Universität Stuttgart
Institut für Systemtheorie und Regelungstechnik
Prof. Dr.–Ing. Frank Allgöwer

Open Thesis (MA)

When are linear systems hard to learn?

Description:

System identification is widely used in practice and offers great opportunities when systems are hard to model. The statistical analysis of system identification algorithms under the asymptotic regime is a field that has been studied for a long time. Recently a new line of study has evolved, which takes on a finite-sample perspective. Using this approach phenomena that are lost in the big-O notation of the asymptotic case can be analyzed. One interesting question in this regime is to consider when systems are hard or easy to learn. Using careful statistical analysis, recent works have shown that system theoretic quantities like the controllability index play a fundamental role in that regard. The goal of this thesis is to extend existing results which are limited to very particular classes of linear systems. To this end, we seek to use results from statistical learning theory to analyze the properties of identification algorithms. In order to do so both fundamental limits ranging over all learning algorithms as well as the performance of popular algorithms like ordinary least squares could be explored. Another interesting direction could be to identify quantities of linear systems that make learning for the purpose of control easy or hard.

Prerequisites:

- Strong background in control theory and mathematics
- Background in statistics and ideally statistical learning theory
- Interest in theoretical problems

Supervisor:

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Room 3.244

Area:

Control theory
System identification
Statistical learning theory

Properties:

Type: **MA**

35% literature
65% theory

Beginning:

anytime

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

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