"Design and Optimization of Resilient Manufacturing Systems"

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Refreshments at 3:30, Upson Hall Lounge

Abstract
Invisible performance degradation of machines and processes of a manufacturing system impact both product performance and system productivity. To enable a resilient and near-zero-breakdown performance, my research investigates predictive analytics and techniques to enhance intelligent prognostics and health management capabilities in components, machines, and manufacturing systems. Since performance and health condition solely physics-based models can’t predict condition of systems under one or more operating conditions, modeling of degradation with the advent of ever-increasing sensors and measurements devices is a rich and challenging area. In this seminar, models dealing with various uncertainties and heterogeneous data are demonstrated to enhance prognostics with adaptive condition monitoring and remaining useful life prediction. I will also present the design optimization for system resilience based upon the previous prediction results, including optimal redundancy and flexibility design, and adaptive resilient control to mitigate the fault-induced disruptions in the systems. The optimization results suggest that both accurate prognostics and building flexibility into systems are highly beneficial for the overall system resilience against disruptions, and the overall methodology retains extensibility for aiding engineers in effectively designing and placing sensors for complex systems.

Biographical sketch
Dr. Xiaoning Jin is currently an Assistant Research Scientist in the Department of Mechanical Engineering at the University of Michigan. She received a Ph.D. in Industrial and Operations Engineering from the University of Michigan in 2012. She is currently leading several collaborative projects at the NSF I/UCRC Center for Intelligent Maintenance Systems. Her research efforts focus on modeling, optimization and decision-support tools with advanced diagnostics and prognostics. Dr. Jin received the Best Paper Award in 2014 ASME Mechanical Engineering and Science Conference. She was also the Best Paper receiver for the 11th International conference on Frontiers of Design and Manufacturing in 2014. Dr. Jin received 2008 Rackham Graduate Fellowship and S. M. Wu Outstanding Research Award in 2011.