

SPECIAL SESSION PROPOSAL FOR IEEE CASE 2021

“Smart Semiconductor Manufacturing”

Session Organizers:

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Technical Committee name: [Semiconductor Manufacturing Automation](#)

Session description:

Semiconductor manufacturing plays a vitally important role in economic development. New enabling technologies such as Industry 4.0, Internet of Things (IoT), Big Data, and Machine Learning can be used to advance industrial migration significantly, in which semiconductor manufacturing has been developing related solutions, while other industries may not be ready owing to their infrastructures and business ecosystems. The rapid development and implementation of the mentioned technologies have allowed for various possibilities in technological advancements for different aspects of semiconductor manufacturing. IoT solutions and real-time data processing can empower the processing of a massive amount of data captured from interconnected machines. Big data analytics, together with AI-based solutions, can help tackle many concerns in order to achieve smart prediction, evaluation, optimization, and decision-making. However, various challenges like interoperability, decentralization, distributed control, real-time manufacturing process control, service orientation, and maintenance optimization should be addressed.

This special session aims to present the latest advances and developments of new methods, techniques, systems, and tools dedicated to the application of enabling technologies for smart manufacturing, especially the semiconductor manufacturing sector. The goal is to bring together researchers and practitioners to present efficient scientific and engineering solutions and provide visions for future research and development.

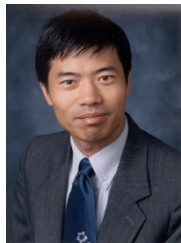
The latest developments in smart semiconductor manufacturing will be the core topic of this session. Specifically, papers discussing AI-based solutions for smart semiconductor manufacturing are encouraged. In addition, research on big data analytics, cyber-physical systems, robustness and flexibility of smart semiconductor manufacturing systems are also highly related. Specifically, contributions to theory and practice, including but not limited to, the following technical areas, are invited.

- Industry 4.0 and Big Data Analytics for Semiconductor Manufacturing Systems
- Artificial Intelligence and Evolutionary Techniques for Smart Manufacturing
- Digital Transformation to Empower Smart Manufacturing
- Intelligent Monitoring & Control Systems
- Data-driven Modeling and Optimization
- Machine & Deep Learning for Intelligent Systems
- Intelligent Sensor Fusion for Smart Manufacturing
- Data Analytics for Scheduling Semiconductor Manufacturing Processes
- Data Analytics for Monitoring and Control of Manufacturing Operations
- Computational Intelligence Technologies for Manufacturing
- Emerging Technologies to enable Semiconductor Manufacturing

Keywords

Tentative Contributions to the Special Session

1. *Data-driven Predictive Analytics for Smart Semiconductor Manufacturing Processes*, Mohammadhossein Ghahramani, et al., Univeersity College Dublin, Ireland
2. *Will Industry 3.5 be a better alternative than direct migration of Industry 4.0?*
Chen-Fu Chien et al., National Tsing Hua University, Hsinchu, Taiwan
3. *Convolutional Neural Networks for Automatic Virtual Metrology*
Yu-Ming Hsieh, Tan-Ju Wang, Chin-Yi Lin, Li-Hsuan Peng, Fan-Tien Cheng, and Sui-Yan Shang, National Cheng Kung University, Taiwan
4. *Modeling and optimization for multi-product disassembly sequence planning problems*
Liang Pei, Yaping Fu, Xiwang Guo, and Liang Qi, Qingdao University, China
5. *Cell formation and product scheduling for multi-factory cellular manufacturing via hybrid genetic algorithm*
Jufeng Wang and Chunfeng Liu, China Jiliang University, China
6. *Wafer quality prediction for ICP etching tool in LED semiconductor manufacturing*
WenQing Xiong, Yan Qiao, and LiPing Bai, Macau University of Science and Engineering, China
7. *Deep Learning and Random Forest-combined Method for Intelligent Fault Diagnosis of Rotating Machines*
H. Li, G. Hu, J. Li and M. Zhou, Beijing Institute of Technology, China and New Jersey Institute of Technology, USA
8. *Knowledge-based Intelligent Optimization Algorithm to schedule Semiconductor Manufacturing Systems*
Z. Cao and C. Lin, Beijing University of Chemical Technology, China



MengChu Zhou (Fellow, IEEE) joined New Jersey Institute of Technology in 1990, and is now a Distinguished Professor. His interests are in Petri nets, intelligent automation, Internet of Things, and big data. He has over 900 publications including 12 books, 600+ journal papers (500+ in IEEE transactions), 28 patents and 29 book-chapters. He is the founding Editor of IEEE Press Book Series on Systems Science and Engineering and Editor-in-Chief of IEEE/CAA Journal of Automatica Sinica. He is a recipient of Humboldt Research Award for US Senior Scientists from Alexander von Humboldt Foundation, Franklin V. Taylor Memorial Award and the Norbert Wiener Award from IEEE Systems, Man and Cybernetics Society. He is Fellow of IFAC, AAAS, CAA and NAI.



Chen-Fu Chien is a Tsinghua Chair Professor and Micron Chair Professor of National Tsing Hua University, Taiwan. He is the Director of the Artificial Intelligence for Intelligent Manufacturing Systems (AIMS) Research Center, Ministry of Science and Technology (MOST), the NTHU- TSMC Center for Manufacturing Excellence, and President of Chinese Institute of Industrial Engineers (CIIE), Taiwan. From 2005 to 2008, he had been on-leave as a Deputy Director with Industrial Engineering Division, TSMC. He has received 10 US invention patents on semiconductor manufacturing and published 7 books, over 190 journal papers, and 11 case studies in Harvard Business School. His book on Industry 3.5 received the Most Influential Scientific Publication by MOST and the Golden Book Award by the Ministry of Economic Affairs, Taiwan. He was the recipient of the National Quality Award, the Executive Yuan Award for Outstanding Science and Technology Contribution, the Distinguished Research Awards, and the Tier 1 Principal Investigator (Top 3%) from MOST, the Distinguished University-Industry Collaborative Research Award from the Ministry of Education, the University Industrial Contribution Awards from the Ministry of Economic Affairs, the 2011 Best Paper Award of the IEEE Transactions on Automation Science and Engineering, and the 2015 Best Paper Award of the IEEE Transactions on Semiconductor Manufacturing.