Description:
Model Predictive Control (MPC) solves optimal control problems by computing an open-loop input trajectory online and applying the solution in a receding-horizon fashion. By computing a new input trajectory at every time step, an MPC controller thus generates *a lot of data* over time. However, the data is typically used only to apply the first input and then forgotten afterwards. In this Master thesis project, we want to develop and analyze MPC schemes that save previous solutions in memory and leverage this data to improve control over time.

There are different directions to pursue this basic idea; please contact us if you are interested to know more details. A core focus of this project will be on rigorous theoretical analysis of the developed MPC scheme and the derivation of provable properties. At the same time, the developed solution shall be implemented in simulation examples or hardware experiments.

This project will be carried out in cooperation with the Max Planck Institute for Intelligent Systems (MPI-IS) in Tübingen (Dr. Sebastian Trimpe, strimpe@tuebingen.mpg.de).

Prerequisites:
- Strong background in control theory, strong skills in mathematical analysis
- Good *Matlab & Simulink* skills
- Knowledge in machine learning and C/C++ or python programming is a plus (no prerequisite)

Supervisor:
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Sebastian Trimpe
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Area:
Model pred. control
Data-based approaches
Machine learning

Properties:
Type: **MA**
10% Literature
60% Theory
30% Simulation/experiments

Start:
any time

Weitere Informationen: [www.ist.uni-stuttgart.de/lehre_und_studium/bama](http://www.ist.uni-stuttgart.de/lehre_und_studium/bama)

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