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Special Issue on Machine Learning for Resilient Industrial Cyber-Physical Systems

With the rapid development of information technologies, the computing, networking, and physical elements in industrial environments are becoming tightly amalgamated with each other, resulting in the formation of the so-called Industrial Cyber-Physical Systems (ICPS). These systems forge the core of current real-world networked industrial infrastructures, having a cyber-representation of physical assets through digitalization of data across the enterprise, along the value stream and process engineering life cycle, along the digital thread, and along the supply chain. Typical applications of ICPS include smart grids, digital factory, cognitive and collaborative robots, freight transportation, process control, plant-wide systems, medical monitoring, etc. ICPS often operate in an unpredictable and challenging environment, where various disturbances, such as unplanned natural events, human faults or malicious behaviors, software and hardware failures, etc., may occur during the automation process at runtime. Moreover, ICPS can exhibit strong reconfigurability and evolve structurally for many purposes. During this evolution, new and unforeseen possibilities in the service-oriented business process may appear among various ICPS components. In particular, new "emergent" behaviors may arise that need to be monitored, understood, managed and controlled. When there are significant uncertainties, such emergent behaviors could make the evolved ICPS unstable and unable to meet the quality/performance targets, even resulting in hazards. Well-designed machine learning techniques have the potential to effectively address the uncertainties and disturbances in the automation of ICPS. They can also facilitate the automated discovery of valuable underlying rules and patterns to improve the performance of ICPS in all phases of their life cycles. This special issue will promote the state-of-the-art research of leveraging machine learning to handle uncertainties and disturbances arisen in the automation in ICPS. The topics of interests for this special issue include, but are not limited to

* Data-driven modelling of uncertainties and disturbances in inputs, cyber or physical components, and physical surroundings in ICPS
* Machine learning based design automation to handle uncertainties and disturbances in ICPS
* Uncertainty-aware machine learning based data analytics for ICPS
* Metrics and methods to evaluate machine learning accuracy in ICPS
* Machine learning techniques to handle disturbances from environment interferences in ICPS
* Anomaly detection for malicious attacks to ICPS
* Machine learning based methodologies for resiliency driven ICPS life-cycle management
* Machine learning based modelling, analysis, simulation, and verification for ICPS
* Machine learning based solutions for resilient, dependable, and adaptive ICPS
* Machine learning based automation of digital threads in ICPS Eco-Systems
* Machine learning for automation of ICPS of Systems
* Novel industrial applications of machine learning in resilient CPS design

Important Dates

- Paper submission deadline: October 1, 2020
- Completion of the first-round review: December 15, 2020
- Completion of the second-round review: March 1, 2021
- Final submission due: April 15, 2021
- Tentative publication date: May 15, 2021

Guest Editors

Prof. Shiyan Hu
School of Electronics and Computer Science
University of Southampton, UK
Email: S.Hu@soton.ac.uk

Prof. Yiran Chen
Department of Electrical and Computer Engineering
Duke University, USA
Email: yiran.chen@duke.edu

Prof. Qi Zhu
Department of Electrical and Computer Engineering
Northwestern University, USA
Email: qzhu@northwestern.edu

Prof. Armando Walter Colombo
Department of Electrotechnical and Industrial Informatics
University of Applied Sciences Emden/Leer, Germany
Email: awcolombo@ieee.org

Paper Submission

All papers are to be submitted through the IEEE's Manuscript Central for Transactions on Automation Science and Engineering http://mc.manuscriptcentral.com/t-ase. Please select the Manuscript Category "**Machine Learning for Resilient Industrial Cyber-Physical Systems**" under "Type" in Step 1 and this specific Special Issue in Step 6 of your article's submission process. **All manuscripts must be prepared according to the IEEE Transactions on Automation Science and Engineering publication guidelines** (http://www.ieee-ras.org/publications/t-ase)**.** Please address inquiries to S.Hu@soton.ac.uk.