Project/Master Thesis

Neural Network based simulation model of a car brake

The Dynamics Group is happy to announce that we are currently looking for a highly motivated, independently working and ambitious student for a project/master thesis. Within a new research project we develop an AI-driven brake system control strategy for electrified vehicles. Using deep learning, we aim at predicting the friction sounds and brake particle emissions of real braking systems in collaboration with automotive manufacturers and suppliers, such as AUDI AG, VW AG and Hitachi Astemo.

This thesis encompasses the implementation of an autoregressive model, i.e. a NNARX model, in order to model car braking behavior from a multivariate time series data-set. Exclusive car brake data sets from our cooperation partners are available, encompassing pin-on-disc, dynamometer and real world EV-brake test runs.

This simulation model can be used to simulate the behavior of the system for old and

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new input combinations. We will utilize it to create realistic brake trajectories, in order to design controllers in a consecutive step. Thus the simulation model will be the essential building block for finding a control strategy that reduces the overall particle and squeal emissions of car brakes.

Project milestones:

- Detailed literature survey on NNARX models
- Implementation of a NNARX model for one or several data-sets and integration into the project Python module
- Conduction of hyperparameter studies in order to identify important algorithm parameters
- Documentation, description, interpretation of the results, writing a thesis report

Your profile and skills:

- Demonstrated programming skills in Python, tensorflow, and related libraries
- Knowledge of control theory, non-linear dynamics, system identification
- Structured way of thinking, working, and communicating

Interested? Please contact: Nathanael Winter (Nathanael.winter@tuhh.de)