TUTORIAL

"Symbiotic Autonomous Systems in Smart-Cities and Industry 4.0"
for SMC'19
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Tutorial organizers

Francesco Flammini, Linnaeus University, francesco.flammini@lnu.se

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Type of tutorial

Talk and discussion with exercises

Speakers

Rodolfo Fiorini, Politecnico di Milano

Roberto Saracco, EIT ICT Labs Italy, IEEE FDC

Contact information

Roberto Saracco

President

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Biography of the contact organizers

Roberto Saracco fell in love with technology and its implications long time ago. His background is in math and computer science. Until April 2017 he led the EIT Digital Italian Node and then was head of the Industrial Doctoral School of EIT Digital up to September 2018. Previously, up to December 2011 he was the Director of the Telecom Italia Future Centre in Venice, looking at the interplay of technology evolution, economics and society. At the turn of the century he led a World Bank-Infodev project to stimulate entrepreneurship in Latin America.

He is a senior member of IEEE where he leads the Industry Advisory Board within the Future Directions Committee, chairs the Symbiotic Autonomous Systems Initiative and co-chairs the Digital Reality fostering Digital Transformation Initiative. He teaches a Master course on Technology Forecasting and Market impact at the University of Trento and he is a COMSOC Distinguished Lecturer. He has published over 200 papers in journals and magazines and 14 books.

He writes a daily blog, http://sites.ieee.org/futuredirections/category/blog/, with commentary on innovation in various technology and market areas.

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Abstract of the tutorial

Symbiotic Autonomous Systems

This Tutorial is fully in line with the SMC 2019 focus and it leverages on education material that has been prepared in the last three months and that is now available. Participants to the tutorial will be provided access to relevant video lectures.

Today, we are at a crossroads, whereby continued advances in computerization and digitalization are bringing significant transformative changes that will impact society worldwide, revolutionizing global business operations and fundamentally altering how inanimate objects are perceived in a world increasingly reliant on autonomous systems. A key outcome of this transformation will be a notable shift in the interaction of previously independent systems, including humans, and an increased awareness and responsiveness to autonomous systems that will lead to the development of symbiotic relationships that have significant implications for human society as a whole. The IEEE FDC Digital Reality Initiative aims to take a leadership role in fostering consensus on how best to bring about symbiotic relationships between autonomous systems, and capitalize on the recognition that Symbiotic Autonomous Systems are poised to have a revolutionary impact on society over the coming years. Collaborating with IEEE communities and global organizations conducting ongoing efforts in the area of autonomous and intelligent systems, the Initiative will pave the way for the development of a new field of symbiotic systems science to consolidate and advance technological expertise with emphasis on ethical, societal, legal implications, and with the objective to promote human-centric economic growth. https:// digitalreality.ieee.org. The tutorial is structured into two parts, the first taking place in the morning is providing the basic landscape on Symbiotic Autonomous Systems, including enabling technologies, from sensors to digital twins, economic aspects and current.applications in industrial and civil environment, the second providing in depth technical insights in the area.

Part I

The evolution in the areas of machine augmentation and human augmentation is converging towards a symbioses of human and machines where we are not seeing a fight to prevail of one over the other but rather a flanking resulting in increased potential in all sectors, from wellbeing to manufacturing, from education to expression and arts. This evolution is fuelled by technology and is rooted in economics. We will be addressing both, presenting examples of today applications in industry, in smart cities, in health care and in education. A specific attention will be given to Digital Twins as the bridge between the cyberspace and the physical space. Some consideration will also be given to 5G , beyond the hype, as a communication fabric that will mark a transition from network centric to edge networks paradigms sustained, in part by autonomous systems.

Part II

Over the last few years, integration of stochastic methods into a multiscale framework or development of multiscale models in a stochastic setting for epistemic uncertainty quantification (UQ), analysis and design of physical systems is becoming an emerging research frontier. Nevertheless, to find competitive solutions, we need an extended, wider panorama, by using new eyes. To grasp a more reliable representation of reality and to get stronger biological and physical system measurement and correlates, researchers and scientists need two intelligently articulated hands: both stochastic and combinatorial approaches synergistically articulated by natural coupling. It is much better to consider ontological uncertainty as an emergent phenomenon out of a complex system, where the notion of anticipation can offer competitive computational solutions. Examples are presented and discussed.

Duration of the tutorial

SIX hours