

Industrial Cyber-Physical Systems: new trends in computing and communications

Theme: Stimulated by the rise of Industry 4.0, as well as by the pervasiveness of Information Communication Technologies (ICT), intense research in Industrial Cyber-Physical Systems (ICPS) is emerging for several applications. The further integration of the Internet of Things within the ICPS scenario triggered considerable research efforts within the new Industrial Internet of Things (IIoT) paradigm, with application scenarios like smart factories, smart energy grids, smart transportation systems, etc. One of the defining features of ICPS is the involvement of a large amount of cooperative computational elements tasked with the control of time-critical and mission-critical physical entities. These strict requirements are also shared by the IIoT scenario to provide unprecedented vertical integration, specialized high-level services, enhanced interoperability and availability. Furthermore, an ever more rising and ubiquitous trend in this IIoT context is represented by Digital Twins, where a real-time update of a large amount of data from the physical system is required to update the corresponding digital replica. As a consequence, both the computing architecture and the communication networks and protocols call for novel paradigms, albeit satisfying stringent low latency, high reliability and availability, safety, and security requirements. Traditional computing and communication and paradigms are not properly equipped to fulfill all these requirements, as they are typically designed to optimize different performance metrics and application scenarios. Hence, new paradigms are emerging, significantly changing the landscape of industrial automation systems and networks. In the computational realm, edge/fog computing is gaining popularity to leverage the enhanced capabilities of end devices, and at the same time, the interest in virtualization techniques is steadily increasing, with the aim of increasing the quality, timeliness and reliability of time-critical tasks. The new generations of communication systems, both wired and wireless, are also focused on ultra-reliable and ultra-low latency information delivery, as well as on enhanced features to enable time-sensitive operations, highlighted by the developing 5G and TSN standards. A common trend in both areas is the increasing adoption of approaches based on machine/deep learning to improve the adaptiveness of such system to different applications and environments.

This special section will focus on (but not limited to) the following topics:

- Concepts, modeling, simulation and validation of ICPS and IIoT
- Emerging applications of industrial and smart CPS in healthcare, mining, logistics, transportation, energy, manufacturing, etc.
- Security and safety solutions for ICPS
- Interoperability and standardization for computing, intelligence and communication in the ICPS and IIoT scenarios
- Cloud, edge and fog computing for ICPS and IIoT: resource allocation and management, network slicing, etc.
- Big data analysis for ICPS real-time control
- Fog-based deployment and management of AI applications in ICPS
- Machine learning techniques in real-time closed loop control
- Partitioning of machine learning frameworks over fog/edge infra
- Virtualization of computing resources
- High performance industrial wireless and wired communications
- Emerging cellular networks for critical control systems
- Convergence of industrial wired and wireless networks
- Cross layer design of computing and communications with enhanced performance
- Real-time data storage, distribution, and analytics

Manuscript Preparation and Submission

Follow the guidelines in "Information for Authors" in the IEEE Transaction on Industrial Informatics <http://www.ieee-ies.org/pubs/transactions-on-industrial-informatics>. Please submit your manuscript in electronic form through Manuscript Central web site: <https://mc.manuscriptcentral.com/tii>. On the submitting page #1 in popup menu of manuscript type, select: SS on **Industrial Cyber-Physical Systems: New Trends in Computing and Communications**

Submissions to this Special Section must represent original material that has been neither submitted to, nor published in, any other journal. Regular manuscript length is 8 pages.

Note: The recommended papers for the section are subject to final approval by the Editor-in-Chief. Some papers may be published outside the special section, at the EIC discretion.

Timetable:	Deadline for manuscript submissions	January 30, 2020
	Expected publication date (tentative)	July 2020

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