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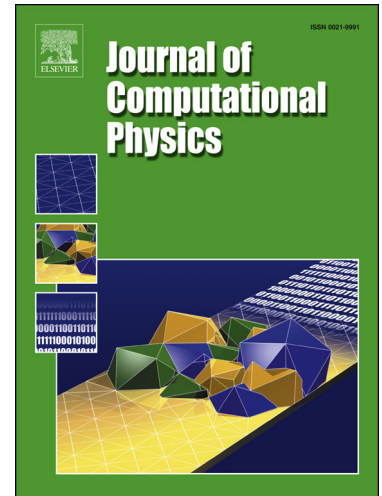
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Gaussian functional regression for output prediction: Model assimilation and experimental design

N. C. Nguyen* and J. Peraire†

Abstract

In this paper, we introduce a Gaussian functional regression (GFR) technique that integrates multi-fidelity models with model reduction to efficiently predict the input–output relationship of a high-fidelity model. The GFR method combines the high-fidelity model with a low-fidelity model to provide an estimate of the output of the high-fidelity model in the form of a posterior distribution that can characterize uncertainty in the prediction. A reduced basis approximation is constructed upon the low-fidelity model and incorporated into the GFR method to yield an inexpensive posterior distribution of the output estimate. As this posterior distribution depends crucially on a set of training inputs at which the high-fidelity model are simulated, we develop a greedy sampling algorithm to select the training inputs. Our approach results in an output prediction model that inherits the fidelity of the high-fidelity model and has the computational complexity of the reduced basis approximation. Numerical results are presented to demonstrate the proposed approach.

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