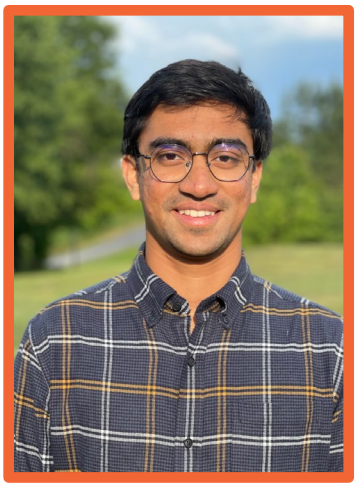
Graduate Student Research Seminar

Fall 2024

Koopman Operator Based Predictive Control With a Data Archive of Observables



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Monday, November 4th
3:00 pm (EST) – 132 Fluor Daniel Building

Abstract

The control of complex systems is often challenging due to high dimensional nonlinear models, unmodeled phenomena, and parameter uncertainty. The increasing ubiquity of sensors measuring such systems and increased computational resources has led to an interest in purely data-driven control methods, particularly using the Koopman operator. We elucidate the construction of a linear predictor based on a sequence of time realizations of observables drawn from a data archive of different trajectories combined with subspace identification methods for linear systems. This approach is free of any predefined set of basis functions but instead depends on the time realization of these basis functions. The prediction and control are demonstrated with examples. The basis functions can be constructed using time-delayed coordinates of the outputs, enabling the application to purely data-driven systems. The paper thus shows the link between Koopman operator-based control methods and classical subspace identification methods. The approach in this paper can be extended to adaptive onlinelearning and control.

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