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Multi-fidelity modelling for flow over a cylinder PRERNA PATIL, Brown University, HESSAM BABAEE, Massachusetts Institute of Technology, GEORGE KARNIADAKIS, Brown University — We tackle the classical problem of predicting the relation between C_L, C_D and C_P vs Reynolds number for flow over cylinder using the multi-fidelity framework. The stochastic response surface is obtained by implementing the auto-regressive stochastic modelling (Kennedy and O'Hagan, 2000) and Gaussian process regression to combine data from variable levels of fidelity. In particular, we predict the lift, drag and pressure coefficients where codes with multiple levels of fidelity are available. We correlate data at each of these levels and build the surrogate model using multi-level recursive co-kriging. The deficient physics of the low-fidelity model is explored by examining the cross-correlation between the low-fidelity and high-fidelity models. The proposed framework ultimately intends to meld computational accuracy of the expensive high fidelity with the computational cost of the inexpensive low-fidelity.

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