

Mechanical and Aerospace Engineering

MAE Seminar Series

Data Driven Uncertainty Analysis for Complex Systems

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ABSTRACT

The field of uncertainty quantification has received increasing amount of attention recently. Extensive research efforts have been devoted to it and many novel numerical techniques have been developed. These techniques aim to conduct stochastic simulations for large-scale complex systems. In this talk we will review one of the most widely approaches -- generalized polynomial chaos (gPC). The gPC based methods employ orthogonal polynomials in random space and take advantage of the solution smoothness (whenever possible). The features of various gPC numerical schemes will be reviewed. Furthermore, we will discuss how real observational data can be utilized and combined with stochastic simulations. The resulting data-driven uncertainty analysis can provide much more insight to the true physics and produce predictions of high fidelity.

Bio:

Dongbin Xiu is an Associate Professor of Mathematics at Purdue University. He obtained his Ph.D. from the Division of Applied Mathematics of Brown University in 2004. He then conducted post-doctoral research in Los Alamos National Laboratory, Princeton University and Brown University. In 2005 he joined the Mathematics department of Purdue as an Assistant Professor, and in 2009 he was promoted to the rank of Associate Professor. His research focuses on high performance numerical methods for stochastic computations and uncertainty quantification. The research is currently funded by the National Science Foundation, Air Force Office of Scientific Research and the Department of Energy.

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