

**Department of Structural Engineering
University of California, San Diego
SE 290 Seminar**



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“Uncertainty Quantification via a Multi-Fidelity Model Reduction Approach”

Wednesday, May 23, 2018

12:00 pm - 12:50 pm, Center Hall, Room 214

<https://structures.ucsd.edu/seminars>

Abstract

Realistic analysis and design of multi-disciplinary engineering systems require not only a fine understanding and modeling of the underlying physics and their interactions but also recognition of intrinsic uncertainties and their influences on the quantities of interest. Uncertainty Quantification (UQ) is an emerging discipline that attempts to address the latter issue: It aims at a meaningful characterization of uncertainties from the available measurements, as well as efficient propagation of these uncertainties through the governing equations for a quantitative validation of model predictions.

The use of model reduction has become widespread as a means to reduce computational cost of UQ of complex engineering systems. This talk introduces a model reduction

technique that exploits the low-rank structure of the uncertain solution of interest – when exists – for fast propagation of high-dimensional uncertainties. To construct this low-rank approximation, the proposed method utilizes models with lower fidelities (hence cheaper to simulate) than the intended high-fidelity model. Using realizations of the lower fidelity solution, a set of reduced basis and an interpolation rule are identified and applied to a small set of high-fidelity realizations to obtain the low-rank, bi-fidelity approximation, which in turn will be employed to generate statistics of the high-fidelity solution. The talk will then focus on the convergence analysis of the method and discuss a verifiable condition for the low-fidelity model to lead to accurate, bi-fidelity approximation. Numerical examples will be presented to illustrate the performance of this approach.

Biography

Alireza Doostan is currently a Rome Associate Professor at the Smead Aerospace Engineering Sciences Department of the University of Colorado Boulder. Prior to his appointment at CU Boulder in 2010 he was an Engineering Research Associate in the Center for Turbulence Research at Stanford University. Alireza received his PhD in Structural Engineering and M.A. in Applied Mathematics and Statistics from the Johns Hopkins University both in 2007. He is a recipient of a DOE ASCR and an NSF Early Career awards. His research interests include: Uncertainty quantification, optimization under uncertainty, and computational stochastic mechanics.

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*Sponsored by Professor Alicia Kim
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