

# Developing a Modular Wind Turbine Framework with State Estimation in the HILO-MPC-Toolbox

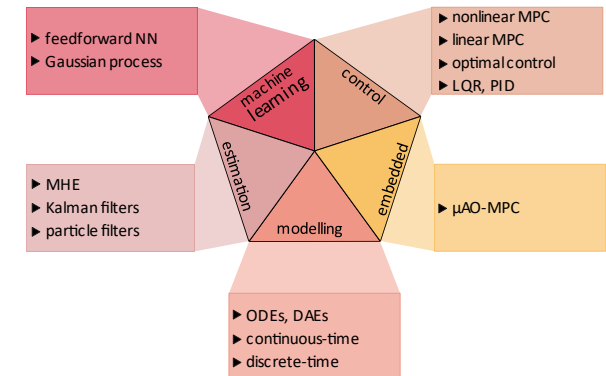
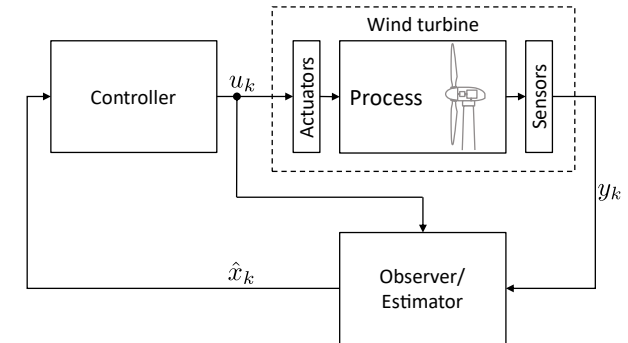
## Projektseminar (2-3 Personen, Homeoffice)

Wind turbines are highly nonlinear, dynamical systems with complex disturbances, such as varying wind speeds. Controlling them is thus challenging, and the development of controllers and state estimators is still an active field of research.

To simplify research of new controller and estimation techniques for wind turbines, you are tasked to develop a modular framework for wind turbine control in Python using the HILO-MPC toolbox [1]. HILO-MPC is a Python toolbox for easy, flexible and fast realization of machine-learning-supported optimal control and estimation problems developed within our group. The aim is to be able to efficiently test different wind turbine control and estimation techniques, including machine-learning supported approaches.

Your first task, therefore, is to develop a modular framework, where different processes, controllers and state estimators can be easily interchanged. Secondly, you will integrate an already existing wind turbine model and controller in this framework [2]. If the time allows, you should then investigate different wind turbine state estimator approaches (Kalman filter, MHE, RNN/LSTM) in the framework.

The preferred language for this project is English but German also works. Since the project is heavily focused on transferring code to the HILO-MPC-based framework, programming experience with Python is required. Experience with C++, Matlab as well as the PyTorch and CasADi toolboxes are beneficial. If you have questions, feel free to contact us.



[1] <https://github.com/hilo-mpc/hilo-mpc>

[2] <https://github.com/gjeisler0303/CADynTurb>

**M.Sc. Felix Häusser**

**Dr.-Ing. Anton Savchenko**

Tel.: 06151 / 16-25190

E-Mail: [felix.haeusser@iat.tu-darmstadt.de](mailto:felix.haeusser@iat.tu-darmstadt.de)

[anton.savchenko@iat.tu-darmstadt.de](mailto:anton.savchenko@iat.tu-darmstadt.de)

Web: <https://www.ccps.tu-darmstadt.de/ccps/>

