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WORKSHOP PROGRAM

Monday, June 7

SESSION 1.1 - General Session - PART 1

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Chairs: Francesca De Tommasi, *Università Campus Bio-Medico di Roma, Italy*
Carlo Massaroni, *Università Campus Bio-Medico di Roma, Italy*

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Luca Callegaro, INRIM - Istituto Nazionale di Ricerca Metrologica, Italy
Alessandro Cultrera, INRIM - Istituto Nazionale di Ricerca Metrologica, Italy
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Massimo Ortolano, Politecnico di Torino, INRIM, Italy
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SESSION 1.2 - SPECIAL SESSION: Industry 4.0 and IoT for the Hospital of the Future - Part I

Room: Virtual Room #2

Chairs: Sergio Silvestri, *University Campus Bio-Medico of Rome, Italy*
Leandro Pecchia, *University of Warwick, UK*

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Silvia Conforto, Roma TRE University, Italy
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Koksal Kurt, Pievision Technology, Turkey
Cengizhan Ozturk, Boğaziçi University Biomedical Engineering Institute, Turkey

**SESSION 1.3 - SPECIAL SESSION: Measurements and Virtual Measurements for Industry
 4.0: Approaches and Solutions for Smart Manufacturing - PART I**

Room: Virtual Room #3

Chairs: *Giulio D'Emilia, University of L'Aquila, Italy*
Antonella Gaspari, Polytechnic of Bari, Italy
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Vadim Tynchenko, Reshetnev Siberian State University of Science and Technology, Russia
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SESSION 2.1 - SPECIAL SESSION: Rapid Prototyping of Smart Industrial IoT Solutions

Room: Virtual Room #1

Chairs: Davide Brunelli, *University of Trento, Italy*

Elisabetta Farella, *Fondazione Bruno Kessler, Italy*

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Davide Brunelli, University of Trento, Italy
Andrea Acquaviva, University of Bologna, Italy
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SESSION 2.2 - SPECIAL SESSION: Industry 4.0 and IoT for the Hospital of the Future - Part II

Room: Virtual Room #2

Chairs: Sergio Silvestri, *University Campus Bio-Medico of Rome, Italy*

Leandro Pecchia, *University of Warwick, UK*

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Federico Bianchi, Industry 4.0 Competence Center, ARTES4.0, Italy
Gastone Ciuti, Scuola Superiore Sant'Anna, Italy
Arianna Menciacchi, Scuola Superiore Sant'Anna, Italy
Lorenzo Capineri, Università degli Studi di Firenze, Italy
Calogero Maria Oddo, Scuola Superiore Sant'Anna, Italy

SESSION 2.3 - SPECIAL SESSION: Sensors in Smart Objects for IoT Devices in Industry 4.0

Room: Virtual Room #3

Chairs: *Michela Borghetti, University of Brescia, Italy*
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Carl J. Debono, University of Malta, Malta
Dario C. Guastella, University of Catania, Italy
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SESSION 3.1 - SPECIAL SESSION: Applications of Fiber Optic Sensors in Industry 4.0

Room: Virtual Room #1

Chairs: *Daniela Lo Presti, Università Campus Bio-Medico di Roma, Italy*

Cátia Leitão, University of Aveiro, Portugal
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Carlo Massaroni, Università Campus Bio-Medico di Roma, Italy
Agostino Iadicicco, University of Naples "Parthenope", Italy
Eliodoro Faiella, Università Campus Bio-Medico di Roma, Italy
Massimiliano Carassiti, Università Campus Bio-Medico di Roma, Italy
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Room: Virtual Room #2

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

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Umile Giuseppe Longo, Università Campus Bio-Medico di Roma, Italy
Emiliano Schena, Università Campus Bio-Medico di Roma, Italy
Vincenzo Denaro, Università Campus Bio-Medico di Roma, Italy

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Room: Virtual Room #3

Chairs: *Alessandro Massaro, Dyrecta Lab srl, Italy*

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Simone Mari, University of L'Aquila, Italy
Andrea Fioravanti, University of L'Aquila, Italy
-

Tuesday, June 8

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Room: Virtual Room #1

Chairs: Marco Tarabini, *Politecnico di Milano, Italy*

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Chiara Conese, Politecnico di Milano, Italy

Maurizio Colombo, One-Off Solution - Automation Software Services, Italy

Luca Maggioni, Politecnico di Milano, Italy

Giovanni Moschioni, Politecnico di Milano, Italy

Marco Tarabini, Politecnico di Milano, Italy

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Luigi Garibaldi, Politecnico di Torino, Italy

Luca Bonmassar, Agilent Technologies Italia Spa

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Alessandro Zavalloni, GDM SpA, Italy

Marco Tarabini, Politecnico di Milano, Italy

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Stefan Marr, GFE, Germany

Sebastian Uziel, IMMS GmbH, Germany

Silvia Krug, IMMS GmbH, Germany

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Francesco La Mura, Università degli Studi di Pavia, Italy

Marco Tarabini, Politecnico di Milano, Italy

Mattia Camnasio, Todeschini Mario s.r.l., Italy

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Room: Virtual Room #2

Chairs: Susanna Spinsante, *Università Politecnica delle Marche, Italy*

Grazia Iadarola, University of Sannio, Italy

Gloria Cosoli, Università Politecnica delle Marche, Italy

Angelica Poli, Università Politecnica delle Marche, Italy

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Alfredo Rosado-Munoz, University of Valencia, Spain

Lotfi Mostefai, Dr Moulay Tahar University of Saida, Algeria

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Sara Casaccia, Università Politecnica delle Marche, Italy

Gian Marco Revel, Università Politecnica delle Marche, Italy

Lorenzo Scalise, Università Politecnica delle Marche, Italy

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Susanna Spinsante, Marche Polytechnic University, Italy

SESSION 4.3 - SPECIAL SESSION: Gender-Inspired Approaches to the Design of Innovative Measurement Systems and IoT Applications

Room: Virtual Room #3

- Chairs:** Paola Saccomandi, *Politecnico di Milano, Italy*
Cristina Emilia Costa, *Fondazione Bruno Kessler, Italy*
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Dajana Cassioli, *University of L'Aquila, Italy*
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Flavia Mastroberardino, University of Campania "Luigi Vanvitelli", Italy
Roberta Gragnano, University of Campania "Luigi Vanvitelli", Italy
Giovanni Di Palma, Presidio Ospedaliero Busto – Arsizio, Italy
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Adriana Re, Politecnico di Milano, Italy
Paolo Volonté, Politecnico di Milano, Italy
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- 330 **Preliminary analysis on the cervicothoracic angular velocity during forward bending and backward return task**
Davide Paloschi, Politecnico di Milano, Italy
Marco Bravi, Università Campus Bio-Medico di Roma, Italy
Sandra Miccinilli, Università Campus Bio-Medico di Roma, Italy
Emiliano Schena, Università Campus Bio-Medico di Roma, Italy
Silvia Sterzi, Università Campus Bio-Medico di Roma, Italy
Carlo Massaroni, Università Campus Bio-Medico di Roma, Italy
Paola Saccomandi, Politecnico di Milano, Italy

335 A 3D printed human skin phantom made of multifunctional nanocomposites for the assessment of RF treatments effect

Patrizia Lamberti, University of Salerno, Italy

Luca Melillo, University of Salerno, Italy

Monica La Mura, University of Salerno, Italy

Rumiana Kotsilkova, Bulgarian Academy of Sciences, Bulgaria

Vladimir Georgiev, Bulgarian Academy of Sciences, NanoTechLab Ltd., Bulgaria

Vincenzo Tucci, University of Salerno, Italy

SESSION 5.3 - SPECIAL SESSION: Metrology for Data Interoperability in Industry 4.0

Room: Virtual Room #3

Chairs: Blair Hall, *Measurement Standards Laboratory of New Zealand, New Zealand*

Sascha Eichstädt, *Physikalisch-Technische Bundesanstalt, Germany*

Mark Kuster, *Consultant*

Michael Schwartz, *CalLab Solutions*

341 Considerations about quantities, units, and dimensions for interoperability

Blair Hall, Measurement Standards Laboratory of New Zealand, New Zealand

347 Interoperable processes and infrastructure for the digital transformation of the quality infrastructure

Anke Keidel, Physikalisch-Technische Bundesanstalt, Germany

Sascha Eichstädt, Physikalisch-Technische Bundesanstalt, Germany

352 Benefits of network effects and interoperability for the digital calibration certificate management

Juho Nummiliikki, Aalto University School of Engineering, Finland

Tuukka Mustapää, Aalto University School of Engineering, Finland

Katri Hietala, Aalto University School of Engineering, Finland

Raine Viitala, Aalto University School of Engineering, Finland

358 Semantics in Sensor Networks: An Ontology for Dynamic Transfer Behavior in Calibrated Sensors

Anupam Prasad Vedurmudi, Physikalisch-Technische Bundesanstalt, Germany

Maximilian Gruber, Physikalisch-Technische Bundesanstalt, Germany

Sascha Eichstädt, Physikalisch-Technische Bundesanstalt, Germany

Adrian Paschke, Freie Universität Berlin, Fraunhofer FOKUS, Germany

364 SmartCom - Key Findings for Digitalisation in Metrology

Wiebke Heeren, Physikalisch-Technische Bundesanstalt, Germany

Bernd Müller, Ostfalia University of Applied Sciences, Germany

Gianfranco Miele, University of Cassino and Southern Lazio, Italy

Tuukka Mustapää, Aalto University School of Engineering, Finland

Daniel Hutzschenreuter, Physikalisch-Technische Bundesanstalt, Germany

Clifford Brown, Physikalisch-Technische Bundesanstalt, Germany

Oksana Baer, Physikalisch-Technische Bundesanstalt, Germany

370 Decreasing the implementation costs of smart metering systems with interoperability

Jovan Vujasinović, University of Belgrade, Serbia

Goran Savić, University of Belgrade, Serbia

Ilija Batas - Bjelic, Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Serbia

Nikola Rajaković, University of Belgrade, Serbia

374 Metrological Data Completeness for Digital Transformation

Mark Kuster, Consultant

SESSION 6.1 - SPECIAL SESSION: AI-Enhanced Sensing for Industrial and Medical IoT Applications - Part I

Room: Virtual Room #1

Chairs: Luca Vollero, *University Campus Bio-Medico of Rome, Italy*

Samuel Oluwarotimi Williams, *Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, China*

380 A Low Channel Number Sensing Approach for an Ethnic Specific Labour Immanency Prediction using Bio-Electromagnetism

Ejay Nsugbe, Independent Researcher
Ibrahim Sanusi, University of Sheffield, UK
Olusayo Obajemu, Fredericton, Canada
Oluwarotimi Williams Samuel, Chinese Academy of Sciences, China
Mojisola Grace Asogbon, Chinese Academy of Sciences, China
Guanglin Li, Chinese Academy of Sciences, China

386 A Machine Learning-based Approach for Advanced Monitoring of Automated Equipment for the Entertainment Industry

Michele Berno, University of Padua, Italy
Marco Canil, University of Padua, Italy
Nicola Chiarello, University of Padua, Italy
Luca Piazzon, University of Padua, Italy
Fabio Berti, Antonio Zamperla S.p.A., Italy
Francesca Ferrari, Antonio Zamperla S.p.A., Italy
Alessandro Zaupa, Antonio Zamperla S.p.A., Italy
Nicola Ferro, University of Padua, Italy
Michele Rossi, University of Padua, Italy
Gian Antonio Susto, University of Padua, Italy

392 Image sensors and VPU acceleration for data analysis and classification

Lorenzo Petrosino, Università Campus Bio-Medico di Roma, Italy
Giulio Iannello, Università Campus Bio-Medico di Roma, Italy
Mario Merone, Università Campus Bio-Medico di Roma, Italy
Luca Vollero, Università Campus Bio-Medico di Roma, Italy

397 Edge computing optimization method. Analyzed task: crowd counting

Alessandro Graziosi, Università Campus Bio-Medico di Roma, Italy
Giulio Iannello, Università Campus Bio-Medico di Roma, Italy
Valerio Lapadula, Università Campus Bio-Medico di Roma, Italy
Mario Merone, Università Campus Bio-Medico di Roma, Italy
Marco Sabatini, Università Campus Bio-Medico di Roma, Italy
Luca Vollero, Università Campus Bio-Medico di Roma, Italy

402 Heart Rate Analysis through Smartphone Camera

Anna Sabatini, Università Campus Bio-Medico di Roma, Italy
Giulio Iannello, Università Campus Bio-Medico di Roma, Italy
Giorgio Pennazza, Università Campus Bio-Medico di Roma, Italy
Marco Santonico, Università Campus Bio-Medico di Roma, Italy
Mariassunta Spinosa, Università Campus Bio-Medico di Roma, Italy
Luca Vollero, Università Campus Bio-Medico di Roma, Italy

407 A Machine Learning-Based Voice Analysis for the Detection of Dysphagia Biomarkers

Valerio Cesarini, University of Rome Tor Vergata, Italy
Niccoló Casiddu, University of Genoa, Italy
Claudia Porfirione, University of Genoa, Italy
Giulia Massazza, University of Genoa, Italy
Giovanni Saggio, University of Rome Tor Vergata, Italy
Giovanni Costantini, University of Rome Tor Vergata, Italy

SESSION 6.2 - SPECIAL SESSION: Measurements and Sensors for Safety and Wellness of Workers

Room: Virtual Room #2

Chairs: *Carla Fanizza, DITSPIA, INAIL, Italy*

Maria Sabrina Sarto, DIAEE, CNIS, Sapienza University of Rome, Italy

Marco Di Rienzo, IRCCS Fondazione Don Carlo Gnocchi, Italy

Enzo Pasquale Scilingo, University of Pisa, Italy

Fabio Di Francesco, University of Pisa, Italy

- Maurizio Ferrarin, *IRCCS Fondazione Don Carlo Gnocchi, Italy*
Antonio Lanatà, *University of Florence, Italy*
Calogero Maria Oddo, *Scuola Superiore Sant'Anna, Pisa, Italy*
Emiliano Schena, *Università Campus Bio-Medico di Roma, Italy*
- 412 **Radar-Based Monitoring of the Worker Activities by Exploiting Range-Doppler and Micro-Doppler Signatures**
Emanuele Cardillo, University of Messina, Italy
Changzhi Li, Texas Tech University, USA
Alina Caddemi, University of Messina, Italy
- 417 **Initial evaluation of a portable ultrasound exposimeter for occupational health monitoring**
Michal Cieslak, Physikalisch-Technische Bundesanstalt, Germany
Christoph Kling, Physikalisch-Technische Bundesanstalt, Germany
Andrea Wolff, Institut für Arbeitsschutz der Deutschen Gesetzlichen Unfallversicherung, Germany
- 423 **Analysis of Physiological Parameters and Workload during Working Tasks in COVID-19 Pandemic Conditions**
Christian Tamantini, Università Campus Bio-Medico di Roma, Italy
Martina Lapresa, Università Campus Bio-Medico di Roma, Italy
Francesco Scotto di Luzio, Università Campus Bio-Medico di Roma, Italy
Francesca Cordella, Università Campus Bio-Medico di Roma, Italy
Loredana Zollo, Università Campus Bio-Medico di Roma, Italy
- 429 **Architecture of a Wireless Wearable Body Area Sensor Network for Work Risk Assessment**
Stefano Di Modica, University of Pisa, Italy
Marco Di Rienzo, Fondazione Don Carlo Gnocchi, Italy
Fabio Di Francesco, University of Pisa, Italy
Enzo Pasquale Scilingo, University of Pisa, Italy
Antonio Lanatà, University of Florence, Italy
- 433 **A clustering-based approach for quality level verification of sanitation procedures in workplaces**
Francesca Santucci, Università Campus Bio-Medico di Roma, Italy
Luca Faramondi, Università Campus Bio-Medico di Roma, Italy
Roberto Setola, Università Campus Bio-Medico di Roma, Italy
Marco Massenzi, Teleconsys S.p.A, Italy
Francesco Orlando, Teleconsys S.p.A, Italy
- 439 **Respiratory rate monitoring of video terminal operators based on fiber optic technology**
Daniela Lo Presti, Università Campus Bio-Medico di Roma, Italy
Martina Zaltieri, Università Campus Bio-Medico di Roma, Italy
Joshua Di Tocco, Università Campus Bio-Medico di Roma, Italy
Carlo Massaroni, Università Campus Bio-Medico di Roma, Italy
Giacomo D'Alesio, Scuola Superiore Sant'Anna, Italy
Jessica D'Abbraccio, Scuola Superiore Sant'Anna, Italy
Mariangela Filosa, Scuola Superiore Sant'Anna, Italy
Calogero Maria Oddo, Scuola Superiore Sant'Anna, Italy
Maria Chiara Carrozza, Scuola Superiore Sant'Anna, Italy
Maurizio Ferrarin, IRCCS Fondazione Don Carlo Gnocchi, Italy
Marco Di Rienzo, IRCCS Fondazione Don Carlo Gnocchi, Italy
Emiliano Schena, Università Campus Bio-Medico di Roma, Italy
- 444 **Enhancing joint torque estimation of the workers using 3D body models**
Teodorico Caporaso, University of Naples Federico II, Italy
Stanislao Grazioso, University of Naples Federico II, Italy
Dario Panariello, University of Naples Federico II, Italy
Roberta Antonia Ruggiero, BeyondShape, Italy
Angela Palomba, University of Campania Luigi Vanvitelli, Italy
Giuseppe Di Gironimo, University of Naples Federico II, Italy
-

Wednesday, June 9

SESSION 7.1 - SPECIAL SESSION: Zero Defect Manufacturing - Part I

Room: Virtual Room #1

Chairs: Daniela Kirchberger, *PROFACTOR GmbH, Austria*

Christian Eitzinger, *PROFACTOR GmbH, Austria*

Raul Poler, *CIGIP - Universitat Politècnica de València, Spain*

449 The ROBxTASK architecture for interoperability of robotic systems

Georg Weichhart, PROFACTOR GmbH, Austria

Andreas Pichler, PROFACTOR GmbH, Austria

Felix Strohmeier, Salzburg Research Forschungsgesellschaft mbH, Austria

Mathias Schmoigl, Salzburg Research Forschungsgesellschaft mbH, Austria

Helmut Zörrer, PROFACTOR GmbH, Austria

454 Industrial Data Services for Quality Control in Smart Manufacturing – the i4Q Framework

Anastasios Karakostas, Centre for Research and Technology Hellas, Greece

Raul Poler, Universitat Politècnica de València, Spain

Francisco Fraile, Universitat Politècnica de València, Spain

Stefanos Vrochidis, Centre for Research and Technology Hellas, Greece

458 Deep learning for zero-defect inkjet-printing of electronics

Flaig Minnette, PROFACTOR GmbH, Austria

Zambal Sebastian, PROFACTOR GmbH, Austria

464 Multi-tenant Data Management in Collaborative Zero Defect Manufacturing

Francisco Fraile, Universitat Politècnica de València, Spain

Leticia Montalvillo, Industrial Cybersecurity IKERLAN, Spain

María Ángeles Rodríguez, Universitat Politècnica de València, Spain

Héctor Navarro, Universitat Politècnica de València, Spain

Ángel Ortiz, Universitat Politècnica de València, Spain

SESSION 7.2 - SPECIAL SESSION: Wearable Sensors and Devices for Unobtrusive Physiological Monitoring - Part I

Room: Virtual Room #2

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

Wei Gao, *California Institute of Technology, USA*

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

Giorgio Pennazza, *Università Campus Bio-Medico di Roma, Italy*

469 Metrological Characterization of a new textile sensor for temperature measurements and a comparison with a Pt100 sensor

Giorgia Mazzini, University of Florence, Italy

Lorenzo Capineri, University of Florence, Italy

Andrea Zanobini, University of Florence, Italy

Riccardo Marchesi, Knitronix srl, Italy

473 Wearable system for elbow angles estimation based on a polymer encapsulated conductive textile

Joshua Di Tocco, Università Campus Bio-Medico di Roma, Italy

Arianna Carnevale, Università Campus Bio-Medico di Roma, Italy

Marco Bravi, Università Campus Bio-Medico di Roma, Italy

Umile Giuseppe Longo, Università Campus Bio-Medico di Roma, Italy

Silvia Sterzi, Università Campus Bio-Medico di Roma, Italy

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

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

478 Wearable Sensor based on Fiber Bragg Grating with Flexible Polymer for Squat Exercise

Dongjoo Shin, Sungkyunkwan University, Republic of Korea

Taesung Kim, Sungkyunkwan University, Republic of Korea

482 An accurate and stable bed-based ballistocardiogram measurement and analysis system

Niccolò Mora, University of Parma, Italy
Federico Cocconcelli, University of Parma, Italy
Guido Matrella, University of Parma, Italy
Giovanni Chiorboli, University of Parma, Italy
Paolo Ciampolini, University of Parma, Italy

SESSION 7.3 - SPECIAL SESSION: Additive Manufacturing for Industry 4.0

Room: Virtual Room #3

Chairs: *Eduardo Palermo, Sapienza University of Rome, Italy*
Ilaria Mileti, Sapienza University of Rome, Italy
Livio D'Alvia, Sapienza University of Rome, Italy

488 Microwave characterization of Polyamide 6 Graphene Nanoplatelet Composites

Erika Pittella, Pegaso University, Italy
Emanuele Piuzzi, Sapienza - University of Rome, Italy
Pietro Russo, Institute for Polymers, Composites and Biomaterials IPCB-CNR, Italy
Francesco Fabbrocino, Pegaso University, Italy

493 FEM deformation analysis of a transtibial prosthesis fed with gait analysis data: A preliminary step towards restoring proprioception in amputees

Francesco Castelli Gattinara Di Zubiena, Sapienza University of Rome, Italy
Federica Perugini, Sapienza University of Rome, Italy
Marco Germanotta, IRCCS Fondazione Don Carlo Gnocchi, Italy
Irene Aprile, IRCCS Fondazione Don Carlo Gnocchi, Italy
Gabriele Cortis, Sapienza University of Rome, Italy
Zaccaria Del Prete, Sapienza University of Rome, Italy
Eduardo Palermo, Sapienza University of Rome, Italy

499 Reproducibility and Embedding Effects on Static Performace of 3D Printed Strain Gauges

Ilaria Mileti, University Niccolò Cusano, Italy
Luca Cortese, Sapienza University of Rome, Italy
Zaccaria Del Prete, Sapienza University of Rome, Italy
Eduardo Palermo, Sapienza University of Rome, Italy

505 Uncertainty assessment techniques for selective laser melting process control

Gennaro Salvatore Ponticelli, University Niccolò Cusano, Italy
Simone Venettacci, University Niccolò Cusano, Italy
Flaviana Tagliaferri, University Niccolò Cusano, Italy
Oliviero Giannini, University Niccolò Cusano, Italy
Fabrizio Patanè, University Niccolò Cusano, Italy
Stefano Guarino, University Niccolò Cusano, Italy

SESSION 8.1 - SPECIAL SESSION: Zero Defect Manufacturing - Part II

Room: Virtual Room #1

Chairs: *Daniela Kirchberger, PROFACTOR GmbH, Austria*
Christian Eitzinger, PROFACTOR GmbH, Austria
Raul Poler, CIGIP - Universitat Politècnica de València, Spain

510 Smart Digital Twin for ZDM-based job-shop scheduling

Julio César Serrano Ruiz, Universitat Politècnica de València, Spain
Josefa Mula Bru, Universitat Politècnica de València, Spain
Raúl Poler Escoto, Universitat Politècnica de València, Spain

- 516 **Big Data Provision for Digital Twins in Industry 4.0 Logistics Processes**
Paulo Figueiras, CTS, UNINOVA, Portugal
Luis Lourenço, CTS, UNINOVA, Portugal
Ruben Costa, CTS, UNINOVA, Portugal
Diogo Graça, Volkswagen Autoeuropa, Portugal
Gisela Garcia, Volkswagen Autoeuropa, Portugal
Ricardo Jardim-Gonçalves, CTS, UNINOVA, Portugal
- 522 **Towards Zero Defect Manufacturing: probabilistic model for quality control effectiveness**
Elisa Verna, Politecnico di Torino, Italy
Gianfranco Genta, Politecnico di Torino, Italy
Maurizio Galetto, Politecnico di Torino, Italy
Fiorenzo Franceschini, Politecnico di Torino, Italy
- 527 **Failure prediction through a model-driven machine learning method**
Amirreza Baghbanpourasl, PROFACTOR GmbH, Austria
Daniela Kirchberger, PROFACTOR GmbH, Austria
Christian Eitzinger, PROFACTOR GmbH, Austria

SESSION 8.2 - SPECIAL SESSION: Wearable Sensors and Devices for Unobtrusive Physiological Monitoring - Part I

Room: Virtual Room #2

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

Wei Gao, *California Institute of Technology, USA*

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

Giorgio Pennazza, *Università Campus Bio-Medico di Roma, Italy*

- 532 **Smart Mattress Based on Fiber Bragg Grating Sensors for Respiratory Monitoring: A Feasibility Test**

Francesca De Tommasi, Università Campus Bio-Medico di Roma, Italy

Daniela Lo Presti, Università Campus Bio-Medico di Roma, Italy

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

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

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

- 538 **Single beat ECG-based Identification System: development and robustness test in different working conditions**

Riccardo Sorvillo, Università Campus Bio-Medico di Roma, Italy

Luca Bacco, Università Campus Bio-Medico di Roma, Italy

Mario Merone, Università Campus Bio-Medico di Roma, Italy

Alessandro Zompanti, Università Campus Bio-Medico di Roma, Italy

Marco Santonico, Università Campus Bio-Medico di Roma, Italy

Giorgio Pennazza, Università Campus Bio-Medico di Roma, Italy

Giulio Iannello, Università Campus Bio-Medico di Roma, Italy

- 544 **Respiratory Rate Estimation During Walking/Running Activities Using Principal Components Estimated from Signals Recorded by a Smart Garment Embedding Piezoresistive Sensors**

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

Joshua Di Tocco, Università Campus Bio-Medico di Roma, Italy

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

Giovanni Di Pino, Università Campus Bio-Medico di Roma, Italy

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

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

- 550 **An undershirt for monitoring of multi-lead ECG and respiration wave signals**

Luca De Vito, University of Sannio, Italy

Enrico Picariello, University of Sannio, Italy

Francesco Picariello, University of Sannio, Italy

Ioan Tudosa, University of Sannio, Italy

Luca Loprevite, Modaimpresa S.r.l., Italy

Davide Avicolli, Modaimpresa S.r.l., Italy

Gennaro Laudato, University of Molise, Italy

Rocco Oliveto, University of Molise, Italy

SESSION 8.3 - General Session - PART II

Room: Virtual Room #3

Chairs: Joshua Di Tocco, *Università Campus Bio-Medico di Roma, Italy*

- 556 **Missing data imputation in meteorological datasets with the GAIN method**
Marina Popolizio, Politecnico di Bari, Italy
Alberto Amato, Politecnico di Bari, Italy
Tiziano Politi, Politecnico di Bari, Italy
Roberto Calienno, Università Giustino Fortunato, Italy
Vincenzo Di Lecce, Politecnico di Bari, Italy
- 561 **Metrological Characterization of Measurement Systems through Monte Carlo Simulations, Design of Experiments and Robotic Manipulation**
Davide Maria Fabris, Politecnico di Milano, Italy
Alice Meldoli, Politecnico di Milano, Italy
Remo Sala, Politecnico di Milano, Italy
Paolo Salina, Giorgi Engineering, Italy
Marco Tarabini, Politecnico di Milano, Italy
- 566 **Microfluidic arena for high-throughput C. elegans calcium imaging experiments with multiple strain confinement**
Enrico Lanza, Istituto Italiano di Tecnologia, Italy
Davide Caprini, Istituto Italiano di Tecnologia, Italy
Valeria Lucente, Istituto Italiano di Tecnologia, Italy
Viola Folli, Istituto Italiano di Tecnologia, Italy
- 572 **A WAMS emulation framework for the characterization of measurement algorithms on electrical transmission networks**
Annalisa Liccardo, University of Naples Federico II, Italy
Salvatore Tessitore, Terna Rete Italia, Italy
Cosimo Pisani, Terna Rete Italia, Italy
Francesco Bonavolontà, University of Naples Federico II, Italy
Salvatore Cacciapuoti, University of Naples Federico II, Italy
Giorgio Maria Giannuzzi, Terna Rete Italia, Italy

SESSION 9.1 - SPECIAL SESSION: Sensors, measurement systems and methods for in-line control, safety and security

Room: Virtual Room #1

Chairs: Alessandro Schiavi, *INRiM - National Institute of Metrological Research, Italy*
Ada Fort, *University of Siena, Italy*

- 578 **Towards large-scale calibrations: a statistical analysis on 100 digital 3-axis MEMS accelerometers**
Andrea Prato, INRiM – National Institute of Metrological Research, Italy
Fabrizio Mazzoleni, INRiM – National Institute of Metrological Research, Italy
Francesca R. Pennecchi, INRiM – National Institute of Metrological Research, Italy
Gianfranco Genta, Politecnico di Torino, Italy
Maurizio Galetto, Politecnico di Torino, Italy
Alessandro Schiavi, INRiM – National Institute of Metrological Research, Italy
- 583 **NO2 photoacoustic sensing system based on resonant cell and UV-LED sensor**
Ada Fort, University of Siena, Italy
Enza Panzardi, University of Siena, Italy
Valerio Vignoli, University of Siena, Italy
Elia Landi, University of Siena, Italy
Marco Mugnaini, University of Siena, Italy
Klaus Stefan Drese, Coburg University of Applied Sciences and Arts, Germany
- 588 **Quasi-Real Time Remote Video Surveillance Unit for LoRaWAN-based Image Transmission**
Ada Fort, University of Siena, Italy
Giacomo Peruzzi, University of Siena, Italy
Alessandro Pozzebon, University of Siena, Italy

594 A Dynamic Uncertainty Protocol for Digital Sensor Networks

Michael Gaitan, NIST, USA
Richard A. Allen, NIST, USA
Jon Geist, NIST, USA
Akobuije Chijioko, NIST, USA

598 Condition Monitoring with LoRaWAN: Preliminary Tests on Gas Turbine Exciters

Gabriele Di Renzone, University of Siena, Italy
Ada Fort, University of Siena, Italy
Marco Mugnaini, University of Siena, Italy
Alessandro Pozzebon, University of Siena, Italy
Valerio Vignoli, University of Siena, Italy
Alessandro Elmi, Alta Industries S.R.L., Italy

SESSION 9.2 - SPECIAL SESSION: AI-Enhanced Sensing for Industrial and Medical IoT Applications - Part II

Room: Virtual Room #2

Chairs: Luca Vollero, *University Campus Bio-Medico of Rome, Italy*

Samuel Oluwarotimi Williams, *Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, China*

604 A Comparative Analysis on the Impact of Linear and Non-Linear Filtering Techniques on EMG Signal Quality of Transhumeral Amputees

Yazan Jarrah, SIAT-UCAS, China
Mojisola Asogbon, Shenzhen Institute of Advanced Technology, China
Samuel W. Oluwarotimi, Shenzhen Institutes of Advanced Technology, China
Mingxing Zhu, Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, China
Xin Wang, Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, China
Obe O Olumide, Federal University of Technology, Nigeria
Shixiong Chen, Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, China
Guanglin Li, SIAT, China

609 A Deep Learning based Model for Decoding Motion Intent of Traumatic Brain Injured Patients' using HDsEMG Recordings

Mojisola Asogbon, Shenzhen Institute of Advanced Technology, China
Samuel W. Oluwarotimi, Shenzhen Institutes of Advanced Technology, China
Ejay Nsugbe, Independent Researcher, United Kingdom
Yazan Jarrah, SIAT-UCAS, China
Obe O Olumide, Federal University of Technology, Nigeria
Yanjuan Geng, Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences, China
Guanglin Li, SIAT, China

615 A Novel Synchronous Hybrid Steady-State Brain-Computer Interface Based on Visual and Auditory Integration

Jun Xie, Xi'an Jiaotong University, China
Zhiyuan Ren, Xi'an Jiaotong University, China
Yi Liu, Beijing Institute of Astronautical Systems Engineering, China
Peng Fang, Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, China
Guanglin Li, SIAT, China
Mengwei Zhang, Xi'an Jiaotong University, China

620 NMF Based System for Speaker Identification

Giovanni Costantini, University of Rome Tor Vergata, Italy
Valerio Cesarini, University of Rome Tor Vergata, Italy
Fabio Paolizzo, University of Rome Tor Vergata, Italy

625 A New Multilabel System for Automatic Music Emotion Recognition

Fabio Paolizzo, University of Rome Tor Vergata, Italy
Natalia Pichierri, University of Rome Tor Vergata, Italy
Daniele Giardino, University of Rome Tor Vergata, Italy
Marco Matta, University of Rome Tor Vergata, Italy
Daniele Casali, University of Rome Tor Vergata, Italy
Giovanni Costantini, University of Rome Tor Vergata, Italy

SESSION 9.3 - SPECIAL SESSION: Measurement Systems in the Industrial IoT era

Room: Virtual Room #3

Chairs: Ivanovitch Silva, *Federal University of Rio Grande do Norte, Brazil*
Dennis Brandão, *Universidade de São Paulo, Brazil*
Paolo Ferrari, *University of Brescia, Italy*

630 Impact of Usage Profiles on Remaining Useful Life and Post-Prognostic Maintenance Decisions

Roberto Bodo, Università degli Studi di Padova, Italy
Matteo Bertocco, Università degli Studi di Padova, Italy
Alberto Bianchi, Carel Industries SPA, Italy

636 Towards fixtureless robotic in-line measurement assisted assembly, a case study

Victor Azamfirei, Malardalen University, Sweden
Anna Granlund, Malardalen University, Sweden
Yvonne Lagrosen, Malardalen University, Sweden
William J. Palm, Robotdalen, Sweden

642 An Unsupervised TinyML Approach Applied for Pavement Anomalies Detection Under the Internet of Intelligent Vehicles

Pedro Andrade, Federal University of Rio Grande do Norte, Brazil
Ivanovitch Silva, Federal University of Rio Grande do Norte, Brazil
Gabriel Signoretti, Federal University of Rio Grande do Norte, Brazil
Marianne Silva, Federal University of Rio Grande do Norte, Brazil
Joao Dias, Federal University of Rio Grande do Norte, Brazil
Lucas Marques, Federal University of Rio Grande do Norte, Brazil
Daniel G. Costa, State University of Feira de Santana, Brazil

648 MSensorMob: A Multi-Sensors Hardware Framework to Support the Development of Adaptable Monitoring Units in Mobile Applications

Franklin Oliveira, State University of Feira de Santana, Brazil
Daniel G. Costa, State University of Feira de Santana, Brazil
Ivanovitch Silva, Federal University of Rio Grande do Norte, Brazil
Pedro Andrade, Federal University of Rio Grande do Norte, Brazil
Anfranserai Dias, State University of Feira de Santana, Brazil

654 RFID based Predictive Maintenance System for Chemical Industry

Simone Nappi, University of Rome Tor Vergata & Radiobense srl, Italy
Sara Amendola, University of Rome Tor Vergata & Radiobense srl, Italy
Marco Ramacciotti, ISE srl, Italy
Edoardo Zambonini, ISE srl, Italy
Nicola D'Uva, Radiobense srl, Italy
Francesca Camera, University of Rome Tor Vergata, Italy
Carolina Miozzi, University of Rome Tor Vergata, Italy
Cecilia Occhiazzi, University of Roma Tor Vergata & DICII, Italy
Gaetano Marrocco, University of Rome Tor Vergata, Italy

SESSION 10.1 - SPECIAL SESSION: Wireless Solutions for IoT-based Measurements over Wide Areas

Room: Virtual Room #1

Chairs: Emiliano Sisinni, *University of Brescia, Italy*
Diego Silva, *Federal University of Rio Grande do Norte, Brazil*

Federico Tramarin, *University of Modena and Reggio Emilia, Italy*

659 A real-time MCU-based wireless system for remote monitoring of PV devices

Antonino Laudani, Roma Tre University, Italy

Valentina Lucaferri, Roma Tre University, Italy

Martina Radicioni, Roma Tre University, Italy

Francesco Riganti Fulginei, Roma Tre University, Italy

665 Turning old into new: adding LoRaWAN connectivity to PLC in brownfield installations

Paolo Ferrari, University of Brescia, Italy

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Marco Pasetti, University of Brescia, Italy

Stefano Rinaldi, University of Brescia, Italy

671 Adaptive LoRaWAN Transmission exploiting Reinforcement Learning: the Industrial Case

Tommaso Fedullo, University of Padova, Italy

Alberto Morato, University of Padova, Italy

Federico Tramarin, University of Modena and Reggio Emilia, Italy

Paolo Bellagente, University of Brescia, Italy

Paolo Ferrari, University of Brescia, Italy

Emiliano Sisinni, University of Brescia, Italy

677 IoT framework with flexible management of multi-protocol nodes for redundancy applications

Diego Silva, Universidade Federal do Rio Grande do Norte, Brazil

Vinicius S. S. Lima, Federal University of Rio Grande do Norte, Brazil

Hudson B. M. Alves, Federal University of Rio Grande do Norte, Brazil

Rafael N Cunha, Universidade Federal do Rio Grande do Norte, Brazil

Emiliano Sisinni, University of Brescia, Italy

Paolo Ferrari, University of Brescia, Italy

SESSION 10.2 - SPECIAL SESSION: Measurements and Virtual Measurements for Industry 4.0: Approaches and Solutions for Smart Manufacturing

Room: Virtual Room #2

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

Antonella Gaspari, Polytechnic of Bari, Italy

Emanuela Natale, University of L'Aquila, Italy

682 Edge-enabled cloud computing management platform for smart manufacturing

Jeffrey Ying, Caloudi Corporation, Taiwan

Jackie Hsieh, Caloudi Corporation, Taiwan

Dennis Hou, Caloudi Corporation, Taiwan

Janpu Hou, Caloudi Corporation, Taiwan

Tuo Liu, Yuanjie Semiconductor Technology, China

Xiaobin Zhang, Yuanjie Semiconductor Technology, China

Yuxi Wang, Yuanjie Semiconductor Technology, China

Yen-Ting Pan, Yuanjie Semiconductor Technology, China

687 Managing the sampling rate variability of digital MEMS accelerometers in dynamic calibration

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

Antonella Gaspari, Politecnico di Bari, Italy

Emanuela Natale, University of L'Aquila, Italy

Andrea Prato, INRiM - National Institute of Metrological Research, Italy

Fabrizio Mazzoleni, INRiM - National Institute of Metrological Research, Italy

Alessandro Schiavi, INRiM - National Institute of Metrological Research, Italy

693 Dimensional measurements in production line: a comparison between a custom-made telecentric optical profilometer and on-the-market measurement systems

Alessia Baleani, Università Politecnica delle Marche, Italy
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Lorenzo Zampetti, Project Engineer Z4tec, Italy
Marco Zannini, General Manager Zannini, Italy
Saverio Zitti, Business Developer Z4tec, Italy

699 Enhancing Object Detection Performance Through Sensor Pose Definition with Bayesian Optimization

Loris Roveda, Istituto Dalle Molle di studi sull'Intelligenza Artificiale, Switzerland
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Giuseppe Bucca, Politecnico di Milano, Italy
Dario Piga, Istituto Dalle Molle di studi sull'Intelligenza Artificiale, Switzerland

SESSION 10.3 - SPECIAL SESSION: Cybersecurity Standards and Technologies for IoT and Industry 4.0 (SecurityStandards)

Room: Virtual Room #3

Chairs: Alan Oliveira de Sá, *Admiral Wandenkolk Instruction Center, Brazil*
Lucila Maria de Souza Bento, *Inmetro, Brazil*

704 Securing the metrological chain in IoT environments: an architectural framework

Helder Aranha, ESPAP, I.P., Portugal
Massimiliano Masi, Tiani "Spirit" GmbH, Austria
Tanja Pavleska, Jozef Stefan Institute, Slovenia
Giovanni Paolo Sellitto, Independent Scholar

710 Soft Computing Optimization of Stealth Data Loss Attack to Industrial Control Systems

Philippe de A. A. Ciampi, Brazilian Navy, Brazil
Micky Steve M. Lins, Brazilian Navy, Brazil
Paolo Ferrari, University of Brescia, Italy
Alan Oliveira de Sá, Brazilian Navy, Brazil

715 Testing and selecting lightweight pseudo-random number generators for IoT devices

Augusto Parisot, Fluminense Federal University, Brazil
Lucila M. S. Bento, Nautilus Laboratory Armor Shield Innovation Company, Brazil
Raphael C. S. Machado, Nat. Inst. Metrology, Quality and Technology, Fluminense Federal University, Brazil

721 Towards a Practical Information Security Maturity Evaluation Method focused on People, Process and Technology

Davidson R. Boccardo, Clavis Information Security, Brazil
Lucila M. S. Bento, Armor Shield Innovation Co, Brazil
Fernando H. Costa, Clavis Information Security, Brazil

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