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Towards equation-free resolvent analysis¹ STEVEN BRUNTON, University of Washington, PETER BADDOO, Imperial College London, BENJAMIN HERRMANN, University of Washington, BEVERLEY MCKEON, California Institute of Technology — As an equation-based method, resolvent analysis requires knowledge of the exact governing equations of the system so that the resolvent operator can be computed. In this presentation, we explore whether resolvent analysis can be performed purely from data. We base our approach on a nonlinear version of dynamic mode decomposition (DMD) that allows us to approximate the underlying nonlinear operator. Since the system is typically of very high dimension, we leverage techniques from machine learning to project the data onto the principal components of a high (or infinite) dimensional latent space. This approach enables us to disambiguate the linear and nonlinear parts of the operator in the original physical domain. We then establish a connection to the resolvent operator and, finally, validate our approach on a range of high-dimensional problems.

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