Regularization Techniques in Koopman-based System Identification

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Abstract:

Using the Koopman operator, nonlinear systems can be expressed as infinite-dimensional linear systems. Data-driven methods can then be used to approximate a finite-dimensional Koopman operator, which is particularly useful for system identification, control, and state estimation tasks. However, approximating large Koopman operators is numerically challenging, leading to unstable Koopman operators being identified for otherwise stable systems. This talk will present a selection of techniques to regularize the Koopman regression problem, including a novel H-infinity norm regularizer. In particular, how to re-pose the system identification problem in order to leverage numerically efficient optimization tools, such as linear matrix inequalities, will be presented. This talk is based on the pre-print
https://arxiv.org/abs/2110.09658