

Sampling low-dimensional Markovian dynamics for learning certified reduced models from data
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Solution manifolds induced by transport-dominated problems such as hyperbolic conservation laws typically exhibit nonlinear structures, which means that traditional model reduction methods based on linear approximations are inefficient when applied to these problems. This presentation discusses model reduction methods for constructing nonlinear reduced models that lead to efficient dimensionality reduction even for transport-dominated problems. A crucial feature of the methods discussed in this presentation is that the nonlinear reduced models time-step the governing equations of the systems of interest, which is in contrast to, e.g., data-fit surrogate models that ignore the dynamics of the underlying systems. Thus, the proposed nonlinear reduced models have the potential to be predictive beyond the data that are observed. Numerical results demonstrate orders of magnitude speedups compared to reduced models constructed with traditional, linear model reduction methods.