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Dynamical model identification via a method combining data driven and data assimilation approaches NISHANT KUMAR, FRANCK KERHERVÉ, LAURENT CORDIER, Institut Pprime, UPR 3346, France — Model-based control strategies require a dynamical model that is sufficiently accurate and robust with respect to the variation of the control parameters. When this model can not be determined using first principle equations, then identification techniques are needed. In this work, we present a general framework for identifying the parameters of a POD reduced-order model. The model obtained directly by POD Galerkin projection of the N-S equations is, in general, not robust. Here, we obtain a scalable identification of the parameters by a combined implementation of machine learning and data assimilation (DA) approaches. Recent advances in data driven techniques have given the possibility to learn the driving partial differential equations by using neural networks. However, without a partial knowledge of the underlying dynamics, the learning time may increase prohibitively with the number of parameters. To circumvent this difficulty, this work combines: i) PDE discovery methods to identify the parameters in the model, by using the physics-informed neural network[1], and ii) Dual Ensemble Kalman filter[2], a DA technique to correct both the predicted state and parameters.

[1]Raissi et al., J. Comp. Phys. 378 (2019)
[2]Moradkhani et al., Adv. Water Res. 28(2) (2005)

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