Research and Technologies for Society and Industry
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Tutorial Program

Monday September 10	10:30 – 12:30	Tutorial Track 1 **Towards connected vehicles enabled smart transportation** S. Djahel Senior lecturer at the School of Computing, Mathematics and Digital Technology, Manchester Metropolitan University, UK
Tuesday September 11	14:30 – 16:30	Tutorial Track 2 **Additive manufacturing and 3D printing for medicine: experiences and opportunities** F. Auricchio Full Professor of Solids and Structural Mechanics, University of Pavia, Italy
Tuesday September 11	17:00 – 19:00	General tutorial **Competence Centers as a key line of Italian Industry 4.0 Plan: role and expected outcomes** L. Angrisani Full Professor of Electrical and Electronic Measurements, University of Naples Federico II, Italy F. Dughiero Full Professor of Electromagnetic Processing of Materials, University of Padova, Italy
Wednesday September 12	09:00 – 11:00	General tutorial **Ethical considerations in system design** A.G. Hessami Director of R&D and Innovation at Vega Systems, UK
Thursday September 13	9:00 – 10:30	Tutorial Track 3 **Machine-Type Communications (MTC) in 5G: challenges, algorithmic design and performance analysis** M. Assaad Professor and Holder of the TCL Chair at CentraleSupélec, France

Tutorial Presentation

Tutorial Track 1

Towards connected vehicles enabled smart transportation

Speaker

Prof. Soufiene Djahel - School of Computing, Mathematics and Digital Technology Manchester Metropolitan University, UK

Summary

Smart transportation, a main pillar of future smart cities, aims to leverage advanced technologies to enable smarter, eco-friendly and more efficient mobility of people and goods around the world, especially in big cities. The projected massive growth of the number of vehicles on the roads (2.9 billion vehicles by 2050 according to a recent UN report), plus urban transformation and a trend towards mega cities create greater and more challenges for achieving smart transportation goals. Among these challenges, the excessive traffic congestion and its resulting impact on travellers' journey experience, road safety, air quality and economy. In this tutorial, we will give an overview of the recent advances on smart transportation with special focus on Connected and Smart Vehicles (CSVs) and how this emerging technology can enable safer driving, shorter journey times and less CO_2 emissions. We will also shed the light on the main emerging challenges hindering the achievement of a sustainable and efficient smart mobility system.

Brief CV of the speaker

Soufiene Djahel is Senior Lecturer at the School of Computing, Mathematics and Digital Technology, Manchester Metropolitan University (UK) since Sep. 2015. Prior to this, he held an Engineering Research Manager position at University College Dublin (Ireland) where he was conducting and leading research activities on smart transportation for almost four years. Dr. Djahel received his M.Sc. and Ph.D. degrees in computer science from A. Mira University (Algeria, 2007) and Lille 1 University- Science and Technology (France, 2010), respectively. His current research interests include smart transportation, vehicular networks, security and QoS issues in wireless networks and e-health. He is a senior member of the IEEE and Fellow of the Higher Education Academy in the UK. Dr. Djahel serves as TPC member in many IEEE flagship conferences and as a reviewer for several IEEE journals in his research areas. He was the general co-chair of VTM 2014, RA-WERHA 2015, ISNCC 2016 and ICT-DM 2018 and the TPC co-chair of VTM 2012, ISNCC 2015 and IEEE ISC2 2016 & 2017.

Tutorial Presentation

Tutorial Track 2

Additive manufacturing and 3D printing for medicine: experiences and opportunities

Speaker

Prof. Ferdinando Auricchio - Full Professor of Solids and Structural Mechanics, University of Pavia, Italy

Summary

Today, 3D printing and other Additive Manufacturing technologies are important drivers of technological innovation in many scientific fields; numerous 3D printing applications are proposed, developed and applied, promising a revolution in conventional technologies. In the field of biomedical engineering and therefore of medicine there are different opportunities for the application of 3D printing, thanks to the development of new materials and printing technologies, in diagnostic processes such as in surgical interventions.

Brief CV of the speaker

Ferdinando Auricchio is full professor of Solids and Structural Mechanics, Department of Civil Engineering and Architecture at University of Pavia, Italy. Since 2001 he is research associate at IMATI-CNR (Institute for Applied Mathematics and Information Technologies of the National Research Council), Pavia, Italy. In 2012 he had the Fellow Award by IACM (International Association for Computational Mechanics); in 2016 he won the Euler Medal by ECCOMAS (European Community of Computational Methods in Applied Sciences).

Author of over 200 publications on internatinal journals, his main research topics regard:

− 3D printing: modeling of phenomena occurring during 3D printing at different scales and with different technologies (mainly, FDM & SLM), activation of a 3D printing lab with different technologies;

− Mixed finite elements: development and analysis of finite element methods for Reissner-Mindlin plates, laminates, shells, locking problems in small and large deformation regimes;

− Material constitutive modeling: static and dynamic response for low and high number of cycles, advanced materials (shape memory alloys and self-diagnosing materials);

− Biomechanics: constitutive laws for biological tissue, modeling and investigation of minimally invasive procedures (stenting) as well as invasive cardio-surgery procedures, generation of computational models from patient-specific medical images; i

− Isogeometric analysis: structural mechanics problems in small and large deformations.

Tutorial Presentation

General tutorial

Competence Centers as a key line of Italian Industry 4.0 Plan: role and expected outcomes

Speakers

Prof. Leopoldo Angrisani – Full Professor of Electric and Electronic Measurements, University of Naples Federico II, Italy

Prof. Fabrizio Dughiero – Full Professor of Electromagnetic Processing of Materials, University of Padova, Italy

Summary

Appeared for the first time during the presentation of the Italian Industry 4.0 Plan, on September 2016, as part of the Plan itself, the national Competence Centers are now beginning to take shape to allow Italian industries to create innovative products keeping up with the trend 4.0.

Eight Competence Centers have been selected according to the Italian Economic Development Ministry Call dated as January 2018. The aim of the Call was: "*Establishment of centers capable of promoting the transfer of technological solutions and innovation in processes, products and business models deriving from the development, adoption and diffusion of the technologies in the 4.0 area, according to the framework of the Italian Industry 4.0 Plan*".

They are configured as a Service Center, in the form of public-private partnership, and differentiated by skills not by geographical location. Major Italian universities are involved, among which the Polytechnics of Turin, Milan and Bari, University of Padova, University of Bologna, School of Advanced Studies Sant'Anna of Pisa, the University of Naples Federico II, the University of Rome La Sapienza.

They can play a decisive role in defining the future of Industry 4.0 in Italy, and can exert an influence that can go well beyond national borders. In theory they are called to perform three main functions, for the benefit mainly of small and medium enterprises: assessing digital maturity; training on Industry 4.0 enabling technologies; promoting industrial research and innovation projects.

But how will they really work? What will they have to do and how, in the transition from theory to practice? How could small and medium-sized entrepreneurs benefit?

The Tutorial will try to provide answers to these questions.

Brief CV of the speakers

Leopoldo Angrisani is Full Professor of Electrical and Electronic Measurements with the Department of Information Technology and Electrical Engineering of the University of

Naples Federico II. He is also General Manager/Director of CeSMA – Center of Advanced Measurement and Technology Services of the same university. His research activity is currently focused on communication systems and networks test and measurement; measurements for Internet of Things and Industry 4.0applications; compressive sampling based measurements; measurement uncertainty. He was and is currently involved, as a scientific coordinator, in many industrial research projects in cooperation with small, medium and great enterprises. He is currently playing a relevant role in designing and developing the strategic pillars on which the constituting national Competence Center on Industry 4.0, led by Federico II University, is going to be based. He is Senior Member of the IEEE I&M and Communications Societies and Chair of the IEEE I&M Society Italy Chapter. He is Representative of Italy in the IEC Validation Team-VT 60050 for maintenance and management of the International Electrotechnical Vocabulary. He is member of the Editorial Board of Sensors Journal by MDPI, and in particular of its Section Board for "Internet of Things". In 2009, he was awarded the IET Communications Premium for the paper entitled "Performance measurement of IEEE 802.11b-based networks affected by narrowband interference through cross-layer measurements" (published in IET Communications, vol. 2, No. 1, January 2008). In 2013, he was awarded the prestigious recognition "IEEE Transactions on Instrumentation and Measurement Outstanding Reviewer". As Chair of the IEEE Instrumentation & Measurement Society Italy Chapter, in 2016 he was awarded the prestigious recognition "I&M Society Best Chapter Award". He is the author or co-author of more than 300 scientific articles, one-third of which published in relevant international journals.

Fabrizio Dughiero (Degree in Electrical Engineering, MBA) is currently full professor of Electromagnetic processing of Materials (EPM) at the university of Padova and Chief Scientist of Laboratory of Electroheat of Padova. He is currently Vice Rector for Tech Transfer. His current research activity, documented by more than 180 scientific publications, and about 15 deposited patents, mainly deals with theoretical aspects and applications of EPM and electroheat technologies spanning from industrial heat treatments of metals to thermal characterization of magnetic nanoparticles for cancer therapy, to household applications like induction cooktops and solid state microwave ovens. He has been founder of two spin-off companies and founder of Unismart Padova Enterprise, a new in-house limited company aimed to Tech Transfer of University of Padova. He is involved in many industrial research projects in cooperation with small, medium and large enterprises. He is currently leading the national SMACT (Social, Mobile, Analytics, Cloud, Internet of Things) Competence Center on Industry 4.0, led by University of Padova, involving all the universities of North East Italy Region.

Tutorial Presentation

General tutorial

Ethical considerations in system design

Speaker

Prof. Ali G. Hessami - Director of R&D and Innovation at Vega Systems, UK

Summary

This tutorial will cover the current focus within the Engineering Institutions on the ethical consideration and a development of a process for ethical assurance in product, systems and service development. The work of the UK Royal Academy of Engineering and the IEEE SA P7000 standard under development will be presented as a basis for raising awareness and providing a systematic framework for the innovators, researchers and technologists as well as small and large enterprises involved in technology innovation and development.

Brief CV of the speaker

Ali is currently the Director of R&D and Innovation at Vega Systems, UK. He is an expert in the systems assurance and safety, security, sustainability and knowledge assessment/ management methodologies and has a background in design and development of advanced control systems for business and safety critical industrial applications. Ali project managed the safety analysis and assessment of European Rail Traffic Management System's ETCS for the EU Commission under the ESROG project. He also project managed the development of an advanced and systematic Safety & Risk Management System for EU Commission under SAMRail project, in support of the European Railway Safety Directive. He contributed significant original material to CENELEC WGA10 Report TR-50451 on Allocation of Safety Integrity & authored TR-50506-1 on the Cross-Acceptance of Signalling Systems. He is a UK expert on CENELEC & IEC safety systems, hardware & software standards committees. He was appointed by CENELEC as convenor of WGA11 for review of EN50128 Software Safety Standard and Convenor of RG3 in WG14, responsible for update and restructuring of the software, hardware and system safety standards in CENELEC. He is also a member of CENELEC Railway Cyber Security Standardisation SGA16, SG24 Survey Groups and WG26 working group on IT SecurityAli is also a member of the Working Group and has been elected as the Technical Editor for the IEEE P7000, Model Process for Addressing Ethical Concerns During System Design Standard. He is a Visiting Professor at London City University's Centre for Systems and Control in the School of Engineering & Mathematics and at Beijing Jiaotong University School of Electronics & Information Engineering. He is also a Fellow of Royal Society of Arts, Fellow of the Institution of Engineering & Technology and a Senior Member of IEEE.

Tutorial Presentation

Tutorial Track 3

Machine-Type Communications (MTC) in 5G: challenges, algorithmic design and performance analysis

Speaker

Prof. M. Assaad - Full Professor of TLC 5G, CentraleSupélec, France

Summary

Wireless communications are fast evolving in order to meet the emergence of new domains in the market of the wireless communications, such as smart cities, eHealth, automotive, etc. The next generation of cellular networks (5G) is expected to support 1000-fold increases in traffic demand and to tackle the challenge of connecting billions of devices with heterogeneous service requirements. This necessitates drastic changes in the network paradigm in addition to a large array of disruptive innovations at both physical and networking layers. This talk will provide an overview of the recent advances in this area with a main focus on the technologies required to support the demands of a high number of connected MTC devices with low data capacity and/or latency-sensitivity requirements. Intuitive understanding of recent research results and identification of some open problems will also be presented.

Brief CV of the speaker

Mohamad Assaad received the MSc and PhD degrees, both in telecommunications, from Telecom ParisTech, Paris, France, in 2002 and 2006, respectively. Since 2006, he has been with the Telecommunications Department at CentraleSupélec, where he is currently a professor and holds the TCL Chair on 5G. He has co-authored 1 book and more than 90 publications in journals and conference proceedings and serves regularly as TPC member for several top international conferences. He is an Editor for IEEE Wireless Communications Letters and has served as Co-Chair of IEEE ICC 2017 Wireless Communications Symposium. He has given in the past successful tutorials on 5G systems at various conferences including IEEE ISWCS'15 and IEEE WCNC'16 conferences. His research interests include mathematical modeling of communication networks, MIMO systems, resource management and cross-layer design in wireless networks. He is a Senior Member of the IEEE.