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Process Monitoring for Smart Manufacturing: Challenges and Opportunities

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Abstract: Process monitoring is an important component in the long-term reliable operation of any system or process and its importance can only become greater in the era of smart manufacturing. Currently, driving by market demand and global competition, process operations in manufacturing are being pushed closer to the process limits; at the same time, with recent advances in sensor technology (such as Internet-of-Things devices), data storage and computing power, there are more data than ever before being collected and stored. These on-going changes in manufacturing industries present a broad spectrum of challenges and opportunities to process monitoring. In this talk, we present a roadmap that summarizes the development of process monitoring over the last century, with the focus on how process monitoring has been evolving in response to various challenges presented by manufacturing industries. Specifically, we believe "feature space monitoring" (FSM) is emerging as the next generation process monitoring tool, and is poised to provide general solutions that could address many unsolved long-standing challenges (such as process nonlinearity) and emerging challenges (such as 4V challenges associated with IoT generated big data). Finally, we introduce Statistics Pattern Analysis (SPA) as a specific example of FSM, with several case studies (including an IoT-enabled testbed) to demonstrate its performance in addressing various challenges exhibited in smart manufacturing.

Bio: Dr. Jin Wang is Walt and Virginia Woltosz Endowed Professor in the Department of Chemical Engineering at Auburn University. She obtained her BS and PhD degrees in chemical engineering (specialized in biochemical engineering) from Tsinghua University in 1994, and 1999 respectively. She then obtained a PhD degree (specialized in control engineering) from the University of Texas at Austin in 2004. While pursuing her second PhD, she joined AMD in 2002 as a senior development engineer. In 2006, Dr. Wang joined Auburn University as B. Redd Assistant Professor, and was promoted to Associate Professor in 2011, then full professor in 2016. The central theme of her research is to apply systems engineering principles and techniques to understand, predict and control complex dynamic systems, including both engineered systems and microbial organisms. Her current research interest includes genome-scale metabolic network modeling and analysis with experimental validations, and big data analytics for smart manicuring. Her research is funded by various US federal and state funding agencies including DOE, NSF, USDA, DOEd and DOT, as well as private foundations.