Pupil Dilation Responses: A Model for Removing the Effect of Luminosity**
Zeel Pansara, Vito De Feo and Caterina Cinel (University of Essex, United Kingdom)

PS02 **Comparison of Imaging and Data Prediction Compression Methods for Implanted Real-Time Peripheral Nervous System**
Antonio Coviello, Letizia Mangiagalli, Umberto Spagnolini and Maurizio Magarini (Politecnico di Milano, Italy)

PS03 **Impact of Microelectrode Recording Artefacts on Subthalamic Nucleus Functional Identification via Features-Based Machine Learning Classifiers**
Chiara Gorlini and Federica Forzanini (Fondazione IRCCS Istituto Neurologico Carlo Besta, Italy); Stefania Coelli (Politecnico di Milano, Italy); Sara Rinaldo and Roberto Eleopra (Fondazione IRCCS Istituto Neurologico Carlo Besta, Italy); Anna M. Bianchi (Politecnico di Milano, Italy); Vincenzo Levi (Fondazione IRCCS Istituto Neurologico Carlo Besta, Italy)

PS04 **Neural Network Enabled Robotic Contact Measurement**
Davide Zhou, Valentina Furlan, Nicola Giulietti, Marco Carnevale, Hermes Giberti (University of Pavia, Italy)

PS05 **Measuring Human Body Inertia in Real-Time Using Stereo Cameras and Deep Learning: A Model Dependency Analysis**
Laura Viprati (Politecnico di Milano, Italy); Nicola Giulietti (Università degli Studi di Pavia, Italy); Carol Sergenti and Hermes Giberti (Università di Pavia, Italy); Marco Carnevale (University of Pavia, Italy)

PS06 **Analyzing Uncertainty in Microplastic Detection: A Comprehensive CT Scan and Neural Network Approach**
Alessia Caputo, Pierluigi Strafella, Paolo Castellini (Università Politecnica Delle Marche, Italy)

PS07 **An Innovative Binary Quadratic Programming Approach for the Accurate Identification of Discharge Timings of Motor Units From High-Density Surface EMG Signals**
Roberto Zanotti, Francesco Negro (Università Degli Studi di Brescia, Italy)

PS08 **A Mixed Reality Application to Help Impaired People Rehabilitate Outside Clinical Environments**
Michele Mazzamuto (University of Catania, Italy); Francesco Ragusa (University of Catania & Next Vision Srl); Antonino Furnari (University of Catania, Italy & Next Vision Srl); Irene D'Ambra (University of Catania, Italy); Antonia Guarriera and Armando Sorbello (AIAS Acireale, Italy); Giovanni Maria Farinella (University of Catania, Italy)

PS09 **On the Potential Use of Smartglasses for Earthquake Early Warning**
Francesco Carotenuto (University of Naples Federico II, Italy); Giovanni Acampora (University of Naples Federico II & Istituto Nazionale di Fisica Nucleare, Italy); Aldo Zollo (University of Naples Federico II, Italy)

PS10 **VALUE: Visual Analysis for Location and Understanding of Environments**
Michele Mazzamuto (University of Catania, Italy); Daniele Di Mauro (Next Vision, Italy); Francesco Ragusa (University of Catania & Next Vision Srl); Irene D'Ambra (University of Catania, Italy); Andrea Sciuto, Angelo Aiello and Flavio Licandro (Xenia Progetti, Italy); Ignazio Infantino (Istituto di Calcolo e Reti ad Alte Prestazioni - ICAR-CNR, Italy); Antonino Furnari (University of Catania, Italy & Next Vision Srl); Giovanni Signorello and Giovanni Maria Farinella (University of Catania, Italy)

PS11 **An XR Eye-Tracking Investigation on the Assessment of Existing Food Habits**
NIkolaos Dimitrios Tantaroudas, Dr, Georgios Karafiotas, Kostantinos Koukoudis, Georgios Tsimiklis, Angelos Amditis and Tina Katika (Institute of Communication and Computer Systems, Greece)

PS12 **Comparison Between External and Internal Imputation of Missing Values in Longitudinal Data for Alzheimer's Disease Diagnosis**
Federica Aracri (Neuroscience Research Center, Italy); Monica Hernandez (Aragon Institute on Engineering Research University of Zaragoza, Spain); Andrea Quattrone (Magna Graecia University of Catanzaro, Italy); Alessia Sarica (Neuroscience Research Center, Italy)

PS13 **A Deep-Learning System for Detecting the Brain MRI Anatomical Plane to Be Examined With Priority in Alzheimer's Disease**
Selene Tomassini, Carlo Cosimo Quattrocchi, Abdallah Zeggada, Damiano Duranti, Farid Melgani and Paolo Giorgini (University of Trento, Italy)

PS14 **A Multi-Task Deep Learning Approach for the Assessment of COVID-19 in Lung Ultrasound**
Maria Chiara Fiorentino, Riccardo Rosati, Lorenzo Federici, Primo Zingaretti (Università Politecnica delle Marche, Italy)

PS15 **Vision Transformer Approaches for COVID-19 Pneumonia Assessment in Lung Ultrasound Images**
Maria Chiara Fiorentino, Riccardo Rosati, Andrian Melnic, Edoardo Conti, Primo Zingaretti (Università Politecnica delle Marche, Italy)

PS16 **Re-Configuring Domestic Environments: A Decision Support System for Ambient Assisted Living**
Daniele Spoladore (National Research Council, Italy); Atieh Mahroo (Italian National Research Council & University of Milano-Bicocca, Italy); Marco Sacco (Italian National Research Council, Italy); Tiziana Ferrante, Federica Romagnoli and Teresa Villani (Sapienza University of Rome, Italy)

PS17 **Towards the Integration of Mixed Reality and Machine Learning for Older Adults Personalized Smart Home and Health Monitoring**
Atieh Mahroo (Italian National Research Council & University of Milano-Bicocca, Italy); Marco Sacco (Italian National Research Council, Italy)

PS18 **Reinforcement Learning to Enhanced Microwave Imaging for Accurate Tumor Detection in Breast Images**
Sandra Costanzo and Alexandra Flores (University of Calabria, Italy)

PS19 **A Novel Lebesgue-Space Inversion Approach for Microwave Stroke Imaging**
Valentina Schenone, Alessandro Fedeli, Claudio Estatico, Andrea Sciarrone, Igor Bisio, Fabio Lavagetto and Andrea Randazzo (University of Genoa, Italy)

PS20 **Noncontact Cardiorespiratory Feature Extraction Using Frequency Modulated Continuous Wave Radar: Opportunities and Challenges**
Gengqian Yang, Benjamin W Metcalfe, Robert J Watson and Adrian N Evans (University of Bath, United Kingdom)

PS21 **Towards an Ethical and Data Privacy Metrology for AI-Enriched Human-Centered XR Systems**
Yan Hu, Kurt Tutschku, Veselka Boeva, Prashant Goswami, Shahrooz Abghari and Veronica Sundstedt (Blekinge Institute of Technology, Sweden)

PS22 **An Overview on Large Language Models Across Key Domains: A Systematic Review**
Mattia Bruscia, Graziano Alfredo Manduzio, Federico Galatolo, Mario Giovanni C.A. Cimino, Alberto Greco, Lorenzo Cominelli and Enzo Pasquale Scilingo (University of Pisa, Italy)

PS23 **Acoustic Side Channel Attack for Keystroke Splitting in the Wild**
Massimo Orazio Spata, Valerio Maria Russo, Alessandro Ortis and Sebastiano Battiato (University of Catania, Italy)

PS24 **Assessing Deep Neural Networks in Face Recognition Using Multiple Mugshot Sets**
Paolo Contardo, Yassir Flavio Suarez Sanchez and Aldo F. Dragoni (Università Politecnica Delle Marche, Italy); Paolo Sernani (University of Macerata, Italy)

PS25 **A Retrospective Analysis of Deep Learning for Tunnel Asset Management: Balancing Efficiency, Ethics, Sustainability, and Security in the MIRET Framework**
Federico Foria, Maurizio Di Meglio, Mario Calicchio, Francesco Emanuele Panico, Marianna Brichese and Gabriele Miceli (ETS, Italy)

PS26 **Statistical Learning to Measure the Efficacy of Digital Surgical Workflows**
Vittorio Santoriello (University of Naples Federico II, Italy); MIchela D'Antò and Silvia De Franciscis (Istituto Nazionale Tumori-IRCCS Fondazione Pascale, Italy); Danilo Calderone and Giuseppe Cesarelli (University of Naples Federico II, Italy); Paolo Delrio (Istituto Nazionale Tumori-IRCCS Fondazione Pascale, Italy); Maria Romano (University of Naples "Federico II", Italy); Alfonso M Ponsiglione (University of Naples Federico II, Italy)

PS27 **Measurements of Postural Sway to Classify Freezing of Gait in Parkinson's Disease**
Noemi Pisani, Michela Russo (University of Naples Federico II, Italy); Maria Consiglia Calabrese (Azienda Ospedaliera Universitaria OO. RR. San Giovanni di Dio Ruggi, Italy); Federico Di Filippo (University of Salerno, Italy); Giuseppe Cesarelli (University of Naples Federico II, Italy); Paolo Barone (University of Salerno, Italy); Carlo Ricciardi (University of Naples Federico II, Italy); Marianna Amboni (University of Salerno, Italy); Francesco Amato (University of Naples Federico II, Italy)

PS28 **Quantitative Measures of Gait Kinematics in Camptocormia Parkinson's Disease**
Michela Russo, Noemi Pisani (University of Naples Federico II, Italy); Gianluca Ricciardelli (Azienda Ospedaliera Universitaria OO. RR. San Giovanni di Dio Ruggi, Italy); Antonio Volzone (University of Salerno, Italy); Maria Romano (University of Naples Federico II, Italy); Paolo Barone and Marianna Amboni (University of Salerno, Italy); Alfonso M Ponsiglione and Carlo Ricciardi (University of Naples Federico II, Italy)

PS29 **Motion Sickness Sensitivity Modifies the Cortical Neurodynamics of Postural Control in the Virtual Reality BioVRSea Paradigm**
Kyle J. Edmunds (Reykjavik University, Institute of Biomedical and Neural Engineering, Iceland & University of Wisconsin-Madison, Alzheimer's Disease Research Center, USA); Lorena Guerrini (Reykjavik University, Iceland & University of Campania L. Vanvitelli, Italy); Federica Pescaglia (Institute of Biomedical and Neural Engineering,

Iceland); Casey Ostheimer, Alexis Garbisch, Deborah Jacob, Romain Aubonnet and Marco Recenti (Reykjavik University, Iceland); Mahmoud Hassan (Institute of Biomedical and Neural Engineering, Reykjavik University, Iceland); Hannes Petersen (Akureyri Hospital, Iceland); Paolo Gargiulo (Reykjavik University, Iceland)

PS30 **Biomechanical Risk Evaluation Through Machine Learning Algorithms Fed With Features Extracted From sEMG of Neck Extensors**
Giuseppe Prisco (University of Molise, Italy); Leandro Donisi (University of Naples Federico II, Italy); Lorena Guerrini (Reykjavik University, Iceland & University of Campania L. Vanvitelli, Italy); Francesco Mercaldo (University of Molise, Italy); Fabrizio Esposito (University of Campania Luigi Vanvitelli, Italy); Antonella Santone (University of Molise, Italy); Mario Cesarelli (University of Sannio, Italy); Francesco Amato (University of Napoli Federico II, Italy); Paolo Gargiulo (Reykjavik University, Iceland)

PS31 **How Muscle and Intramuscular Adipose Tissue Volume and Density Progress in Knee Osteoarthritis-Affected Subjects: A Virtual Histology Study**
Federica Kiyomi Ciliberti and Greta Pianegonda (Reykjavik University, Iceland); Halldór Jónsson Jr (Landspitali Hospital, Iceland); Magnús Kjartan Gíslason (Institute of Biomedical and Neural Engineering, Reykjavik University, Iceland); Paolo Gargiulo (Reykjavik University, Iceland)

PS32 **Knee Cartilage Degradation in the Medial and Lateral Anatomical Compartments: A Radiomics Study**
Francesca Angelone (University of Naples Federico II, Italy); Federica Kiyomi Ciliberti (Reykjavik University, Iceland); Halldór Jónsson Jr (Landspitali Hospital, Iceland); Magnús Kjartan Gíslason (Institute of Biomedical and Neural Engineering, Reykjavik University, Iceland); Maria Romano, Alessandra Franco, Francesco Amato (University of Naples Federico II, Italy); Paolo Gargiulo (Reykjavik University, Iceland)

PS33 **XAI-Based Identification of EEG Features of Inhibition and Working Memory Activation**
Matteo De Luca, Pasquale Arpaia, Ciro Ivan De Girolamo, Allegra Fullin, Ludovica Gargiulo, Luigi Maffei, Nicola Moccaldi (University of Naples Federico II, Italy); Paolo De Blasiis (University of Campania Vanvitelli, Italy); Rachele Robbio (University of Naples Federico II, Italy)

PS34 **Artifact Removal From Low-Density EEG Measured With Dry Electrodes**
Angela Natalizio (Politecnico di Torino, Italy); Pasquale Arpaia, Antonio Esposito (University of Naples Federico II, Italy & Augmented Reality for Health Monitoring Laboratory (ARHEMlab), Italy); Marco Parvis (Politecnico di Torino, Italy); Egidio De Benedetto, Marisa Pesola (University of Naples Federico II, Italy); Michele Sansone (University of Salento Lecce, Italy)

10:30 - 11:00	*The Alban Arena - Auditorium* **OPENING CEREMONY**

11:00 - 12:00	*The Alban Arena - Auditorium* **PLENARY SESSION - KEYNOTE SPEAKER** **Chair**: Farshid Amirabdollahian, *University of Hertfordshire, UK*

Developmental Robotics for Language Learning, Trust and Theory of Mind

Angelo Cangelosi, *University of Manchester - Alan Turing Institute, UK*

12:00 - 12:30	*The Alban Arena - Foyer* **DEMO SESSION #1 / POSTER SESSION #1**

Still presenting Demos of the **Demo Session #1** and Posters of the **Poster Session #1**.

12:30 - 14:00	*The Alban Arena - Foyer* **LUNCH / DEMO SESSION #1 / POSTER SESSION #1**

14:00 - 15:40	*The Alban Arena - Auditorium* **Session 1.1 - Wearable devices and data for physiological, activity and environmental monitoring** **Chairs:** Alessandra Angelucci, *Politecnico di Milano, Italy* Dario Salvi, *Malmö University, Sweden*

14:00 **Comparing Consumer and Research-Grade Wristbands for Inter-Beat Intervals Monitoring**
Stefania Coelli, Marta Carrara and Anna M. Bianchi (Politecnico di Milano, Italy); Matteo De Tommaso and Rossana Actis-Grosso (Università di Milano Bicocca, Italy); Pierluigi Reali (Politecnico di Milano, Italy)

14:20 **Estimating Heart Rate Variability From Wrist-Worn PPG Devices in Daily Activities: A Preliminary Convolutional Denoising Autoencoder Approach**
Gianluca Rho, Nicola Carbonaro (University of Pisa, Italy); Marco Laurino (National Research Council, Italy); Alessandro Tognetti, Alberto Greco (University of Pisa, Italy)

14:40 **Comparison of ECG-Free Algorithms for Heart Rate Computation From Head-BCG Signals Obtained With Smart Eyewear**
Sarah Solbiati, Saina Charkas, Federica Mozzini, Antonella LoMauro, Sara Bernasconi, Alessandra Angelucci and Andrea Aliverti (Politecnico di Milano, Italy); Diana Trojaniello (EssilorLuxottica Smart Eyewear Lab); Enrico G Caiani (Politecnico di Milano, Italy)

15:00 **Monitoring Cardiac Electromechanical Activity Underwater Using Micro Electro Mechanical Systems**
Giuseppe Di tursi, Sarah Solbiati and Claudio Pighini (Politecnico di Milano, Italy); Marco Pivetta (Università Cattolica del Sacro Cuore, Italy); Enrico G Caiani (Politecnico di Milano, Italy)

15:20 **An Inertial and Positioning Dataset for the 6-Minute Walk Test**
Sara Caramaschi, Carl Magnus Olsson (Malmö University, Sweden); Elizabeth Orchard and Jackson Molloy (Oxford University Hospitals NHS Foundation Trust, United Kingdom); Dario Salvi (Malmö University, Sweden)

14:00 - 15:40 *The Alban Arena - Basement Room*
Session 1.2 - Exploring the Human Factor: Measurements in Mixed Reality, Virtual Reality, and Augmented Reality
Chairs: Marta Mondellini, *STIIMA, National Research Council, Italy*
Mario Covarubbias, *Politecnico di Milano, Italy*

14:00 **The Impact of Collaborative Learning Virtual Environments on Student's Performance**
Ourania Koutzampasopoulou Xanthidou and Nadine Aburumman (Brunel University London, United Kingdom); Hanêne Ben Abdallah (HCT, United Arab Emirates)

14:20 **Leveraging Augmented Reality for Emergency Training and Management: A Pilot Study at ARGOR-HERAEUS SA**
Mario Covarrubias (Politecnico di Milano, Italy); Angelo Rizzella and Davide Zamperoni (Argor-Heraeus SA, Switzerland); Marta Mondellini (National Research Council, Italy)

14:40 **Evaluating Human Experiences of Touching Virtual Reality: A State of the Art Review**
Joanna Aldhous and Emilia Sobolewska (Edinburgh Napier University, United Kingdom); Gemma Webster (University of Dundee, United Kingdom)

15:00 **Residual Emotional Effects From Virtual Reality Experiences**
Lewis Russell, Duke Gledhill and Matthew Novak (University of Huddersfield, United Kingdom)

15:20 **Design of a Virtual Reality-Based Neuroadaptive System for Treatment of Arachnophobia**
Rene Weber, Adyasha Dash, Selina Christin Wriessnegger (Graz University of Technology, Austria)

14:00 - 15:40 *The Alban Arena - Circle Room*
Session 1.3 - Artificial intelligence, complex networks and computational models to explore brain cognitive functions and neurological disorders
Chairs: Giulia Varotto, *Polytechnic University of Madrid, Spain*
Jesus Poza, *University of Valladolid, Spain*

14:00 **Hippocampal Processing of Levels of Uncertainty and Environmental Volatility. OPM-MEG Correlates of Learning Through Levels of Uncertainty by a Hierarchical Gaussian Filter**
Marta Suárez-Pinilla (Universidad Politécnica de Madrid, Spain); Holly Schofield, Ryan Hill and Matthew Brookes (University of Nottingham, United Kingdom); Christoph Mathys (Aarhus University, Denmark); Bryan Strange (Universidad Politécnica de Madrid, Spain)

14:20 **Analysis of the Neural Networks Dynamics Associated to Resting-State Electroencephalographic Activity in Schizophrenia Patients**
Aarón Maturana-Candelas, Víctor Rodríguez-González and Jorge Gijón-Ortego (University of Valladolid, Spain); Segio Iglesias-Parro and Antonio J. Ibáñez-Molina (University of Jaén, Spain); Carlos Gómez and Jesús Poza Crespo (University of Valladolid, Spain)

14:40 **The Effect of EEG Segment's Length on Mental Workload Detection**
Khalil Maarouf (Tishreen University, Syria); Nibras Abo Alzahab (Marche Polytechnic University, Italy); Ghada Saad (Tishreen University, Syria)

15:00 **Dynamic Brain Functional Networks to Investigate Protective Mechanisms Against Epileptic Seizures**
Giulia Varotto (Polytechnic University of Madrid, Spain); Pablo Nuñez (Consciousness, University of Liège, Belgium); Roberta Di Giacomo (Fondazione IRCCS Istituto Neurologico Carlo Besta, Italy); Jesús Poza (University of Valladolid, Spain); Alessandra Burini (University of Udine, Italy); Víctor Rodríguez-González, Carlos Gomez (University of Valladolid, Spain); Laura Castana (Niguarda Hospital, Italy); Marco de Curtis (Fondazione IRCCS Istituto Neurologico Carlo Besta, Italy); Laura Tassi (Niguarda Hospital, Italy)

15:20 **Validation of Non-Invasive MEG Techniques for Detecting Hippocampal and Visual Cortex Responses to Entropy and Surprise**
Rachele Robbio (University of Naples Federico II, Italy); Marta Suárez-Pinilla (Universidad Politécnica de Madrid, Spain); Dunja Duran (IRCCS Istituto Neurologico Carlo Besta, Italy); Darya Frank (University of Manchester, United Kingdom); Nicola Moccaldi (University of Naples Federico II, Italy); Elisa Visani (IRCCS Istituto Neurologico Carlo Besta, Italy); Ryan Hill, Holly Schofield and Matthew Brookes (University of Nottingham, United Kingdom); Robin Hellerstedt (Universidad Politécnica de Madrid, Spain); Pasquale Arpaia (University of Naples Federico II, Italy); Marco de Curtis and Paola Lanteri (Fondazione IRCCS Istituto Neurologico Carlo Besta, Italy); Bryan Strange, Giulia Varotto (Polytechnic University of Madrid, Spain)

14:00 - 15:40	*"The Saint and Sinner" Pub* **Session 1.4 - Creative XR** **Chairs:** Vali Lalioti, *University of the Arts London, UK* Hooman Samani, *University of the Arts London, UK*

14:00 **Alleviating Skin Hunger in Older Adults: The Convergence of Creative VR and Robotic Sensory Cushions**
Ziwei Zhao, Stella Doukianou, Rebecca Fiebrink and Vali Lalioti (University of the Arts London, United Kingdom)

14:20 **Chase or Be Chased. Motivating Physical Output Using Dynamic Resistance & Chase Based Game Mechanics**
Joey Campbell (Munster Technological University, Ireland); Javier Monedero (Technological University Dublin, Ireland); Paul Marshall (School of Computer Science, University of Bristol, UK)

14:40 **Ethical Extended Reality: Bridging Technology and Cultural Heritage**
Stella Doukianou, Vali Lalioti (University of the Arts London, United Kingdom)

15:00 **CEDAR: An Augmented Reality Mobile Application Using a Participatory Design Framework for Citizen Science Data Sensing**
Mengci Liu, Peter Hall, Stella Doukianou, Anna Troisi (University of the Arts London, United Kingdom)

15:20 **Realtime AI Driven Environment Development for Virtual Metaverse**
Ahren E Hart and Muhammad Zeeshan Shakir (University of the West of Scotland, United Kingdom (Great Britain))

15:40 - 16:40 *The Alban Arena - Auditorium*
PLENARY SESSION - KEYNOTE SPEAKER
Chair: Enzo Pasquale Scilingo, *University of Pisa, Italy*

Implanted Brain-Computer Interfaces for Communication: Into the Real World

Mariska Vansteensel, *University Medical Center Utrecht, the Netherlands, President of BCI Society*

16:40 - 17:10 *The Alban Arena - Foyer*
COFFEE BREAK / DEMO SESSION #1 / POSTER SESSION #1

Still presenting Demos of the **Demo Session #1** and Posters of the **Poster Session #1**.

17:10 - 18:50 *The Alban Arena - Auditorium*
Session 2.1 - AI-Powered Virtual Sensors
Chairs: Nicola Giulietti, *Università di Pavia,Italy*
Leonardo Iacussi, *Politecnico di Milano, Italy*

17:10 **IoT-Based Virtual Sensing Application for Bridge Static Deflection Estimation via Data-Driven Approaches at the Edge**
Leonardo Iacussi and Paolo Chiariotti (Politecnico di Milano, Italy); Diego Melpignano (STMicroelectronics, Italy); Alfredo Cigada (Politecnico di Milano, Italy)

17:30 **Neural Network for Mechanical Component Features Extraction**
Silvia Discepolo, Paolo Castellini (Università Politecnica delle Marche, Italy)

17:50 **Monte Carlo-Based Measurement Uncertainty Propagation on a Virtual Sensor for Real-Time Human Balance Exergame Analysis**
Nicola Giulietti, Davide Fabiocchi, Hermes Giberti, Marco Carnevale (University of Pavia, Italy)

18:10 **On the Role of ANN on the Estimation of Payload Inertia in Parallel Kinematic Machine**
Jose Alfonso Farias, Nicola Giulietti, Marco Carnevale, Hermes Giberti (University of Pavia, Italy)

18:30 **Preliminary Development of a Gesture Recognition System for Posture Monitoring in Chainsaw Cutting: A Step Towards Enhanced Safety for Forestry Workers**
Carlotta Massotti, Marco Tarabini and Tommaso Cardone (Politecnico di Milano, Italy); Luigi Fattorini (Sapienza Università di Roma, Italy); Angelo Tirabasso (INAIL, Italy); Massimo Cavacece (Università di Cassino, Italy); Enrico Marchetti (INAIL, Italy)

17:10 - 18:50 *The Alban Arena - Basement Room*
Session 2.2 - eXtended Reality as a gateway to the Metaverse: Practices, Theories, Technologies and Applications
Chairs: Giuseppe Caggianese, *National Research Council, Italy*
Nicola Capece, *University of Basilicata, Italy*

17:10 **Prototyping Futuristic Experiences in the Metaverse Platform**
Nandhini Giri (Purdue University, USA)

17:30 **Real-Time Interactions Between Human Controllers and Remote Devices in Metaverse**
Kan Chen, Zhen Meng and Xiangmin Xu (University of Glasgow, United Kingdom); Changyang She (The University of Sydney, Australia); Philip Guodong G. Zhao (University of Manchester, United Kingdom)

17:50 **Toward Intuitive Locomotion Techniques in VR: Fully Natural and Semi-Natural Interaction**
Katia Lupinetti, Brigida Bonino, Elia Moscoso-Thompson, Franca Giannini and Marina Monti (CNR-IMATI, Italy)

18:10 **A Methodological Approach for Unveiling the Evolution of Frescoes Through a Virtual Reality**
Nicola Felice Capece, Gilda Manfredi, Brunella Gargiulo, Gabriele Gilio, Ugo Erra and Francesca Sogliani (University of Basilicata, Italy)

18:30 **Enriching Metaverse With Memories Through Generative AI: A Case Study**
Maria Rausa and Salvatore Gaglio (University of Palermo, Italy); Agnese Augello, Giuseppe Caggianese, Silvia Franchini Luigi Gallo and Luca Sabatucci (National Research Council, Italy)

17:10 - 18:50 *The Alban Arena - Circle Room*
Session 2.3 - Trends and perspectives in artificial intelligence for neural signal and image processing
Chairs: Stefania Coelli, *Politecnico di Milano, Italy*
Eleonora Maggioni, *Politecnico di Milano, Italy*

17:10 **A Systematic Approach to Tuning Cover Parameters in Mapper for Improved TDA Representation**
Stefano Vannoni (Politecnico di Milano, Italy); Emma Tassi (Politecnico di Milano & Neurosciences and Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Italy); Inês W Sampaio, Anna M. Bianchi (Politecnico di Milano, Italy); Eleonora Maggioni (Politecnico di Milano & Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Italy)

17:30 **Multivariate Developmental Pattern of Cortical Thickness, Brain Functional Connectivity and Behaviour: A Multi-Block Partial Least Square Discriminant Analysis**
Emma Tassi (Politecnico di Milano & Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Italy); Federica Goffi (Politecnico di Milano, Italy); Carolina Bonivento, Maddalena Mauri and Nivedita Agarwal (Scientific Institute IRCCS Eugenio Medea, Italy); Rossano Girometti (University of Udine, Italy); Yvan Torrente (Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Italy); Anna M. Bianchi (Politecnico di Milano, Italy); Maria Nobile (Scientific Institute IRCCS Eugenio Medea, Italy); Eleonora Maggioni (Politecnico di Milano & Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Italy); Paolo Brambilla (Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Italy)

17:50 **EEG-Driven GAN for Alpha Rhythm Generation in Passive BCI**
Ettore Cinquetti, Guglielmo Zanni, Gloria Menegaz and Silvia Francesca Storti (University of Verona, Italy)

18:10 **The Possible Role of Insula and Default Mode Network in Schizophrenia During an Auditory Task: A Pilot EEG-fMRI Analysis**
Elena Bondi (Politecnico di Milano & Università degli Studi di Milano, Italy); Francesco Luciano Donati (Università degli Studi di Milano, Italy); Anna M. Bianchi (Politecnico di Milano, Italy); Fabio Maria Triulzi, Yvan Torrente (Fondazione IRCCS Ca' Granda

Ospedale Maggiore Policlinico, Italy); Armando D'Agostino (ASST Santi Paolo e Carlo, Italy); Paolo Brambilla (Fondazione IRCCS Ca' Granda-Ospedale Maggiore Policlinico & Università degli studi di milano, Italy); Eleonora Maggioni (Politecnico di Milano & Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Italy)

18:30 **Multi-Site External Sets Harmonization With M-ComBat: An Application to Functional Connectivity in a Normative Framework**
Inês W Sampaio (Politecnico di Milano, Italy); Emma Tassi (Politecnico di Milano & Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Italy); Anna M. Bianchi (Politecnico di Milano, Italy); Stefan Borgwardt (University of Luebeck, Germany); Joseph Kambeitz (University Hospital of Cologne, Germany); Lana Kambeitz-Ilankovic (Hospital of Cologne, Germany); Eva Meisenzahl (Heinrich-Heine University, Germany); Raimo K. R. Salokangas (University of Turku, Finland); Rachel Upthegrove (University of Birmingham, United Kingdom); Stephen J. Wood (Orygen, Australia); Nikolaos Koutsouleris (Ludwig-Maximilian University Munich, Germany); Paolo Brambilla (Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Italy); Eleonora Maggioni (Politecnico di Milano & Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Italy)

17:10 - 18:50	*"The Saint and Sinner" Pub* **Session 2.4 - PANEL - Standardization to support companies and protect consumers in the expanding BCI market** **Chair:** Pasquale Arpaia, *University of Naples Federico II, Italy*

PANELISTS

Yuntao Yu (*Chair of Brain-Computer Interfaces - ISO/IEC JTC 1/SC 43*)

Mariska Vanstensel (*President of the BCI Society*)

Reinhold Scherer (*Board member and Standards Committee member of the International BCI Society*)

Nicola Moccaldi (*Chair of CEI/TC 324 Brain Computer Interface - IT*)

World's leading BCI manufacturers

- Aequilibria Health (MT)
- ANT Neuro (NL)
- Cephalgo (FR)
- g.tec (AT)

19:30	*"The Saint and Sinner" Pub* **WELCOME PARTY**

08:30 - 18:00	*The Alban Arena - Foyer* **REGISTRATIONS**

09:00 - 10:40	*The Alban Arena - Auditorium* **Session 3.1 - Integrated, multimodal, and multiscale approaches to explore the human brain and neuromuscular system** **Chairs:** Maria Agnese Pirozzi, *University of Campania Luigi Vanvitelli, Italy* Leandro Donisi, *University of Campania Luigi Vanvitelli, Italy*

9:00 **Brainstem Exploration: PCA-Based Partial Correlation for Sparse and Direct Functional Connectivity Networks**
Santa Sozzi (University of Pisa, Italy); Alejandro Luis Callara (Research Center "E. Piaggio", University of Pisa, Italy); Simone Cauzzo (University of Padua, Italy); Enzo Pasquale Scilingo (University of Pisa, Italy); Paola Binda, Nicola Vanello (University of Pisa, Italy)

9:20 **Agreement of Cerebral Blood Flow Estimates for Large-Scale Cortical Networks Across Multiple Resolution Parcellations**
Federica Franza, Alessandro Pasquale De Rosa, Antonio Russo, Marcello Silvestro, Mario Cirillo, Fabrizio Esposito and Maria Agnese Pirozzi (University of Campania Luigi Vanvitelli, Italy)

9:40 **Changes in EEG Spectral Power Elicited During Visual and Motor Stimuli With the BioVRSea Paradigm**
Carmine Gelormini (Reykjavik University, Iceland); Lorena Guerrini (Reykjavik University & University of Campania L. Vanvitelli, Iceland); Federica Pescaglia (Institute of Biomedical and Neural Engineering, Iceland); Kyle J. Edmunds (Reykjavik University, Institute of Biomedical and Neural Engineering, Iceland & University of Wisconsin-Madison, Alzheimer's Disease Research Center, USA); Romain Aubonnet (Università di Roma Tor Vergata, Italy); Marco Recenti (Reykjavik University, Iceland); Giorgio Di Lorenzo (Università di Roma Tor Vergata, Italy); Paolo Gargiulo (Reykjavik University, Iceland)

10:00 **Improving Motor Imagery-Based Brain-Computer Interfaces With Simple EEG Data Augmentation Algorithms: A Comparative Analysis**
Sourojit Goswami, Jacob Phelan and Sean Anderson, Mahnaz Arvaneh (University of Sheffield, United Kingdom)

10:20 **Agreement of Global Topological Properties of EEG Connectomes as Estimated From Phase-Locking Values and Cross-Correlation Coefficients**
Marianna Chianese (University of Campania Luigi Vanvitelli, Italy); Simone Papallo, Mario Cirillo (University of Campania Luigi Vanvitelli, Italy); Francesco Amato (University of Naples Federico II, Italy); Fabrizio Esposito (University of Campania Luigi Vanvitelli, Italy); Leandro Donisi (University of Naples Federico II, Italy)

09:00 - 10:40 *The Alban Arena - Basement Room*
Session 3.2 - Adaptive and personalized human-machine interfaces
Chairs: Alberto Greco, *University of Pisa, Italy*
Danilo Menicucci, *University of Pisa, Italy*

9:00 **Designing an Immersive Virtual Reality Scenario for Social Anxiety Elicitation and Modeling: A Preliminary Evaluation**
Matteo Martini and Eros Viola (University of Genoa, Italy); Francesco Bossi, Sergio Frumento, Alessio Iannizzotto and Sara Said (University of Pisa, Italy); Alejandro Luis Callara (Research Center "E. Piaggio", University of Pisa, Italy); Fabio Solari (Via Dodecaneso 35, Italy); Enzo Pasquale Scilingo (University of Pisa, Italy); Alberto Greco (Università di Pisa, Italy); Danilo Menicucci (University of Pisa, Italy); Manuela Chessa (University of Genoa, Italy)

9:20 **Visuo-Haptic Mixed Reality for Interactive Therapy With Temperature Stimuli: A Preliminary Study**
Jabrail Chumakov (Istituto Italiano di Tecnologia (IIT), Italy); Manuela Chessa (University of Genoa, Italy); Nikhil Deshpande (University of Nottingham, United Kingdom)

9:40 **Adaptive Application for Cognitive Training on Selective Attention**
Francesco Bossi (University of Pisa, Italy); Francesco Di Gruttola (University of Bologna, Italy); Gabriella Daneluzzi (Intesa Sanpaolo Innovation Center S.p.A. Neuroscience Lab, Italy); Rossella Iannucci (Intesa Sanpaolo S.p.A., Italy); Sonia D'arcangelo (Intesa Sanpaolo Innovation Center S.p.A. Neuroscience Lab, Italy); Emiliano Ricciardi (IMT School for Advanced Studies Lucca, Italy)

10:00 **Perceptual Features of Emotionally-Subliminal Phobic Stimuli Elicit Differences in ERPs: A Study on Holographic Spiders Shown in Augmented Reality**
Sergio Frumento (University of Pisa, Italy); Alejandro Luis Callara (Research Center "E. Piaggio", University of Pisa, Italy); Danilo Menicucci, Enzo Pasquale Scilingo, Alberto Greco, Angelo Gemignani (University of Pisa, Italy)

10:20 **Insights Into Pre-Stimulus Activity for EEG-Based Machine Learning Sensory Classification**
Linda Fiorini (IMT School for Advanced Studies Lucca, Italy); Stefania Lucia (SISSA Scuola Internazionale Superiore di Studi Avanzati, Italy); Francesco Pietrogiacomi (IMT School for Advanced Studies Lucca, Italy)

09:00 - 10:40	*The Alban Arena - Circle Room* **Session 3.3 - Leveraging XR and AI in innovative industrial applications** **Chairs:** Maria di Summa, *STIIMA, National Research Council, Italy* Enricoandrea Laviola, *Politecnico di Bari, Italy*

9:00 **Integrating Deep Learning Based Anomaly Detection With Extended Reality: A Case Study on Extensive Railways Monitoring**
Maria di Summa, Angelo Cardellicchio, Nicola Mosca, Marina Ricci, Vito Renò, Udith Krishnan Vadakkum Vadukkal and Ettore Stella (CNR STIIMA, Italy)

9:20 **Exploring the Microcosm: Immersive Tomographic Analysis of Specimens**
Nicola Mosca, Maria di Summa, Moh Rafik (CNR STIIMA, Italy); Vittorio Bianco (CNR-ISASI, Italy); Cosimo Patruno, Ettore Stella (CNR STIIMA, Italy)

9:40 **Advancing Substructure Analysis in Tomograms**
Moh Rafik (CNR STIIMA, Italy); Nicola Mosca (National Research Council, Italy); Massimiliano Nitti (National Research Council - ISSIA, Italy); Pietro Ferraro (CNR-ISASI, Italy); Maria di Summa (CNR STIIMA, Italy)

10:00 **Exploiting Data Monitoring and Augmented Reality to Foster Customer Service in Domestic Wind Energy Adoption**
Enricoandrea Laviola, Sara Romano, Antonio Uva, Michele Gattullo (Politecnico di Bari, Italy)

10:20 **An Industry 4.0 Framework for Immersive Reality During Assembly and Testing of Satellites**
Matteo Marinacci, Anna Carini, Marco Eugeni, Michele Pasquali and Massimo Mecella (Sapienza Università di Roma, Italy)

09:00 - 10:40	*"The Saint and Sinner" Pub* **Session 3.4 - PANEL - AI: sustainable innovation in compliance with law & ethics** **Chair:** Vincenzo Marchese, *VMTC Limited, UK*

PANELISTS

Lucilla Gatt (*Suor Orsola Benincasa University*)

Veronica Scotti (*Polytechnic of Milan*)

Andrea Aliverti (*Polytechnic of Milan*)

Alessandra Castellani (*Brera Academy*)

P. Paolo Benanti, TOR

10:40 - 11:00	*The Alban Arena - Foyer* **COFFEE BREAK**

10:40 - 11:00	*The Alban Arena - Foyer* **DEMO SESSION #2** **Chair:** Nicola Moccaldi, *University of Naples Federico II, Italy*
DEMO #2.1	**AI-Powered Adventures Using Unity Game Engine** Davinder Singh, Staffordshire University, UK
DEMO #2.2	**HoloLens 2 manual calibration to perform precision tasks** Alessio Nocera, University of Pisa, Italy

10:40 - 11:00	*The Alban Arena - Foyer* **POSTER SESSION #2** **Session Coordinators:** Federica Kiyomi Ciliberti, *Reykjavik University, Iceland*

PS01 **A Machine Learning-Based Approach to Detect Cyberbullying Tweets**
Giuseppe Prisco, Francesco Mercaldo and Antonella Santone (University of Molise, Italy); Mario Cesarelli (University of Sannio, Italy)

PS02 **AI for Discovering the Role of Cognitive and Brain Reserves in Parkinson's Disease Classification**
Ilaria Siviero (University of Verona, Italy); Alice Pirastru (IRCCS Don Gnocchi Foundation, Italy); Nicola Valè (University of Verona, Italy); Valeria Blasi (IRCCS Don Gnocchi Foundation, Italy); Gloria Menegaz (University of Verona, Italy); Francesca Baglio (Rehabilitation Unit, Milano - Fond. Don Carlo Gnocchi Onlus, Italy); Ilaria Boscolo Galazzo and Silvia Francesca Storti (University of Verona, Italy)

PS03 **Unsupervised Machine Learning Approach to Discover Subtypes of Progressive Supranuclear Palsy**
Noemi Pisani (University of Naples Federico II, Italy); Marina Picillo (University of Salerno, Italy); Michela Russo (University of Naples Federico II, Italy); Filomena Abate and Anna Rosa Avallone (University of Salerno, Italy); Francesco Amato (University of Naples Federico II, Italy); Paolo Barone (University of Salerno, Italy); Carlo Ricciardi (University of Naples Federico II, Italy); Mario Cesarelli (University of Sannio, Italy)

PS04 **Transmission Delays in Negative Feedback Physiological Systems: The Case of the Muscle Stretch Reflex**
Francesca Angelone, Annarita Tedesco, Alfonso M Ponsiglione, Carlo Ricciardi, Donatella Dragone (University of Naples Federico II, Italy); Carlo Cosentino, Anna Procopio (Università degli Studi Magna Græcia di Catanzaro, Italy); Maria Romano, Francesco Amato (University of Naples Federico II, Italy)

PS05 **A Combined Use of Radiomics and Connectomics to Classify Sex and Age in Healthy Subjects: The New "Radioconnectomics" Paradigm**
Leandro Donisi (University of Naples Federico II, Italy); Alessandro Pasquale De Rosa, Federica Franza, Maria Agnese Pirozzi, Antonio Gallo and Fabrizio Esposito (University of Campania Luigi Vanvitelli, Italy)

PS06 **Measuring the Accuracy of Artificial Intelligence Algorithms in the Identification of Anatomical Landmarks Through the Rastereography SPINE3D**
Juri Taborri (University of Tuscia, Viterbo, Italy); Luca Molinaro (University of Tuscia & Sensor Medica Srl, Italy); Emanuele Faperdue (University of Tuscia, Italy); Marco Donati (Motustech, Italy); Stefano Rossi (University of Tuscia, Italy)

PS07 **Real-Time Detection of Criminal Actions in the Everyday Life, From Camera-Equipped Street Lamps**
José M Alcalde-Llergo (University of Tuscia & University of Córdoba, Spain); Andrea Zingoni (University of Tuscia, Italy); Enrique Yeguas-Bolívar (University of Córdoba, Spain); Gianluca Morciano (Università Campus Bio-Medico di Roma, Italy); Daniele Melloni (University of Tuscia, Italy); Nicola Fantasia and Matteo Sperandio (Architectures & Emerging Technologies Practice - AlmavivA, Italy); Gianluigi Mascia (AlmavivA, Italy)

PS08 **VRAllexia Project: Provide Customized Support to University Students With Dyslexia Using Artificial Intelligence and Virtual Reality**
Andrea Zingoni (University of Tuscia, Italy); Gianluca Morciano (Università Campus Bio-Medico di Roma, Italy); José M Alcalde-Llergo (University of Tuscia & University of Córdoba, Spain); Juri Taborri (University of Tuscia, Viterbo, Italy); Enrique Yeguas-Bolívar, Pilar Aparicio-Martínez and Sara Pinzi (University of Córdoba, Spain); Giuseppe Calabrò (University of Tuscia, Italy)

PS09 **VR-Based Silent Reading and Rosenberg Tests: Machine-Learning Approach to Identify Learning Disorders**
Michele Materazzini (University of Tuscia - DEIM, Italy); Gianluca Morciano (Università Campus Bio-Medico di Roma, Italy); José M Alcalde-Llergo (University of Tuscia & University of Córdoba, Spain); Enrique Yeguas-Bolívar (University of Córdoba, Spain); Andrea Zingoni, Juri Taborri (University of Tuscia, Italy)

PS10 **Implementation of a Routing Application for People With Impairments, Improved and Evaluated Through Service Learning**
Sediola Ruko, Andrea Zingoni, Raffaele Pelorosso and Giuseppe Calabrò, Daniele Melloni (University of Tuscia, Italy)

PS11 **Efficient Atrophy Mapping: A Single-Step U-Net Approach for Rapid Brain Change Estimation**
Riccardo Raciti, Alessia Rondinella, Lemuel Puglisi, Francesco Guarnera (University of Catania, Italy); Daniele Ravi (University of Messina, Italy & University College London, Italy); Sebastiano Battiato (University of Catania, Italy)

PS12 **SynthBA: Reliable Brain Age Estimation Across Multiple MRI Sequences and Resolutions**
Lemuel Puglisi, Alessia Rondinella (University of Catania, Italy); Ermelinda De Meo (University College London, United Kingdom (Great Britain)); Francesco Guarnera, Sebastiano Battiato (University of Catania, Italy); Daniele Ravi (University of Messina, Italy & University College London, Italy)

PS13 **A Novel Pipeline Based on Attention Mechanism Within a GNN to Predict New Edges Between Diseases and Genes**
Massimo Orazio Spata (University of Catania, Italy); Sabrina Conoci (University of Messina, Italy); Alessandro Ortis and Sebastiano Battiato (University of Catania, Italy)

PS14 **Low-Dose CT-Based Radiomic Model to Identify Malignant Lung Nodules**
Jiaying Liu, Anna Corti, Valentina D.A. Corino and Luca Mainardi (Politecnico di Milano, Italy)

PS15 **Strategies for Efficient ENG Signal Classification Using Data Augmentation and Data Balancing Techniques**
Antonio Coviello, Rafael Sobral Augusto, Davide Gottardello, Matteo Esposito, Matteo Manetti, Umberto Spagnolini and Maurizio Magarini (Politecnico di Milano, Italy)

PS16 **On the Effectiveness of Rapid Antigen Test Kits in Measuring the Spread of SARS-CoV-2**
Aldo F. Dragoni (Università Politecnica Delle Marche, Italy)

PS17 **eXplainable Artificial Intelligence Improves EEG-Based Cognitive Workload Assessment Induced by Fine Motor Activity in Neurosurgeons**
Pasquale Arpaia, Matteo De Luca, Anna Della Calce, Ludovica Gargiulo, Nicola Moccaldi (University of Naples Federico II, Italy); Elisa Visani, Dunja Duran, Giovanni Carone (IRCCS Carlo Besta Neurological Institute, Italy); Cosimo Puttilli and Marco Nalin (Ab Medica, Italy); Alessandro Perin and Nicolò Castelli (IRCCS Carlo Besta Neurological Institute, Italy); Salvatore Piccolo (University of Naples Federico II, Italy)

PS18 **EEG-Based Stress Assessment During Robot Assisted Surgery. Comparison of Statistical Methods With Machine Learning**
Pasquale Arpaia (University of Naples Federico II, Italy); Irene Del Chicca (Ab Medica, Italy); Matteo De Luca, Ludovica Gargiulo, Giovanna Mastrati and Nicola Moccaldi (University of Naples Federico II, Italy); Elisa Morganti (Politecnico di Milano, Italy); Marco Nalin and Mauro Picciafuoco (Ab Medica, Italy); Francesca Pierro (University of Naples Federico II, Italy); Filippo Rigoni (Politecnico di Milano, Italy); Riccardo Rigoni (ETH Zurich, Italy)

10:40 - 11:00 *The Alban Arena - Foyer*
POSTER SESSION - INDUSTRY
Session Coordinators: Luca Martiri, *Politecnico di Milano*

PS19 **Words to Matter: A Comparative Study for Developing Intelligent Design and Manufacturing of 3D Materials Based on Large Language Models**
Raffaele Pugliese, Silvia Badini and Stefano Regondi (Nemo Lab, Italy)

PS20 **Variable Time Delay Estimation for Industrial Processes: Robustness to Noise**
Salvatore Graziani (University of Catania, Italy); Maria Gabriella Xibilia, Luca Patanè (University of Messina, Italy)

PS21 **A Multiphysics Framework for Bacterial Cellulose Sensor Modeling**
Luca Patanè, Francesca Sapuppo and Marco Calapristi (University of Messina, Italy); Giovanna Di Pasquale, Salvatore Graziani, Antonio Pollicino and Carlo Trigona (University of Catania, Italy); Maria Gabriella Xibilia (University of Messina, Italy)

PS22 **Symbolic Regression for Industrial Applications: An NN-Based Approach**
Marco Calapristi, Luca Patanè, Francesca Sapuppo, Riccardo Caponetto and Maria Gabriella Xibilia (University of Messina, Italy)

PS23 **An Embedded Sensing Methodology for the Classification of Activity Rate**
Bruno Ando, Mattia Manenti, Danilo Greco and Antonio Pistorio (University of Catania, Italy)

PS24 **Evolution of Biopolymers: From Bacterial Cellulose via PCL to Pullulan**
Carlo Trigona, Salvatore Graziani, Giovanna Di Pasquale, Antonino Pollicino (University of Catania, Italy)

PS25 **A Convolutional Neural Network for CNC Milling Machines Processes Classification**
Luca Martiri, Parisa Esmaili and Loredana Cristaldi (Politecnico di Milano, Italy)

PS26 **Domain Adversarial Neural Networks for Remaining Useful Life Estimation of Lithium-Ion Batteries**
Luca Martiri, Giuseppe Meli, Luca Pasquarelli, Davide Azzalini, Loredana Cristaldi and Francesco Amigoni (Politecnico di Milano, Italy)

PS27 **Li-Ion Battery State of Charge Estimation With Temperature: A Machine Learning Approach**
Simone Barcellona (Politecnico di Milano, Italy); Loris Cannelli (SUPSI-USI, Italy); Lorenzo Codecasa (Politecnico di Milano, Italy); Silvia Colnago (Ricerca sul Sistema Energetico RSE SpA, Italy); Loredana Cristaldi and Christian Laurano (Politecnico di Milano, Italy); Gabriele Maroni (SUPSI-USI, Switzerland)

PS28 **An Explainable Model Framework for Vehicle-To-Grid Available Aggregated Capacity Prediction**
Luca Patanè and Francesca Sapuppo (University of Messina, Italy); Antonio Comi (University of Rome Tor Vergata, Italy); Giuseppe Napoli (National Research Council - CNR ITAE, Italy); Maria Gabriella Xibilia (University of Messina, Italy)

PS29 **The BOHEMIAN Project: Versatile Hybrid In-fiBer Optical-electrocHemical systEMs for wIdely Applicable bioseNsing**
Bruno Ando, Mattia Manenti, Danilo Greco (University of Catania, Italy); Maria Rachele Guascito, Giuseppe Lamberti, Laura Martina (University of Salento, Italy); Francesco Arcadio, Luigi Zeni, Nunzio Cennamo (University of Campania Luigi Vanvitelli, Italy); Cosimo Trono, Sara Tombelli, Simone Berneschi and Niccolò Marcucci (Istituto di Fisica Applicata Nello Carrara, Italy); Laura Pasquardini (Indivenire Srl, Italy)

PS30 **Boat Detection and Classification Framework for Safety Improvement in Port Areas**
Luca Patanè and Antonino Maio (University of Messina, Italy); Salvatore Graziani (University of Catania, Italy); Maria Gabriella Xibilia (University of Messina, Italy)

PS31 **Sustainability and Resilience in the MICS SPOKE8 Project: The Role of the Digital Twin**
Nicola Berti, Dr. (University of Padua, Italy); Ala Arman (Università Sapienza di Roma, Italy); Parisa Esmaili and Mohsen Zeynivand (Politecnico di Milano, Italy); Daria Battini (University of Padua, Italy); Devis Bianchini (University of Brescia, Italy); Loredana Cristaldi and Laura Boca de Giuli (Politecnico di Milano, Italy); Ambra Galeazzo (University of Padua, Italy); Giambattista Gruosso and Alessio La Bella (Politecnico di Milano, Italy); Francesco Leotta (Sapienza Università di Roma, Italy); Luca Martiri and Eva Masero (Politecnico di Milano, Italy); Massimo Mecella (Sapienza Università di Roma, Italy); Pierluigi Plebani and Paolo Rocco (Politecnico di Milano, Italy); Luigi Salmaso (University of Padua, Italy); Riccardo Scattolini (Politecnico di Milano, Italy); Gian Antonio Susto (University of Padova, Italy); Letizia Tanca (Politecnico di Milano, Italy)

PS32 **The MICS Project Approach for Fault Detection in CNC Machine Bearings**
Laura Boca de Giuli, Alessio La Bella, Eva Masero, Riccardo Scattolini, Parisa Esmaili, Loredana Cristaldi, Letizia Tanca, Giambattista Gruosso, Luca Martiri and Mohsen Zeynivand (Politecnico di Milano, Italy); Giovanni La Vigna and Giovanni Minei (Leonardo SpA, Italy)

11:00 - 12:00 *The Alban Arena - Auditorium*
PLENARY SESSION - KEYNOTE SPEAKER
Chair: Pasquale Arpaia, *University of Naples Federico II, Italy*

Peripersonal space - Multisensory Integration & the iCub robot

Giorgio Metta, *Italian Institute of Technology (IIT), Italy*

12:00 - 13:00	*The Alban Arena - Auditorium* **PLENARY SESSION - TUTORIAL** **Chair**: Karl McCreadie, *Ulster University, UK*

Multi-modal solutions for data-rich brain-machine interfaces (BMIs)

Martijn Schreuder, *CEO (ANT Neuro GmbH) & COO (Neuromotion)*
Andrew Hanson*, Scientific Account Manager (ANT Neuro UK)*

13:00 - 14:00	*The Alban Arena - Foyer* **LUNCH / DEMO SESSION #2 / POSTER SESSION #2 / POSTER INDUSTRY**

14:00 - 15:00	*The Alban Arena - Foyer* **DEMO SESSION #2 / POSTER SESSION #2 / POSTER INDUSTRY**

Still presenting Demos of the **Demo Session #2** and Posters of the **Poster Session #2 / Industry**

14:00 - 16:40	*"The Saint and Sinner" Pub* **Special Event - BCI and Virtual Reality-EEG Workshop - PART I** **Organized by:** Slobodan Tanackovic, *g.tec Medical Engineering*
14:00 - 14:30	**Quick intro into the Brain-Computer Interfaces** We will address BCI basics, modalities, processing steps, different techniques and possible applications.
14:30 - 16:10	**EEG/VR: Games hands-on** Participants will split into four groups and have the opportunity to learn more about EEG in general, codeVEP and interfacing with Unity. Games: Maze Platform, Brain Buddies, Green Shield
16:10 - 16:40	**The full power of BCI** We will present invasive BCI applications which allow quick passive brain function mapping, enhance epilepsy diagnosis, aDBS which improves treatment of Parkinson Disease in patients. UHD EEG advantages: more precision.

15:00 - 16:40	*The Alban Arena - Auditorium* **Session 4.1 - Sensors, Extended Reality and Artificial Intelligence for Human Behavior Analysis** **Chairs:** Andrea Zingoni, *University of Tuscia, Italy* Juri Taborri, *University of Tuscia, Italy*

15:00 **Textile Sensors for Measuring and Classifying Human Breathing: A Preliminary Study Using Machine Learning**
Matteo Piratoni and Ilaria Mileti (University Niccolò Cusano, Italy); Juri Taborri, Stefano Rossi (University of Tuscia, Italy); Fabrizio Patanè (Niccolò Cusano University, Italy)

15:20 **Virtual Training of Healthcare Providers for Migrant Pregnant Women: A Methodological Approach**
Alessia Bisio, Enrique Yeguas-Bolívar and Pilar Aparicio-Martínez (University of Córdoba, Spain); Juri Taborri (University of Tuscia, Viterbo, Italy); Aurora Ruiz Mezcua (University of Córdoba, Spain)

15:40 **Interpreting Type 1 Diabetes Management via Contrastive Explanations**
Daniele Melloni, Andrea Zingoni (University of Tuscia, Italy)

16:00 **Enhancing Tourist Experience via Automatic Personalized Route Suggestions**
Sediola Ruko (University of Tuscia, Italy); José M Alcalde-Llergo (University of Tuscia & University of Córdoba, Spain); Enrique Yeguas (University of Cordoba, Spain); Andrea Zingoni (University of Tuscia, Italy)

16:20 **Results of Measuring Immersion in a Cricket Simulation Game for Improved VR With Real-Time Time-Of-Flight Performance Capture**
Lionel Jayaraj, James Wood and Marcia Gibson (University ff Bedfordshire, United Kingdom)

15:00 - 16:40 *The Alban Arena - Basement Room*
Session 4.2 - Artificial Intelligence, Biometrics and Extended Reality for Criminal Investigation and Digital Forensic
Chairs: Milena Martarelli, *Università Politecnica delle Marche, Italy*
Luca Guarnera, *University of Catania, Italy*

15:00 **Supporting Human Examiners in Facial Image Manipulation Detection**
Maichol Dadi, Annalisa Franco and Davide Maltoni (University of Bologna, Italy)

15:20 **Retrieving Shoeprint Images Using Convolutional Neural Networks**
Struan Robertson, Stephen J McKenna and Roberto Puch-Solis (University of Dundee, United Kingdom)

15:40 **Enhancing Crime Scene Investigations Through Virtual Reality and Deep Learning Techniques**
Antonino Zappalà and Luca Guarnera (University of Catania, Italy); Vincenzo Rinaldi (University of Dundee, United Kingdom); Salvatore Livatino (University of Hertfordshire, United Kingdom); Sebastiano Battiato (University of Catania, Italy)

16:00 **Neural Network Technique Based on Hyperspectral Imaging for Determination of Blood Stains Tissues Washed With Bleach**
Alessandro Bini, Silvia Discepolo (Università Politecnica delle Marche, Italy); Nicola Giulietti (Università degli Studi di Pavia, Italy); Paolo Castellini, Milena Martarelli (Università Politecnica delle Marche, Italy)

16:20 **Integrating AI and Computer Vision for Ballistic and Bloodstain Analysis in 3D Digital Forensics**
Emmanouil Patsiouras, Stavros Kyriakou Vasileiou, Sotirios Papadopoulos (Centre for Research and Technology Hellas, Greece); Nikolaos I Dourvas, Konstantinos Ioannidis and Stefanos Vrochidis (Information Technologies Institute, Greece); Ioannis Kompatsiaris (Centre for Research and Technology Hellas, Greece)

15:00 - 16:40 *The Alban Arena - Circle Room*
Session 4.3 - Assistive technologies for human-machine interactions in harsh environments
Chairs: Maurice Rekrut, *German Research Center for Artificial Intelligence*
Michael Kuhl, *Hochschule Mittweida, University of Applied Science, Germany*

15:00 **Hey TPS, I Need Your Assistance - Social Perception of Telepresence Systems During a Collaborative Assembly Task**
Jennifer Brade, Sarah Mandl, Franziska Klimant, Anja Strobel (Chemnitz University of Technology, Germany); Philipp Klimant (Mittweida University of Applied Sciences, Germany)

15:20 **EEG Hero: A Game With a Purpose Based Imagined Speech BCI Training Paradigm**
Johannes Ihl, Tobias Jungbluth, Maurice Rekrut (German Research Center for Artificial Intelligence & Saarland Informatics Campus, Germany); Antonio Krüger (German Research Center for Artificial Intelligence, Germany)

15:40 **Evaluating Dry EEG Technology Out of the Lab**
Mushfika Sultana (University of Essex, United Kingdom); Osheen Jain (Goldsmiths, United Kingdom); Sebastian Halder, Ana Matran-Fernandez, Rab Nawaz and Reinhold Scherer (University of Essex, United Kingdom); Ricardo Chavarriaga (ZHAW, Switzerland); José del R. Millán (The University of Texas at Austin, USA); Serafeim Perdikis (University of Essex, United Kingdom)

16:00 **Cross-Subject Startle Detection in Pilots on the Flight Deck Using Physiological Signals**
Ganavi Basavaraju, Tobias Jungbluth, Maurice Rekrut (German Research Center for Artificial Intelligence & Saarland Informatics Campus, Germany); Florian Daiber, Antonio Krüger (German Research Center for Artificial Intelligence, Germany)

16:20 **Multisensory Simulations for Smart Personal Protective Equipment**
Felix Mühlberg, Stefan Vogt, Jimmy Orawetz, Georg Freitag and Dirk Reichelt (HTW Dresden, Germany)

16:40 - 17:10 *The Alban Arena - Foyer*
COFFEE BREAK / DEMO SESSION #2 / POSTER SESSION #2 / INDUSTRY

Still presenting Demos of the **Demo Session #2** and Posters of the **Poster Session #2 / Industry**

17:10 - 18:50 *The Alban Arena - Auditorium*
Session 5.1 - Artificial Intelligence and Generative Models for Health
Chairs: Francesco Guarnera, *University of Catania, Italy*
Daniele Ravi, *University of Hertfordshire, University College London, UK*

17:10 **Neural Optimization for Pharmaceutical Transportation Under Stressful Conditions**
Georgia Fargetta, Alessandro Ortis and Sebastiano Battiato (University of Catania, Italy)

17:30 **Industrial Machines Health Prognosis Using a Transformer-Based Framework**
David Poland (University of Hertfordshire, United Kingdom); Lemuel Puglisi (University of Catania, Italy); Daniele Ravi (University of Messina, Italy & University College London, Italy)

17:50 **Towards a Predictive Model of Speech Signatures: Insights From Spectral Analysis and Generative AI Models**
Raffaele Pugliese and Stefano Regondi (Nemo Lab, Italy); Atieh Mahroo (National Research Council & University of Milano-Bicocca, Italy)

18:10 **Breaking the Cycle: Advancements in Universal Influenza Vaccine Design**
Valentina Di Salvatore, Elena Crispino, Giulia Russo and Francesco Pappalardo (University of Catania, Italy)

18:30 **A Case Study on the Use of Hypnosis Combined With Virtual Reality in Psychological Partner Violence**
Mirko Casu (University of Catania, Italy); Salvatore Bellissima (Azienda Sanitaria Provinciale di Catania, Italy); Giorgia Farruggio, Chiara Farrauto and Pasquale Caponnetto (University of Catania, Italy)

17:10 - 18:50 *The Alban Arena - Basement Room*
Session 5.2 - Metrology for eXtended Reality in precision tasks
Chairs: Luigi Duraccio, *University of Naples Federico II, Italy*
Atieh Mahroo, *STIIMA, National Research Council, Italy*

17:10 **Control of the Cameras Matrix Parameters for Accurate On-Line Calibration to Perform Precision Tasks With Microsoft HoloLens 2 Headset**
Alessio Nocera, Sara Condino, Vincenzo Ferrari and Fabrizio Cutolo (University of Pisa, Italy)

17:30 **An Occlusion-Robust Optical-Inertial Tracking Solution for Augmented Reality Headsets**
Matteo Nicoletta, Fabrizio Cutolo and Vincenzo Ferrari (University of Pisa, Italy)

17:50 **A Metrological Approach to the Performance Characterization of Eye- and Head-Tracking Interfaces in Extended Reality**
Leopoldo Angrisani, Pasquale Arpaia, Mauro D'Arco, Egidio De Benedetto, Luigi Duraccio, Fabrizio Lo Regio, Annarita Tedesco (University of Naples, Federico II, Italy)

18:10 **Exploring Variability in Human-Machine Interaction Through Gesture Recognition Based on Hand-Tracking Within XR**
Leopoldo Angrisani, Egidio De Benedetto, Luigi Duraccio and Fabrizio Lo Regio (University of Naples Federico II, Italy); Michele Sansone (University of Salento, Italy); Annarita Tedesco (University of Naples, Federico II, Italy)

18:30 **Customizable Cutting Template for Computer Assisted Osteotomies**
Gabriele Vanni, Antonellamaria Rita Mendicino, Nadia Cattari, Marina Carbone and Paolo Parchi (University of Pisa, Italy); Vincenzo Ferrari (University of Pisa - EndoCAS center, Italy)

17:10 - 18:50 *The Alban Arena - Circle Room*
SPECIAL EVENT - ID4MetroXRAI
Chairs: Loredana Cristaldi, *Politecnico di Milano, Italy*
Flaviana Tagliaferri, *Hochschule Mittweida, University of Applied Sciences, Germany*

17:10 **Sustainability Measurements of ICT Infrastructures: A Case Study With the Dynamic Fourth Lane of the A4 Italian Highway**
Leopoldo Angrisani (University of Naples Federico II, Italy); Giovanni Bonini (Movyon S.p.a., Italy); Mauro D'Arco, Egidio De Benedetto, Luigi Duraccio, Immacolata Esposito, Monica Imbò, Annarita Tedesco (University of Naples Federico II, France)

17:30 **Accurate Energy Measurements for Tiny Machine Learning Workloads**
Pasquale Arpaia (University of Naples Federico II, Italy); Luigi Capobianco (STMicroelectronics, Italy); Francesco Caputo and Antonella Cioffi (University of Naples Federico II, Italy); Antonio Esposito (University of Naples Federico II, Italy & Augmented Reality for Health Monitoring Laboratory (ARHEMlab), Italy); Francesco Isgrò, Nicola Moccaldi (University of Naples Federico II, Italy); Danilo Pietro Pau, David Siorpaes and Ettore Toscano (STMicroelectronics, Italy)

17:50 **Triplet Loss-Based Crack Verification for Structural Health Monitoring and Digital Twin Applications**
Arman Neyestani, Francesco Picariello, Ioan Tudosa, Pasquale Daponte and Luca De Vito (University of Sannio, Italy)

18:10 **Discussion with Financed Projects**

17:10 - 18:00	*"The Saint and Sinner" Pub* **Special Event - BCI and Virtual Reality-EEG Workshop - PART II** **Organized by:** Slobodan Tanackovic, *g.tec Medical Engineering*

17:10 - 18:00 **BCI in neurorehabilitation**
Live demonstration of how "motor imagery" task helps chronic stroke patients. Attendees will have an opportunity to learn what are challenges when applying BCIs to the patient population.

20:30	*The Alban Arena* **CONFERENCE DINNER**

Technical Program - Wednesday, October 23

08:30 - 16:00	*The Alban Arena - Foyer* **REGISTRATIONS**

09:00 - 10:40	*The Alban Arena - Auditorium* **Session 6.1 - Perspectives of Explainable Artificial Intelligence and Data Mining in Medical applications** **Chairs:** Chiara Verdone, *University of Sannio, Italy* Antonella Madau, *University of Sannio, Italy*

9:00 **Decision-Level Fusion for the Early Dementia Identification by Hand-Writing and -Drawing**
Vincenzo Dentamaro, Donato Impedovo and Giuseppe Pirlo (Università degli Studi di Bari, Italy); Gianfranco Semeraro (University School for Advanced Studies IUSS Pavia, Italy)

9:20 **Raman Spectroscopy of Cancer Cells: An Explainable Classification Model**
Andrea Cusano (University of Sannio, Italy); Martina Iammarino (University of Bari Aldo Moro, Italy); Marco Pisco, Sara Spaziani and Chiara Verdone (University of Sannio, Italy)

9:40 **An Explainable Approach for Early Diagnosis of Parkinson's Disease Exploring Motor Symptoms**
Antonella Madau (University of Sannio, Italy); Debora Montano (Cerict Scrl - Regional Center Information Communication Technology, Italy); Lerina Aversano (University of Foggia, Italy)

10:00 **Explainable Gait Analysis for Early Detection of Neurodegenerative Diseases Using Unsupervised Clustering Techniques**
Vincenzo Dentamaro, Felice Franchini, Ignazio Massaro, Luca Musti, Giuseppe Pirlo (Università degli Studi di Bari, Italy); Elena Sblendorio (University of Rome "Tor Vergata", Italy)

10:20 **An Explainable Approach to Characterize Heart Diseases Using ECG Images**
Francesco Denaro (University of Parma, Italy); Antonella Madau (University of Sannio, Italy); Chiara Martini (Azienda Ospedaliero-Universitaria di Parma, Italy); Riccardo Pecori (eCampus University, Italy & IMEM-CNR, Italy)

09:00 - 10:40 *The Alban Arena - Basement Room*
Session 6.2 - SPECIAL EVENT - PsychoBit - PART I
Chairs: Nicola Milano, *University of Naples Federico II, Italy*
Monica Casella, *University of Naples Federico II, Italy*

9:00 **Can Educational Robotics Experiences Shape Early Childhood Interpersonal Dynamics? An Exploratory Investigation**
Alessandra Vitanza (Institute of Cognitive Sciences and Technologies - CNR, Italy); Federica Morleo (University of Padua, Italy); Paolo Pagliuca (Institute of Cognitive Sciences and Technologies - CNR, Italy)

9:20 **Teaching Embodied Artificial Intelligence to Children (Teach E-AI 2C): An Educational Proposal for Young Learners**
Clara Nobile, Davide Marocco, Onofrio Gigliotta, Michela Ponticorvo (University of Naples Federico II, Italy)

9:40 **JOINclusion: A Mobile Game for Social Inclusion in Multicultural School Contexts**
Alessandra Colella (University of Naples Federico II, Italy); Annaleda Mazzucato (Fondazione Mondo Digitale, Italy); Dario Bacchini (University of Naples Federico II, Italy); Ioannis Christidis (University of West Attica, Greece); Concetta Esposito (University of Naples Federico II, Italy); Enrique Hortal (Maastricht University, The Netherlands); Eleni Aikaterini Leligkoy (University of West Attica, Greece); Loukas Oikonomakis, Katerina Palaiologou (Odyssey Academy, Greece); Yusuf Can Semerci (Maastricht University, The Netherlands)

10:00 **An In-Depth Look at MOOW's Innovative Approach in Higher Education**
Maria Luongo and Luigia Sica, Michela Ponticorvo (University of Naples Federico II, Italy)

10:20 **All Digital Academy Project: Upskilling Adult Educators on Key Digital Emerging Technologies**
Alessio Manfredini, Monica Casella, Raffaella Esposito and Davide Marocco (University of Naples Federico II, Italy)

09:00 - 10:40 *The Alban Arena - Circle Room*
Session 6.3 - PANEL - AI and Gender Equality: an Open Challenge
Chairs: Valentina Bello, *University of Pavia, Italy*
Nagham Saeed, *University of West London, UK*

PANELISTS

Letizia Tanca, *Politecnico di Milano, Italy*

Julie Wall, *University of West London, UK*

Luigi Lavorgna, *University of Campania "Luigi Vanvitelli", Italy*

Carol Marsh, *Celestia Technologies Group, UK*

09:00 - 11:00	*"The Saint and Sinner" Pub* **SPECIAL EVENT - Youth Program - PART I** **Chairs:** Giuseppe Cesarelli, *University of Naples Federico II, University of Naples "Parthenope", Italy* Leandro Donisi, *University of Campania Luigi Vanvitelli, Italy* Alessandra Angelucci, *University of Campania Luigi Vanvitelli, Italy*

10:40 - 11:00	*The Alban Arena - Foyer* **COFFEE BREAK**

10:40 - 11:00	*The Alban Arena - Foyer* **DEMO SESSION #3** **Chair:** Nicola Moccaldi, *University of Naples Federico II, Italy*
DEMO #3.1	**Be BRAVE! Assessing (and treating) Social Anxiety in Virtual Reality through biofeedback** Sergio Frumenti, University of Pisa, Italy
DEMO #3.2	**Unicorn Brain Interface: Elevating Gaming and Virtual Reality** Leonhard Schreiner, g.tec medical engineering GmbH

10:40 - 11:00	*The Alban Arena - Foyer* **POSTER SESSION #3** **Session Coordinators:** Mirko Casu, *University of Catania, Italy* Enza Panzardi, *University of Siena, Italy*
PS01	**An Unsupervised Learning Method for Noise Detection in Photoacoustic Gas Measurements** Ada Fort (University of Siena, Italy); Matteo Intravaia (University of Florence, Italy); Marco Mugnaini (University of Siena, Italy); Marco Bindi (University of Florence, Italy); Enza Panzardi and Valerio Vignoli (University of Siena, Italy)
PS02	**LSTM-Based Siamese Networks for Fault Detection in Metereological Time Series Data** Filippo Costanti (University of Florence, Italy); Irene Cappelli, Ada Fort, Elia Ceroni, Monica Bianchini (University of Siena, Italy)
PS03	**Next Generation Memristor Reservoir Computing** Alon Ascoli (TU Dresden, Germany); Fernando Corinto, Davide Rossetti (Politecnico di Torino, Italy); Ahmet Samil Demirkol, Ronald Tetzlaff, Nicolas Schmitt (Technische Universität Dresden, Germany); Martin Ziegler, Kristina Nikiruy, Tzvetan Ivanov (Technische Universität Ilmenau, Germany)

PS04 **Rapid and Cost-Effective Characterization of Graphene Powders Using Memristive Echo State Networks**
Kishan Kartha (Kerala University of Digital Sciences, Innovation and Technology, India); Vineeta Vasudevan Nair (Digital University, Kerala, India); Alex James (Digital University Kerala, India)

PS05 **Eye-Adapted HDR Viewing of Stereoscopic Panoramic Photography in Virtual Reality**
Alessio Regalbuto (Magnopus UK, United Kingdom); Salvatore Livatino (University of Hertfordshire, United Kingdom)

PS06 **A Comparative Analysis Between Quantum Machine Learning and Machine Learning on EEG Dataset**
Leopoldo Angrisani, Egidio De Benedetto, Alessandro Di Bernardo, Roberto Prevete, Annarita Tedesco (University of Naples, Federico II, Italy)

PS07 **Classification of Depressive Symptoms Through Electrodermal Activity During Conversations With Virtual Humans: A Preliminary Study**
Emanuela Imperatore (University of Naples Federico II, Italy); Alberto Altozano (Universitat Politecnica de Valencia, Spain); Luigi Duraccio (University of Naples Federico II, Italy); Mariano Alcaniz (Universitat Politecnica de Valencia, Spain); Mauro D'Arco (University of Naples Federico II, Italy); Javier Marìn-Morales (Universitat Politecnica de Valencia, Spain)

PS08 **Preliminary Exploration of Eye-Tracking Technology to Classify Human Personality Traits During Conversations With Virtual Humans**
Carlotta Genco (University of Naples Federico II, Italy); Alberto Altozano (Universitat Politecnica de Valencia, Spain); Luigi Duraccio (University of Naples Federico II, Italy); Mariano Alcaniz (Universitat Politecnica de Valencia, Spain); Mauro D'Arco (University of Naples Federico II, Italy); Javier Marìn-Morales (Universitat Politecnica de Valencia, Spain)

PS09 **Enhancing Game Development Process Using AI: A Comparative Analysis of Image Generative AI**
Davinder Singh, Joideep Banerjee and Lionel Jayaraj (Staffordshire University, United Kingdom)

PS10 **Advancing Visual Decoding in EEG: Enhancing Spatial Density in Surface EEG for Decoding Color Perception**
Leonhard Schreiner (Gtec Medical Engineering GmbH & Johannes Kepler University Linz, Austria); Sebastian Sieghartsleitner (Gtec Medical Engineering GmbH, Austria); Matteo La Rosa (Sapienza University of Rome, Italy); Slobodan Tanackovic (Gtec Medical Engineering GmbH, Austria); Harald Pretl (Johannes Kepler Universität, Austria); Emma Colamarino (Sapienza University of Rome, Italy); Christoph Guger (Guger Technologies OEG, Austria)

PS11 **A Pilot Study on the User Experience of Different Upper Body Extended Reality Physiotherapy Interventions**
Alex Brennan, Debbie Rankin, Therese Charles, Nicole Blackburn, Karl McCreadie, Joan V Condell (Ulster University, United Kingdom)

PS12 **Parasympathetic-Sympathetic Causal Interactions During Continuous Affect Annotation: A Preliminary Study on the CASE Dataset**
Alejandro Luis Callara (Research Center "E. Piaggio", University of Pisa, Italy); Alberto Greco, Enzo Pasquale Scilingo (University of Pisa, Italy)

PS13 **Proactive Hand Rehabilitation Through a Double Digital Twin Provided by the Virtual Glove**
Alessandro Di Matteo, Daniele Lozzi and Enrico Mattei (University of L'Aquila & A2VI-Lab, Italy); Sara Montagna (University of Urbino, Italy); Alessia Cipriani (Università Cattolica del Sacro Cuore, Italy); Filippo Mignosi and Giuseppe Placidi (University of L'Aquila, Italy)

PS14 **Challenges and Opportunities Applying Laser Beam Scanning Displays Based on Biaxial Resonantly Operated MEMS Scanners**
Leon Pohl, Oleg Petrak, Jan Berlinski, Marcel Metschulat, Lars Boie, Robert Schmoll, Jakob Studer and Wjatscheslaw Galjan (OQmented GmbH, Germany); Andreas Bahr (Jade University of Applied Sciences, Germany)

PS15 **Low Latency Video Streaming System for VR Teleoperation Over 5G Networks**
Laszlo Blazovics, Viktor Kovács, Marton Gotzy (Budapest University of Technology and Economics, Hungary)

PS16 **Review of Neural Sensing Methods in the Peripheral Nervous System**
Maria Nicole Petrou and Mafalda Ribeiro (University of Bath, United Kingdom); Ryan Koh (University of Toronto, Canada); Leen Jabban and Ben Metcalfe (University of Bath, United Kingdom)

PS17 **Virtual Dashboard Design for Grasping Operations in Teleoperation Systems**
Antonio Di Tecco, Cristian Camardella and Daniele Leonardis (Sant'Anna School of Advanced Studies, Italy); Claudio Loconsole (Universitas Mercatorum & Institute of Mechanical Intelligence, Scuola Superiore Sant'Anna, Italy); Antonio Frisoli (Sant'Anna School of Advanced Studies, Italy)

PS18 **Ultrasound Haptics for XR and Rehabilitation: Influence of Arm and Hand Muscle Stiffness on User Perception**
Mattia Alessandro Ragolia, Luisa De Palma, Nicola Giaquinto, Alessandro Pignatelli, Marco Scarpetta (Politecnico di Bari, Italy)

PS19 **Metrology for AI: Quality Evaluation of Datasets for Satellite Images Segmentation**
Marco Scarpetta (Polytechnic University of Bari, Italy); Attilio Di Nisio and Paolo Affuso (Politecnico di Bari, Italy); Maurizio Spadavecchia (Polytechnic University of Bari, Italy); Nicola Giaquinto (Politecnico di Bari, Italy)

11:00 - 12:00	*The Alban Arena - Auditorium* **PLENARY SESSION - KEYNOTE SPEAKER** **Chair**: Loredana Cristaldi, *Politecnico di Milano, Italy*

Providing confidence in the digital age: the need for a fit-for-purpose measurement infrastructure in a digital world

Sundeep Bhandari, *Chief Digital Innovation Officer // Head of Digital Innovation National Physical Laboratory, United Kingdom*

11:00 - 13:00	*"The Saint and Sinner" Pub* **SPECIAL EVENT - Youth Program - PART II** **Chairs:** Giuseppe Cesarelli, *University of Naples Federico II, University of Naples "Parthenope", Italy* Leandro Donisi, *University of Campania Luigi Vanvitelli, Italy* Alessandra Angelucci, *University of Campania Luigi Vanvitelli, Italy*

12:00 - 13:00	*The Alban Arena - Auditorium* **PLENARY SESSION - TUTORIAL** **Chair**: Salvatore Livatino, University of Hertfordshire, UK

Building Cross Platform, Cross Reality Social Experiences Using XR

Alessio Regalbuto, *Magnopus*
Sol Roger, *Magnopus*

13:00 - 13:45	*The Alban Arena - Foyer* **LUNCH / DEMO SESSION #3 / POSTER SESSION #3**

13:45 - 14:30	*The Alban Arena - Foyer* **DEMO SESSION #3 / POSTER SESSION #3**

Still presenting Demos of the **Demo Session #3** and Posters of the **Poster Session #3**.

14:30 - 16:10	*The Alban Arena - Auditorium* **Session 7.1 - Medical Image Digital Transformation** **Chairs:** Paolo Gargiulo, *Reykjavik University, Iceland* Riccardo Forni, *Reykjavik University, Iceland*

14:30 **Replicating Healthy and Metastatic Behavior: A Biomechanical Investigation Using 3D Printed Vertebrae Models**
Riccardo Forni (Institute of Biomedical and Neural Engineering, Reykjavik University, Iceland & University of Bologna, Italy); Daniela Bruno, Marco Palanca, Luca Cristofolini (University of Bologna, Italy); Paolo Gargiulo (Reykjavik University, Iceland)

14:50 **Towards Bio-Mimetic 3D Printable Human Anatomies**
Riccardo Forni (Institute of Biomedical and Neural Engineering, Reykjavik University, Iceland & University of Bologna, Italy); Danilo Calderone (University of Naples Federico II, Italy); Damiano Coato, Gianmarco Dolino (Reykjavik University, Iceland & University of Padova, Italy); Giuseppe Cesarelli and Carlo Ricciardi (University of Naples Federico II, Italy); Mario Cesarelli (University of Sannio, Italy); Paolo Gargiulo (Reykjavik University, Iceland)

15:10 **Multimetric Evaluation of Knee Cartilage Degeneration**
Federica Kiyomi Ciliberti and Ida Maruotto (Reykjavik University, Iceland); Halldór Jónsson Jr (Landspitali Hospital, Iceland); Magnús Kjartan Gíslason (Institute of Biomedical and Neural Engineering, Reykjavik University, Iceland); Paolo Gargiulo (Reykjavik University, Iceland)

15:30 **Unveiling CT-Scan Radiodensity Leg Asymmetry Impact on Common Aging Comorbidities**
Marco Recenti (Reykjavik University, Iceland); Carlo Ricciardi, Alfonso M Ponsiglione and Francesco Amato (University of Naples Federico II, Italy); Magnús Kjartan Gíslason (Institute of Biomedical and Neural Engineering, Reykjavik University, Iceland); Milan Chang (Icelandic Gerontological Research Institute, Iceland); Paolo Gargiulo (Reykjavik University, Iceland)

15:50 **New Frontiers in Postural Control and Motion Sickness Assessment: The BioVRSea Paradigm**
Marco Recenti (Reykjavik University, Iceland); Federica Pescaglia (Institute of Biomedical and Neural Engineering, Iceland); Lorena Guerrini (Reykjavik University, Iceland & University of Campania L. Vanvitelli, Italy); Ida Maruotto, Carmine Gelormini, Deborah Jacob and Romain Aubonnet (Reykjavik University, Iceland); Hannes Petersen (Akureyri Hospital, Iceland); Paolo Gargiulo (Reykjavik University, Iceland)

14:30 - 16:10	*The Alban Arena - Basement Room* **Session 7.2 - SPECIAL EVENT - PsychoBit - PART II** **Chairs:** Maria Luongo, *University of Naples Federico II, Italy* Roberta Simeoli, *University of Naples Federico II, Italy*

14:30 **Modeling Nonlinear Relationships in Psychometric Data Using Variational Autoencoders: Insights From Simulated Data**
Monica Casella, Nicola Milano, Raffaella Esposito and Davide Marocco (University of Naples Federico II, Italy)

14:46 **Analyzing the Impact of Questionnaire Length on Respondent Burden Through Biosensors**
Monica Casella (University of Naples Federico II, Italy); Francesca Borghesi (University of Turin, Italy); Pietro Cipresso (University of Turin & IRCCS Istituto Auxologico Italiano, Italy); Davide Marocco (University of Naples Federico II, Italy)

15:03 **Usability Study of a Virtual Reality-Based Ecological Battery for Memory Assessment: A Pilot Study**
Valentina Mancuso (E-Campus University, Italy); Sara Arlati, Selen Naz Saritas (National Research Council, Italy); Francesca Borghesi (University of Turin, Italy); Simona Gabriella Di Santo (IRCCS Fondazione Santa Lucia, Italy); Marco Cavallo and Elisa Pedroli (E-Campus University, Italy)

15:20 **hUGO, a Humanoid Robot for Training Memory: A Pilot Study on Healthy Younger and Older Adults**
Erica Chinzer, Onofrio Gigliotta, Beth Fairfield and Caterina Padulo (University of Naples Federico II, Italy)

15:36 **Comparing UX Profile of Generative Artificial Intelligence Tools and Traditional Tools in Brainstorming Sessions: A Pilot Study**
Katusha Gerardini and Eleonora Diletta Sarcinella (Università Cattolica del Sacro Cuore, Italy); Francesca Borghesi (University of Turin, Italy); Andrea Pozzi, Andrea Gaggioli and Alice Chirico (Università Cattolica del Sacro Cuore, Italy)

15:53 **Large Language Models: Ethics and Norms in the European Union**
Marianna Ciullo (University of Sannio & Orders of Lawyers of Benevento, Italy)

14:30 - 16:10 *The Alban Arena - Circle Room*
Session 7.3 - Bio-Inspired and Neuromorphic Applications of Memristive Devices
Chairs: Alon Ascoli, *Politecnico di Torino, Italy*
András Horváth, *Peter Pazmany Catholic University, Germany*

14:30 **Programming an Oscillator-Based Ising Machine With Memristive Coupling**
Jonas Röhrig, Bakr Al Beattie and Karlheinz Ochs (Ruhr University Bochum, Germany)

14:50 **Applying Hodgkin-Huxley Neuron Model for Perovskite Memristor in Circuit Simulation**
Mostafa Shooshtari, Manuel Jiménez Través (Institute of Microelectronics of Seville, IMSE-CNM, University of Seville, CSIC, Spain); Saeideh Pahlavan (Institute of Microelectronics of Seville, CSI, Spain); Teresa Serrano-Gotarredona (National

Microelectronics Center, CNM-CSIC, Spain); Bernabe Linares-Barranco (Institute of Microelectronics of Seville, CSI, Spain)

15:10 **Experimental Evidence for Local Fading Memory Effects in TaOx ReRAM Cells**
Nicolas Schmitt, Ioannis Messaris, Ahmet Samil Demirkol, Vasileios Ntinas, Dimitris Prousalis and Ronald Tetzlaff (Technische Universität Dresden, Germany); Alon Ascoli, Fernando Corinto and Marco Gilli (Politecnico di Torino, Italy); Sitandi Zhang, Stephan Menzel and Vikas Rana (Forschungszentrum Jülich, Germany); Leon Chua (University of Berkeley, California, USA)

15:30 **Carbon Nanomaterials-Based Memristive Devices for Neuromorphic Applications**
Luis Antonio Panes-Ruiz (TU Dresden, Germany); Shirong Huang (TU Dresden & Institute for Materials Science and Max Bergmann Center for Biomaterials, Germany); Alon Ascoli (Politecnico di Torino, Italy); Ronald Tetzlaff, Gianaurelio Cuniberti (TU Dresden, Germany)

15:50 **Dynamic Logic Gate Adaptation in TaO-Memristor Cellular Neural Networks**
Andras Horvath (Peter Pazmany Catholic University, Germany); Alon Ascoli (Politecnico di Torino, Italy); Ronald Tetzlaff (Technische Universität Dresden, Germany)

14:30 - 16:10 *"The Saint and Sinner" Pub*
Session 7.4 - General Session - PART I
Chair: Sabatina Criscuolo, *University of Naples Federico II, Italy*
Ludovica Gargiulo, *University of Naples Federico II, Italy*

14:30 **An HRV-fMRI-DTI Integrated Framework at Ultra-High Magnetic Field**
Federica Goffi and Elena Scalbi (Politecnico di Milano, Italy); Emma Tassi (Politecnico di Milano & Neurosciences and Mental Health Fondazione IRCCS Ca Granda Ospedale Maggiore Policlinico, Italy); Letizia Squarcina (Università Degli Studi di Milano, Italy); Michela Tosetti (IRCCS Fondazione Stella Maris, Italy); Anna M. Bianchi (Politecnico di Milano, Italy); Paolo Brambilla (Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Italy); Eleonora Maggioni (Politecnico di Milano & Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy)

14:50 **Analysis of Cortical Excitability During Brain-Computer Interface Stroke Rehabilitation of Upper and Lower Extremity**
Sebastian Sieghartsleitner (Gtec Medical Engineering GmbH, Austria); Marc Sebastian (Universitat Autònoma de Barcelona, Spain & GTEC); Leonhard Schreiner (Gtec Medical Engineering GmbH & Johannes Kepler University Linz, Austria); Johannes Grünwald, Woosang Cho, Rupert Ortner, Slobodan Tanackovic (Gtec Medical Engineering GmbH, Austria); Josef Scharinger (Johannes Kepler University Linz, Austria); Christoph Guger (Guger Technologies OEG, Austria)

15:10 **In Search of Lost Attention: A BCI-Based Therapeutical Safari Tour in VR**
Alexandre Delaux (Capgemini Engineering, France.); Alix Gouret (Integrative Neuroscience and Cognition Center, Université Paris Cité, France); Julien Carponcy and Thibault Porssut (Capgemini Engineering, France.); Sébastien Rouze (VR Research department, Wakeup and Smile Solutions, Spain); Florian Waszak, Sylvie Chokron (Integrative Neuroscience and Cognition Center, Université Paris Cité, France); Solène Le Bars (Capgemini Engineering, France)

15:30 **Enhancing Teleoperation: Personalized Design Through Psychological Profiling**
Valentina Cesari, Giorgia Papini, Andrea Piarulli (University of Pisa, Italy); Yuri De Pra (ENEA-TERIN-PSU-ABI, Italy); Simone Ciotti (University of Pisa & Istituto Italiano di Tecnologia, Italy); Angelo Gemignani, Matteo Bianchi, Danilo Menicucci (University of Pisa, Italy)

15:50 **Automated Analysis of Topics in Story Descriptions Can Help Detect Primary Progressive Aphasia**
Roelant Ossewaarde, Roel Jonkers (University of Groningen, The Netherlands); Yolande Pijnenburg and Antoinette Keulen (Alzheimercenter Amsterdam, The Netherlands); Stefan Leijnen (Hogeschool Utrecht, The Netherlands)

16:10 - 16:30 *The Alban Arena - Foyer*
YOUTH PROGRAM - YOUTH FORUM

16:10 - 16:30 *The Alban Arena - Foyer*
COFFEE BREAK / DEMO SESSION #3 / POSTER SESSION #3

Still presenting Demos of the **Demo Session #3** and Posters of the **Poster Session #3**.

16:30 - 18:10 *The Alban Arena - Auditorium*
Session 8.1 - Passive and active BCI
Chairs: Angela Natalizio, *Politecnico di Torino, Italy*
Naomi Du Bois, *University of Bath, UK*

16:30 **ASIS: A Smart Alarm Clock Based on Deep Learning for the Safety of Night Workers**
Daniele Lozzi, Alessandro Di Matteo and Enrico Mattei (University of L'Aquila & A2VI-Lab, University of L'Aquila, Italy); Alessia Cipriani (Università Cattolica del Sacro Cuore, Italy); Pasquale Caianiello, Filippo Mignosi and Giuseppe Placidi (University of L'Aquila, Italy)

16:50 **Motor Imagery Analysis of EEG Signals Using a Low-Cost Ankle Exoskeleton**
Cristina Polo-Hortiguela, Desirée I. Gracia, Paula Soriano-Segura, Mario Ortiz (Miguel Hernández University of Elche, Spain); Eduardo Iáñez (Brain-Machine Interface

Systems Lab, Miguel Hernández University of Elche, Spain); Carlo Cavaliere-Ballesta (Miguel Hernández University of Elche & BMI Lab research group, Spain); José M. Azorín (Miguel Hernández University of Elche, Spain)

17:10 **Optimized Spatial Filter Selection for Transfer Learning in Brain-Computer Interface**
Mohamed A A Mohamed, Mahnaz Arvaneh, Joshua Giles (University of Sheffiled, United Kingdom)

17:30 **A Case Study for Removing Cardiac Artifacts From Non-Invasive Electrospinography Signals**
Desirée I. Gracia and Cristina Polo-Hortiguela (Miguel Hernández University of Elche, Spain); Manuel Bayón-Calatayud (Hospital Universitario Central de Asturias, Spain); Eduardo Iáñez (Brain-Machine Interface Systems Lab, Miguel Hernández University of Elche, Spain); Mario Ortiz (Miguel Hernández University of Elche, Spain); José M. Azorín (Miguel Hernández University of Elche, Spain)

17:50 **Identification of EEG Features of Transcranial Electrical Stimulation (tES) Based on Explainable Artificial Intelligence (XAI)**
Pasquale Arpaia, Matteo De Luca, Anna Della Calce, Ludovica Gargiulo (University of Naples Federico II, Italy); Luigi Maffei (University of Campania Vanvitelli, Italy); Nicola Moccaldi (University of Naples Federico II, Italy); Lidia Ammendola, Maria Cropano, Giacomo Lus and Daniela Malangone (University of Campania Luigi Vanvitelli, Italy); Simona Raimo (University of Catanzaro, Italy); Elisabetta Signoriello (University of Campania Luigi Vanvitelli, Italy)

16:30 - 18:10 *The Alban Arena - Basement Room*
Session 8.2 - Metrology and Machine Learning in Medical Applications
Chairs: Marisa Pesola, *University of Naples Federico II, Italy*
Fabrizio Lo Regio, *University of Naples Federico II, Italy*

16:30 **Automated Classification of Test Tubes Based on Uncontrolled Image Analysis**
Riccardo Balia (University of Cagliari, Italy); Silvio Barra (University of Naples Federico II, Italy); A. Sebastian Podda and Livio Pompianu (University of Cagliari, Italy); Mara Sangiovanni (Università of Naples Federico II, Italy); Gianni Fenu (University of Cagliari, Italy)

16:50 **Automatic Landmark Detection on Knee Bony Surfaces in PSI-Based Total Knee Arthroplasty Using AI-Enhanced Statistical Shape Models**
Sara Maria Pagotto, Luca Marsilio, Luca Mainardi and Pietro Cerveri (Politecnico di Milano, Italy)

17:10 **Polygenic Risk Scores are Associated to Aβ-τ Protein Accumulation in Alzheimer's Disease**
Irene Treccani, Giorgio Dolci, Lorenza Brusini, Federica Cruciani, Ilaria Boscolo Galazzo and Gloria Menegaz (University of Verona, Italy)

17:30 **Integrated Gradients Demystified: An MRI Case Study on Aβ-τ Protein Localization**
Giorgio Dolci, Cristian Morasso, Federica Cruciani and Lorenza Brusini (University of Verona, Italy); Lorenzo Pini (University of Padua, Italy); Vince Calhoun (Tri-Institutional Research Center in Neuroimaging and Data Science, USA); Ilaria Boscolo Galazzo and Gloria Menegaz (University of Verona, Italy)

17:50 **Comparison of EEG Pre-Processing Techniques for Complexity Measures in Alzheimer's Disease Detection**
Pasquale Arpaia (University of Naples Federico II, Italy); Maria Cacciapuoti and Andrea Cataldo (University of Salento, Italy); Sabatina Criscuolo and Egidio De Benedetto (University of Naples Federico II, Italy); Antonio Masciullo (University of Salento, Italy); Marisa Pesola (University of Naples Federico II, Italy); Raissa Schiavoni (University of Salento, Italy)

16:30 - 18:10 *The Alban Arena - Circle Room*
Session 8.3 - Empowering the Aging Society in the Digital Era. AI-Powered Social and Assistive Robotics
Chairs: Saber Sami, *University of East Anglia, UK*
Farshid Amirabdollahian, *University of Hertfordshire, UK*

16:30 **Human Presence Detection to Support Contextual Awareness in Ambient Assisted Living Scenarios**
Sehrish Rafique and Farshid Amirabdollahian (University of Hertfordshire, United Kingdom); Gu Fang (Western Sydney University, Australia); Patrick Holthaus (University of Hertfordshire, United Kingdom)

16:50 **Association of Facial Action Units With Emotions in People Living With Dementia Listening to Music**
Dimitrios Kolosov (University of Hertfordshire, United Kingdom); Dimana Georgieva, Lucy Kerry, Keith McAdam and Marcel Gehrung (Music for My Mind Charity, United Kingdom); Iosif Mporas (University of Hertfordshire, United Kingdom)

17:10 **Efficient Convolutional Neural Networks for Automated Cognitive Diagnosis**
Connor Pearson, Beatrix De La Iglesia and Saber Sami (University of East Anglia, United Kingdom)

17:30 **ViLaBot: Connecting Vision and Language for Robots That Assist Humans at Home**
Asfand Yaar and Marco Rosano (University of Catania, Italy); Aki Härmä (Maastricht University, The Netherlands); Antonino Furnari, Giovanni Maria Farinella (University of Catania, Italy)

17:50 **Exploring Bias in Text-To-Image Models: From Body Representation of Teenage Students to Perspectives for the Aging Society**
Norberto Albano and Sandro Brignone (University of Turin, Italy)

16:30 - 18:10	*"The Saint and Sinner" Pub* **Session 8.4 - General Session - PART II** **Chairs:** Nicola Giaquinto, *Politecnico di Bari, Italy* Egidio De Benedetto, *University of Naples Federico II, Italy*

16:30 **Milky WAI: Unlocking the Secrets of Raw Cow Milk Through Speckle Pattern and AI**
Valentina Bello, Irene Bassi and Matteo Fiocchi (University of Pavia, Italy); Cristina Nuzzi (University of Brescia, Italy); Paolo Bellassi and Luca Cattaneo (Università Cattolica del Sacro Cuore, Italy); Simone Pasinetti (University of Brescia, Italy)

16:50 **FRIA Implementation Model According to the AI Act**
Lucilla Gatt, Maria Cristina Gaeta and Ilaria Amelia Caggiano (Università Degli Studi Suor Orsola Benincasa, Italy); Emiliano Troisi (University of Naples Suor Orsola Benincasa, Italy); Roberta Savella (ISTI-CNR, Italy); Roberto Trasarti (KDD Lab - ISTI - CNR Italy, Italy); Francesca Pratesi (ISTI-CNR, Italy)

17:10 **Can I Trust You? Exploring the Impact of Misleading AI Suggestions on User's Trust**
Daniele Pretolesi (AIT - Austrian Institute of Technology, Austria & University of Salzburg, Austria); Olivia Zechner and Helmut Schrom-Feiertag (AIT Austrian Institute of Technology GmbH, Austria); Manfred Tscheligi (University of Salzburg, Austria)

17:30 **Legal Design Through AI in Banking Contracts**
Lucilla Gatt, Ilaria Amelia Caggiano, Maria Cristina Gaeta, Livia Aulino, Emiliano Troisi and Luigi Izzo (University of Naples Suor Orsola Benincasa, Italy); Alessandra Fabrocini (University La Sapienza, Italy); Christian Esposito (University of Salerno, Italy); Daniele Marino (Financial Service Consultant VISA, Spain)

17:50 **Graph Neural Networks for Missing Data Imputation in Time Series From Metereological Sensors**
Giovanna Maria Dimitri, Irene Cappelli, Franco Scarselli, Ada Fort and Marco Gori (University of Siena, Italy)

18:10 - 18:40	*The Alban Arena - Auditorium* **CLOSING AND AWARD CEREMONY**

18:40 - 19:00	*The Alban Arena* **WINE AND CHEESE TASTING PARTY**