

Model Reduction for Advection Dominated Problems

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Model order reduction for advection dominated problems has always been not effective due to the slow decay of the Kolmogorov N -width of the problems. Even very simple problems, such as linear transport equations of sharp gradients, show already this behavior. This difficulty can be overcome with different techniques. What we propose is to change the original solution manifold thanks to a geometrical transformation that aligns the advected features of the different solutions and that leads to an Arbitrary Lagrangian Eulerian formulation. In order to be able to use this formulation, we need to know the so-called mesh velocity. In this context, the map is chosen according to parameter and time and can be generated with some expensive detection and optimization algorithms. To effectively use it in the online phase of the model order reduction technique a regression map must be used. To do so, we compare different regression maps (polynomials and deep learning maps). The results for some examples in 1D are shown.

More details on <https://arxiv.org/abs/2003.13735>

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