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An integrated and efficient framework for embedded Reduced Order Models for multifidelity uncertainty quantification GIANLUCA GERACI, PATRICK BLONIGAN, FRANCESCO RIZZI, Sandia National Laboratories, ALEX GORODETSKY, University of Michigan, KEVIN CARLBERG, MICHAEL ELDRED, Sandia National Laboratories — Uncertainty quantification (UQ) is a key component of performing predictions using numerical simulations. Many realistic science and engineering applications require complex high-fidelity (HF) simulations for the characterization of the system's response, in combination with large numbers of random parameters that need to be propagated through these HF simulations. In these cases, a single fidelity approach for UQ becomes intractable due to the extreme cost of resolving both deterministic and stochastic errors. Multi-fidelity strategies have been introduced to alleviate this issue by fusing information from simulations with varying levels of fidelity, in order to obtain estimators that preserve HF statistics at much lower overall cost. This is typically accomplished through a priori definition of a sequence of model physics or discretizations of varying accuracy and expense. Less attention has been dedicated to the automatic generation of low-fidelity models using data from a small number of HF simulations. In this work, we focus on the case in which low-fidelity models are data-driven using HF samples/snapshots, with initial emphasis on projection-based reduced-order models.

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