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Optimal sensor and actuator placement using model reduction KRITHIKA MANOHAR, California Institute of Technology, J. NATHAN KUTZ, STEVEN BRUNTON, University of Washington — The optimal placement of sensors and actuators, given a constrained budget, is a NP-hard combinatorial search in the number of candidate locations. This combinatorial complexity quickly becomes intractable for large-scale complex systems. However, physical systems often possess low-rank underlying structure which can be harnessed for efficient sensor placement. We describe a greedy matrix pivoting scheme that exploits the proper orthogonal decomposition of the dynamics to efficiently place sensors, and extend this method to actuator placement for control using balanced model reduction of observability and controllability gramians. The resulting placements are demonstrably close to known optimal placements for feedback control in a linearized Ginzburg-Landau model. The method is also applied to sensor placement for a Bayesian inverse problem in atmospheric source dispersion.

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