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A Koopman-based framework for forecasting the spatiotemporal evolution of chaotic dynamics MOHAMMAD AMIN KHODKAR, PEDRAM HASSANZADEH, ATHANASIOS ANTOULAS, Rice University — We show the remarkable skills of a data-driven method in spatiotemporal prediction of high-dimensional and chaotic dynamics. The method is based on a finite-dimensional approximation of Koopman operator where the observables are vector-valued and delay-embedded, and the nonlinearities are treated as external forcings. The predictive capabilities of the method are demonstrated for well-known prototypes of chaos such as the Kuramoto-Sivashinsky equation and Lorenz-96 system, for which the data-driven predictions are accurate for several Lyapunov timescales. Similar performance is seen for two-dimensional lid-driven cavity flows at high Reynolds numbers.

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