数学与系统科学研究院

计算数学所学术报告

报告人：Prof. Habib N. Najm

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报告题目：

Uncertainty Quantification in Large Scale Computational Models

邀请人： 周涛 副研究员

报告时间：2019 年 10 月 23 日（周三）

上午 10:00-11:00

报告地点： 科技综合楼三层

311 报告厅

Abstract:

Uncertainty quantification (UQ) in large scale computational models of complex physical systems faces the two key challenges of high dimensionality and high computational sample cost. Such models often involve a large number of uncertain parameters, associated with various modeling constructions, as well as uncertain initial and boundary conditions. Exploring such high-dimensional spaces typically necessitates the use of a large number of computational samples, which, given the cost of large scale computational models, is prohibitively expensive and thus infeasible. I will discuss a set of UQ methods, and a well-defined UQ workflow, to address this challenge. The suite of methods includes global sensitivity analysis with polynomial chaos regression and compressive sensing, coupled with multilevel Monte Carlo and/or multilevel multifidelity methods. The combination of these tools is often useful to reliably cut-down dimensionality with feasible computational costs, identifying a lower dimensional subspace on the uncertain parameters where subsequent adaptive sparse quadrature PC methods can be employed, with accurate estimation of predictive uncertainty. I will illustrate this UQ workflow on model problems of practical relevance.

Bio:

Habib N. Najm is a Distinguished Member at Sandia National Laboratories in Livermore, CA. He leads research programs in computational reacting flow and uncertainty quantification, funded by the US Department of Energy. His research has spanned the development of numerical methods for reacting flow computations, development of uncertainty quantification methods and software with application in large-scale physical systems, analysis and reduction of chemical systems, modeling of electrochemical systems, stochastic dynamical systems, and Bayesian inference methods. He is author/co-author of over 100 journal articles and a number of US patents. He is currently the Editor-in-Chief of International Journal for Uncertainty Quantification and is an Associate Editor of SIAM JUQ.

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