Lectures on Uncertainty Quantification

JIM BERGER
Duke University
(visiting University of Chicago)

Lecture 1: Introduction to Uncertainty Quantification

WEDNESDAY, April 25, 2012, at 4:00 PM
277 Ryerson Hall, 1100 E. 58th Street

ABSTRACT

Central to much of science, engineering and society today is the building of mathematical models to represent complex processes. The mathematical modeling and computational science that underlies the development of such simulators of processes has seen amazing advances over the last two decades. Yet the simulators themselves are of limited usefulness unless it can be shown that they are accurate in predicting the real process they are modeling. There are a host of statistical issues that arise in developing simulators and assessing their accuracy, an area of research today called uncertainty quantification (a somewhat unfortunate name from the perspective of statistics).

This 5-lecture series will provide an introduction to this area. To the extent possible, the lectures will be kept self-contained. They will include numerous examples from engineering and science. The lectures presume a significant grounding in statistics but no specialized knowledge of UQ.

We first give an overview of the subject of UQ, and then illustrate some of the basic ideas on a simple pedagogical example. This example also serves to highlight the differences between UQ and ordinary statistical analysis of uncertainty.