

# Multivariate Profile Data Modelling and Monitoring with Applications in Advanced Manufacturing

## Abstract

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Generally, in an advanced manufacturing system, hundreds of sensors are deployed to measure key process variables in real time. Thus, it is desirable to develop methodologies to use those real-time sensor data for online system condition monitoring and anomaly detection. However, there are several challenges in developing an effective process monitoring system: i) Data streams generated by multiple sensors are high-dimensional profiles; ii) Sensor signals are affected by noise due to system inherent variations; iii) Signals of different sensors have complex dependent structure; iv) An anomaly may only cause sparse changes of sensor signals. To address these challenges, this talk presents several methods for real-time multiple sensor-based process monitoring, which include the following modules: (i) preprocessing sensor signals to remove inherent variations and conduct profile alignments, (ii) using multivariate functional data analysis techniques to extract sensor features by considering their complex dependent structures, and (iii) constructing monitoring schemes based on the extracted features, which have scalable detection power for different fault patterns. We implement and demonstrate our proposed methods using data from a semiconductor manufacturing system.

## Speaker

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Chen ZHANG is an Assistant Professor in Industrial Engineering, Tsinghua University. She received her Ph.D. degree from National University of Singapore in 2017, and B.Eng. degree from Tianjin University in 2012. Her research interests include developing methodologies and algorithms for complex or large-scale systems with multivariate or high-dimensional data, including intelligent sampling and sensing for data collection, data mining and information extraction for system modelling, and on-line monitoring and efficient anomaly detection for streaming data.

## Details

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**Tuesday, February 26, 2019**  
**10:00 AM - 11:00 AM**

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Seminar Room 3-2, Level 3

School of Information Systems, Singapore Management University, 80

Stamford Road, Singapore 178902, Singapore

**We look forward to seeing you at this research seminar.**

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