4dd Systems Engineering Approaches to the Study of Nano-Scale Devices and Biological Systems
Jin Wang
I have worked on subspace identification, statistical process monitoring, control performance monitoring in my doctoral research. Recently, my research interest focuses on developing models and control methods for next generation microelectronics manufacturing.

Recent fundamental advances in physical science and the development of new measurement and characterization tools have enabled us to understand physical phenomena in microelectronics from atomic to macroscopic scales, in which systems engineering play a very important role. Knowledge of biological systems is going through the similar change as recent advances in genomics and proteomics enable us to collect comprehensive data sets on system performance and gain information on the underlying molecules. My future research focuses on understanding, prediction and control of these complex dynamic systems using systems engineering approaches. Specifically, I will focus on: 1) Multi-scale modeling, simulation and optimization of nano-scale device processing 2) Systems biology with emphasis on disease understanding and diagnosis, statistical modeling of genetic regulatory networks.

At the fundamental level, my research will try to capture the systems' complex dynamic behavior through modeling and simulation; the next goal is to predict and control the system behavior using the developed models.

My various research experiences helped me build solid background in chemical and biochemical engineering, applied mathematics, and systems engineering, which enables me to explore these complex dynamic systems. My doctoral research at the University of Texas at Austin is in process systems engineering, which involves system identification, monitoring and control of complex chemical processes. In particular, under the supervision of Professor Joe Qin, I developed (1) a novel subspace identification method; (2) a stochastic fault detection algorithm using second order index; (3) a fault diagnosis method using fault directions in fisher discriminant analysis; (4) a numerical model for valve stiction and (5) a curve fitting method for detecting valve stiction in oscillatory control loops. My research at Tsinghua University focused on bioseparation techniques, and my research at Advanced Micro Devices, Inc. focuses on modeling, monitoring and control of various semiconductor manufacturing processes.