

Modeling Stochastic Inverse Problems Using a Sparse Grid Collocation Approach¹

*Nicholas Zabaras
Sibley School of Mechanical and Aerospace Engineering
Cornell University*

A scalable, parallel methodology for stochastic inverse/design problems is formulated through the representation of the underlying uncertainties and the resultant stochastic dependent variables using a sparse grid collocation methodology. A novel stochastic sensitivity method will be introduced based on multiple solutions to deterministic sensitivity problems. This methodology transforms the stochastic inverse/design problem to a deterministic optimization problem in a larger-dimensional space that is subsequently solved using deterministic optimization algorithms. Various illustrative examples with multiple sources of uncertainty will be provided to showcase the developed framework including inverse problems in random heterogeneous media.

¹ Invited seminar at the Environmental Engineering (ENVE) program at the University of Connecticut, Storrs, CT, February 8, 2008.