Cognitive Intelligence-enabled Self-X Manufacturing

Goal:

Globally, advanced manufacturing industries are transitioning from technology-driven to value-driven development. These industries are prominent in using innovative technologies to create and improve existing products by capitalizing on existing and foreseeable ICT infrastructure in areas such as automation, computation, informatization, and digitalization. However, despite the improvements in the development of data-rich and knowledge-intensive systems, manufacturing companies still struggle to fully mine and interpret industrial data in ways that enhance their processes and products. Meanwhile, emerging technologies, including deep learning, knowledge graphs, and cognitive computing, are maximizing available data to create more so-called Self-X (e.g., self-learning, self-optimization, self-healing, etc.) manufacturing processes toward value-driven sustainability with higher cognitive intelligence. This has great potentials in human-machine/robot collaboration, innovative design, dynamic optimization, predictive maintenance, and decision support through various engineering lifecycle stages. Nevertheless, it is yet uncertain how cognitive intelligence may be used profitably and securely in manufacturing operations. Besides, some fundamental issues remain unresolved, such as data and knowledge architecture alignment across multiple processes, entities, and stages. Hence, this special session aims to bring together specialists in smart manufacturing, information and communication, artificial intelligence, cognitive computing, and other science and engineering domains to address these pressing yet long-standing industrial needs.

Track topics and their description

This special session aims to present the state-of-the-art, cognitive intelligence-related theories, methods, tools, systems, and applications to discuss the challenges and future in Self-X manufacturing. To contribute to those areas, this special session includes the following topics, but are not limited to:

- Advances in cognitive intelligence theories
- Fundamentals in cognitive manufacturing
- Cognitive computing for manufacturing
- Knowledge representation for cognitive intelligence
- Knowledge graph and graph-based reasoning
- Knowledge graph-based predictive maintenance
- Cognition in innovative product/system design
- Cognitive digital twin for manufacturing systems
- Cognitive human-robot collaboration systems
- Cognitive prognostics and health management
- Self-organizing manufacturing networks/systems
- Self-anomaly-detection in manufacturing processes
- Self-coordinating supply chains/networks
- Self-diagnosis of intelligent machines/products
- Cases, applications, and implementations in cognitive intelligence-enabled manufacturing

Contact the lead organisor:
Professor Tao Peng, Institute of Industrial Engineering
School of Mechanical Engineering, Zhejiang University
email: tao_peng@zju.edu.cn