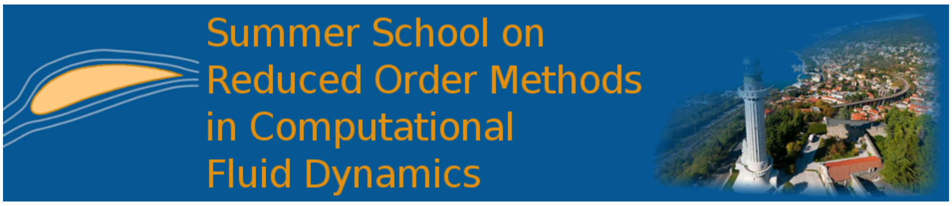

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A novel deep learning architecture for the model reduction of parametric time-dependent problems

Deep learning-based reduced order models (DL-ROMs) have been recently proposed to overcome common limitations shared by conventional ROMs –built, e.g., exclusively through proper orthogonal decomposition (POD) –when applied to nonlinear time-dependent parametrized PDEs.
In this work, thanks to a prior dimensionality reduction through POD, a two-step DL-based prediction framework has been implemented with the aim of providing long-term predictions with respect to the training window, for unseen parameter values. It exploits the advantages of Long-Short Term Memory (LSTM) layers combined with Convolutional ones, obtaining an architecture that consists of two parts: the first one aimed at providing a certain number of independent predictions for each new input parameter, and a second one trained to properly combine them in the correspondent exact evolution in time. In particular, the developed architecture has been tested for the reduction of the incompressible Navier-Stokes equations in a cavity.

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