

COLLOQUIUM

Multilevel methods for uncertainty quantification of systems governed by PDEs with random inputs

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Uncertainty quantification (UQ) is the task of obtaining information about uncertainties in the outputs of a system, given information about uncertainties in the inputs. We consider probabilistic treatments of uncertainty, i.e., they are characterized in terms of statistical information. Also, for us, systems are described by partial differential equations (PDEs). We review the basics of probabilistic UQ for PDEs, including the use of Monte Carlo (MC) and other sampling/simple averaging schemes. We then discuss the recently developed multilevel MC approach that improves on the efficiency of MC by using a hierarchy of spatial grids. After that, we introduce stochastic collocation methods for UQ which use judicious sparsifications of tensor product grids to produce, for solutions that are smooth with respect to the random parameters, much more efficient sampling methods compared to, e.g., MC. Finally, we discuss the multilevel stochastic collocation methods we have developed which effect further improvements relative to standard stochastic collocation methods.

This is joint work with Peter Jantsch, Aretha Teckentrup, and Clayton Webster.

The lecture will take place in Thackeray 704 at 3:30pm.
Refreshments will start at 3:00pm.