

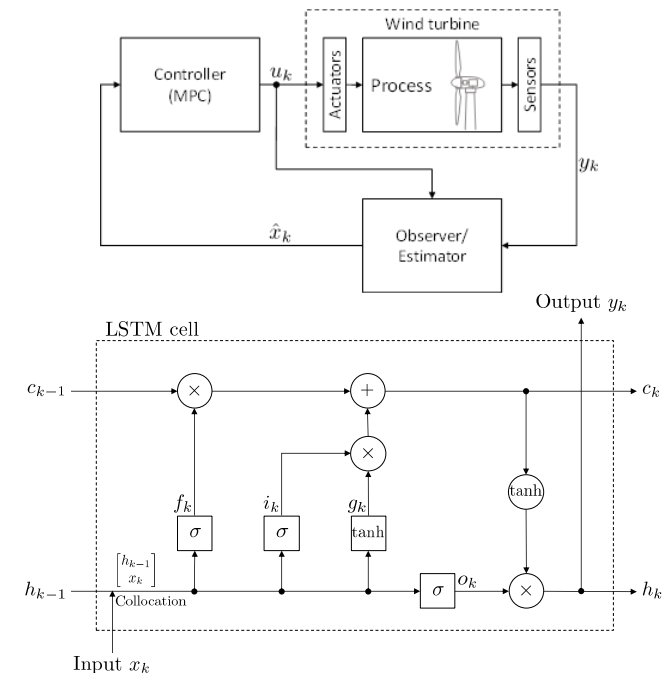
Recurrent Neural Networks for State Estimation of a Wind Turbine

Projektseminar (2-3 Personen, Homeoffice)

Wind turbines are complex, highly nonlinear, dynamical systems subject to strongly fluctuating environmental influences during operation, such as varying wind speeds. In order to efficiently control such a system, modern wind turbine controllers, such as Model Predictive Controllers, need precise knowledge of the wind turbine system states. Since not all states can be measured directly, the use of state estimation techniques becomes necessary. In practice, however, the quality of estimation is severely limited due to high computational cost of the underlying algorithms.

Within the scope of this project, you will investigate the idea of using recurrent neural networks (e.g. LSTMs) to repeatedly estimate the system states of a wind turbine from the stream of measurement data. The project will be a continuation of [1], where this concept was initially formulated. Project participants will tackle the following extensions of the approach: general improvement of estimation quality via hyperparameter optimization and data augmentation; incorporation of first principles (knowledge of the physical meaning of system states) into NN training; investigation of suitable performance metrics and development of the corresponding evaluation methods to compare the quality of the resulting trained neural networks.

The preferred language for this project is English but German also works. Background knowledge about neural networks is required. Experience in programming in Python/Pytorch is beneficial. If you have any questions, feel free to contact us.



[1] F. Häusser. Real-time capable State Estimation for a Wind Turbine Model. Master thesis, Institute for Automation Engineering, University of Magdeburg. 2020.

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