

Proposal for Special Session at IEEE CASE 2022

Goal:

The fourth industrial revolution (also known as Industry 4.0) seeks to evoke new capabilities in manufacturing by exploiting recent advancements in computing. Connectivity, data access and analysis, and computer-driven automation (all made possible by modern cyber-infrastructure), will enable us to make timely, perceptive, and data-supported manufacturing decisions. We view this next generation manufacturing infrastructure as a cyber-physical system that integrates manufacturing resources (mechanical and electrical equipment and processes) with high-bandwidth communications and high-performance edge and endpoint computing.

The special session on *Adaptive and Resilient Cyber-Physical Manufacturing Networks* aims to explore frameworks that make advanced manufacturing more capable, accessible, and democratic to spur innovation and enterprise. Specifically, we aim to consider: (1) Interactions between autonomous hardware and software to produce verifiable and safe manufacturing processes; (2) The curation and use of networks and data to optimize performance; (3) Continuous analysis and learning for both low- and high-level decision-making and control; and (4) On-the-fly adaptation to changing needs and detected errors or risks to ensure resilience.

Relevant to **IEEE CASE topic: Cyber physical production systems and industry 4.0**, the special session hopes to facilitate discussions that develop the foundations for understanding how cyber physical systems and ubiquitous technology can achieve new levels of efficiency, flexibility, and reliability in manufacturing at all scales.

Session Title: Adaptive and Resilient Cyber-Physical Manufacturing Networks

Organizers:

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Contributions:

1. “Seamless Interaction Design with Coexistence and Cooperation Modes for Robust Human-Robot Collaboration” by Zhe Huang, et al
2. “Machine Learning for Failure-Mode Prediction and Diagnostics in Semiconductor Processing” by Xiaoyang Wang, et al
3. “Detecting Hidden Defects in Additively Manufactured Parts using X-Ray Computed Tomography and Computer Vision” by Tianxiang Hu, et al
4. “A Low-cost Data Acquisition System for Vane Pump Maintenance” by Beitong Tian, et al
5. “Self-Recalibrating Micromanipulator System for Resilient Robotic Vision-Based Control” by Tiexin Wang, et al
6. “Immersive Human-Robot Interaction for Dexterous Manipulation in Teleoperation for Minimally Invasive Procedures” by Jiawei Yu, et al.
7. “Ubiquitous Robotics for Remote Resource Sharing and Collaboration” by Tengyue Wang, et al
8. “Computational Design for an Optimal Dexterous Mechanism in Remote-Center-of-Motion” by Hanyu Gan, et al

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