RA-5: Design & Control under Uncertainty

PIs: Willcox, Zabaras, Hesthaven

Objective

Development, implementation, and demonstration of

Methods for Optimization and Control under Uncertainty

for design and control of systems governed by
parametrized
Partial Differential Equations (PDEs)

with application to

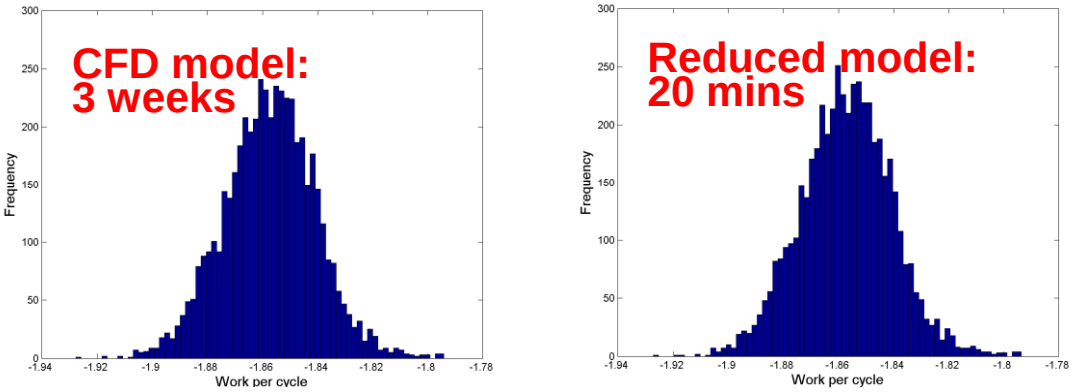
multiscale design
stochastic control
sensitivity analysis
and
visualization of uncertainty.

Decision-Making Under Uncertainty

reduced basis methods — informed by control problem
$\Rightarrow$ certified models for uncertainty quantification

multiscale modeling — nonlinear physics at many scales
$\Rightarrow$ control at multiple scales

multifidelity model management — hierarchy of models
$\Rightarrow$ design allowing for multiple system uncertainties



Reduced-order model enables rapid propagation of uncertainties for unsteady fluid-structure analysis (work per cycle) of a compressor blade row with geometry variations