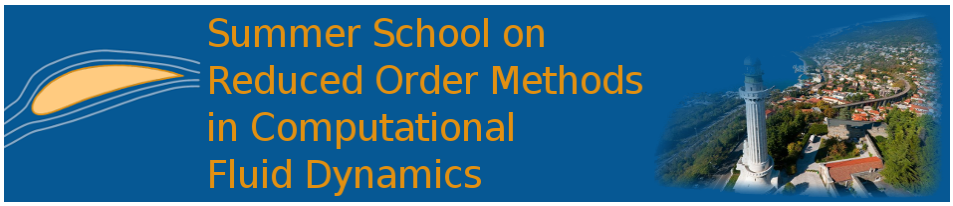

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Non-linear reduction for data-driven non-intrusive reduced-order models with parallel autoencoders

Projection-based intrusive reduced-order models (ROMs) have demonstrated exciting results across a wide range of applications [1-2]; nevertheless, implementing such intrusive techniques requires significant modifications to the underlying numerical codes. Non-Intrusive Reduced-Order Models (NIROM) based on Proper Orthogonal Decomposition (POD) have been proposed for providing a reduced-order subspace approximating the solution manifolds of parametric problems. A finite set of high-fidelity snapshots can be projected onto the POD space to reduce their dimensionality. The set of governing equations for a system is viewed as a black box, and the solution manifold can be estimated using a variety of interpolation techniques without performing any modification to the simulation software.
In this ongoing research, we are investigating a completely data-driven non-intrusive approach utilising a non-linear reduction technique such as the autoencoder neural network instead of the linear POD. Since the size of the input data obtained from the full order simulations can be very large, resulting in a huge set of weights and biases for the neural network, we are aiming to explore the capabilities of the non-linear reduction for various types of problems within the HPC framework taking the advantage of data parallelism techniques.

References:

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