Problem description:
Gaussian Processes (GPs) are a great tool for learning unknown non-linear dynamics from observations [3][2] and have been applied in control [1]. GPs are considered as a Bayesian non-parametric framework, thus they are capable of representing arbitrarily complex continuous functions. Therefore, they are a very powerful tool in system identification.

A commonly used approach for the control of non-linear dynamical systems is model predictive control (MPC) [4]. MPC is based on a forward simulation of the dynamical system over a finite time horizon and requires therefore accurate models. Its application in practice is widespread as it allows to take constraints into account and works successfully for many classes of systems.

Both, MPC (due to the forward simulation) and GP (due to a large matrix inversion) are considered computationally slow. Thus, the combination of both comes with the challenge of a high computational burden, but at the same time is also very promising.

This Advanced Seminar aims to investigate different adaptations of GPs which allow the application of GP in MPC and summarize the corresponding literature.

- Literature research for GPs and MPC
- Summary and comparison for different options of reducing computational burden of GP predictions
- Documentation of the results

Literatur


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