Open Thesis (MA)

Learning linear approximations of nonlinear systems in the presence of Gaussian noise

Description:

Even though many physical systems are nonlinear, linear models are often successfully used to approximate the nonlinear system around a given reference point. This is due to the simplicity and interpretability of linear systems, as well as the often satisfactory results around the reference point. While these models can be inferred via first principles, there is great interest in learning a model from data collected in experiments. Recent contributions in literature have considered the case of learning a linearized model from noisy data collected from a nonlinear system.

The goal of this thesis is to extend this literature by first analyzing the existing results from a system theoretic viewpoint. Based on this analysis different extensions of the existing result may be possible. One possibility is to use the existing finite sample error bounds in combination with robust control techniques to derive a data-based controller that comes with end-to-end guarantees. On the other hand, the existing results could potentially be combined with works that concern learning piecewise linear representations from data for an improved approximation of the true system.

Prerequisites:

- *Konzepte der Regelungstechnik* or similar
- Interest in Statistical Learning Theory

Supervisor:

Nicolas Chatzikiriakos
Room 3.244

Area:

Control theory
System identification
Statistical learning theory

Properties:

Type: **MA**

25% literature
50% Theory
25% simulation

Beginning:

anytime

Further information on www.ist.uni-stuttgart.de/lehre/bama

Aushang vom April 8, 2024