Lagrange interpolants for known coefficients. The latest results in comparing PCE/SC, tailoring for arbitrary random inputs, and embedding within design under uncertainty will be presented.

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MS108

Applications of Polynomial Chaos to Ocean-acoustic Modeling

We discuss an intrusive and non-intrusive application of polynomial chaos expansions for simulating uncertainty in ocean acoustics problems. One example uses a split-step algorithm to propagate an acoustic field through a waveguide within a narrow-angle parabolic approximation to the wave equation, with uncertainty in the sound speed field specified by a Karhunen-Loeve expansion. Another example uses a regression based approach to estimate the expansion coefficients for propagation with uncertainty in both source depth and sound speed. Work supported by the Office of Naval Research.

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MS108

Uncertainty Quantification in Modular Structures through Concentration of Measure Inequalities

We apply concentration-of-measure inequalities to the quantification of uncertainties in the performance of engineering systems. Specifically, we envision uncertainty quantification in the context of certification, i.e., as a tool for deciding whether a system is likely to perform safely and reliably within design specifications. We show that concentration-of-measure inequalities rigorously bound probabilities of failure and thus supply conservative certification criteria. In addition, they supply unambiguous quantitative definitions of terms such as margins, epistemic and aleatoric uncertainties, verification and validation measures, confidence factors, and others, as well as providing clear procedures for computing these quantities by means of concerted simulation and experimental campaigns. We also investigate the tightening of these inequalities and their extensions to systems characterized by multiple modules and scales. This is a joint work with Lenny Lucas, Michael Ortiz and Ufuk Topcu.

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MS108

A Stochastic Dimension-reduction Method for Stochastic PDEs

A dimension-reduction method is presented for solving stochastic PDEs. The solution is a multivariate function of the high-dimensional random input variables. High dimensional model representation is used to decompose this solution hierarchically into a sum of univariate, bivariate and higher-order component functions where each term in the representation reflects the individual or cooperative contributions of the random inputs upon the solution. The lower-order component functions are interpolated using adaptive sparse grid collocation method.

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MS109

VisIt's Python Interface for Visualization and Analysis

VisIt is a richly featured, open source visualization and analysis tool for scientific data. The program is fully scriptable through Python. In this talk, we will describe VisIt's capabilities and how to leverage them with Python.

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MS109

Exploring Network Structure, Dynamics, and Function using NetworkX

NetworkX is a Python language package for exploration and analysis of networks and network algorithms. The core package provides data structures for representing many types of networks, or graphs, including simple graphs, directed graphs, and graphs with parallel edges and self loops. The nodes in NetworkX graphs can be any (hashable) Python object and edges can contain arbitrary data; this flexibility makes NetworkX ideal for representing networks found in many different scientific fields. I will discuss some of our recent work studying synchronization of coupled oscillators to demonstrate how NetworkX enables research in the field of computational networks.

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MS109

Matplotlib: Data Visualization in Python

matplotlib is a 2D python graphics library. In combination with ipython, numpy and scipy, it provides a Matlab (TM)