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Data-driven prediction of multistable systems from sparse measurements MOHAMMAD FARAZMAND, BRYAN CHU, North Carolina State University — We develop a data-driven method for predicting the asymptotic behavior of nonlinear dynamical systems from sparse measurements. The systems of interest are described by partial differential equations (PDEs). As is usually the case in experiments, we assume that, at any given time, the state of the system can only be measured at a few sparse locations. To make accurate predictions, we formulate and solve a metric-learning optimization problem which promotes sparsity. The resulting metric determines the optimal points where measurements have to be made. The sparse measurements are then used in a clustering algorithm to predict the asymptotic state of the system. We illustrate the application of our method on a reaction-diffusion equation and show that it makes correct predictions more than 85% of the time.

Mohammad Farazmand
North Carolina State University

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