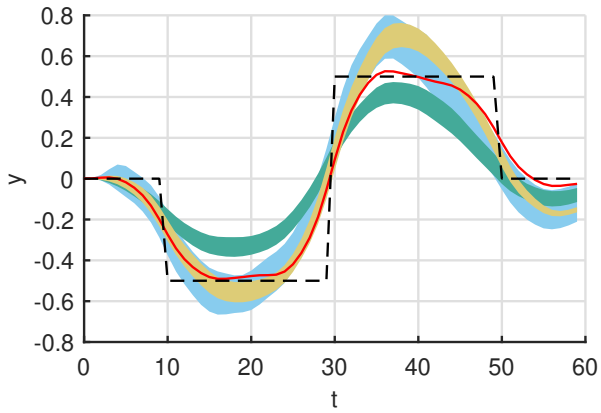
Institut für Regelungstechnik
Leibniz Universität Hannover

Leibniz Universität Hannover

Bachelor-/Masterthesis

A Bayesian Perspective in Data-Driven System Analysis and Control

Recently, data-driven control approaches based on the behavioral system theory have been successful in various applications. Such approaches characterize possible trajectories of systems in the noise-free case by a linear combination of observed trajectories which are persistently exciting. Results are then extended to handle model uncertainties.



In this project, we plan to approach this problem differently from a Bayesian perspective by considering observed trajectories with uncertainty directly. In this way, instead of a binary characterization of possible system trajectories, probable trajectories are characterized as posterior distribution with linear combinations of observed trajectories providing the prior distribution.

We hope to provide a unified framework that unifies data-driven simulation, denoising, and control with stochastic data. Possible research topics include 1) developing optimization algorithms to solve nonlinear hyperparameter tuning programs, 2) conducting case studies of different data-driven problems, and 3) benchmarking results against existing works.

Prospective students should be familiar with optimization and have good programming maturity in Matlab or Python. Knowledge in data- and learning-based control, model predictive control, statistical learning, and system identification would be a plus.

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