University of Southern California

DANIEL J. EPSTEIN DEPARTMENT OF
INDUSTRIAL AND SYSTEMS ENGINEERING

EPSTEIN INSTITUTE SEMINAR • ISE 651 SEMINAR

Model Uncertainty Quantification and Objective-Oriented Sampling in Simulation-Based Design under Uncertainty

Dr. Wei Chen

Wilson-Cook Chair Professor in Engineering Design
Northwestern University

ABSTRACT

Various sources of uncertainty exist in simulation-based design under uncertainty. Quantifying the uncertainty of a model and the resulting probabilistic predictions is essential for robust and reliable decision making. In physics-based engineering modeling, the two primary sources of model uncertainty, which account for the differences between computer models and physical experiments, are parameter uncertainty and model discrepancy. Distinguishing the effects of these two sources of uncertainty can be challenging. For situations in which identifiability cannot be achieved using only a single response, we propose the use of multiple responses that share a mutual dependence on the common set of calibration parameters to improve identifiability. In this talk, we will present a multi-response modular Bayesian approach and demonstrate that using multiple responses can substantially enhance identifiability. In addition, we will also introduce a newly developed, sequential objective-oriented sampling approach to robust design. We will present the need and the techniques developed for sampling control and noise variables separately towards optimizing a robust design objective that incorporates both the mean and variance of design performance.

TUESDAY, JANUARY 31, 2012
ANDRUS GERONTOLOGY BLDG (GER) ROOM 309
3:30 - 4:50 PM

BIO

Dr. Wei Chen is the Wilson-Cook Chair Professor in Engineering Design at Northwestern University. Affiliated with the Segal Design Institute as a Faculty Fellow, she is a Professor in the Department of Mechanical Engineering, with courtesy appointment in the Department of Industrial Engineering and Management. Directing the Integrated Design Automation Laboratory (IDEAL- http://ideal.mech.northwestern.edu/), her current research involves issues such as simulation-based design under uncertainty, model validation, stochastic multiscale analysis and design, robust shape and topology optimization, multidisciplinary optimization, consumer choice modeling and enterprise-driven decision-based design. She is the co-founder and Director of the interdisciplinary doctoral cluster in Predictive Science and Engineering Design (PSED) at Northwestern, a program aiming for integrating scientific, physics-based modeling and simulation into design of innovative "engineered" systems.

Dr. Chen received her Ph.D. from the Georgia Institute of Technology in 1995. She is an elected member of the ASME Design Engineering Division (DED) Executive Committee and currently serving as the DED executive chair of the Technical Committees. She is also an elected Advisory Board member of the Design Society, an international design research community. She is an Associate Editor of the ASME Journal of Mechanical Design and serves as the review editor of *Structural and Multidisciplinary Optimization.*