University of Colorado at Boulder

AEROSPACE ENGINEERING SCIENCES

Seminar

Alireza Doostan

Assistant Professor, AES

On Model Reduction Techniques for Scalable Uncertainty Propagation

Realistic analysis and design of multidisciplinary 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, e.g., PDEs or ODEs, for a quantitative validation of model predictions. The development of efficient uncertainty propagation strategies for complex engineering systems is subject of growing interest in UQ, especially for applications where a large number of uncertain sources are present or when the legacy code for the physics cannot be altered.

This presentation provides a high level introduction to recent work performed by the UQ Group at CU Boulder on the develop.5k. It will be demonstrated how sparsity in such
drastically reduce the cost of uncertainty propagation. As another
for uncertainty propagation, a low-rank approximation technique will
lity approach will be introduced that relies primarily on low-fidelity
em to guide the construction of a reduced order representation of high-
me system. Application examples will be presented to highlight the
pproaches and their wide applicability to a broad range of problems.

Fri