Model Transfer from Simulation to the Real World: Automatic Error Classification in Electric Drives Using Machine Learning

Context and goals

The project is concerned with transferring knowledge learned about error detection from simulations to real-world measurements. The project aims to employ machine learning techniques and algorithms to detect errors and anomalies in electric drives from measurements of the electric currents, by training machine learning models on simulations and applying knowledge-transfer and domain adaptations techniques to detect these errors in real-life measurements.

Training machine learning models to predict the errors and deviations in simulations is considered an easier task than real drives for several reasons, such as:

- The ability to simulate and generate more data compared to the limited real-life training data. because of the scarcity of the errors and the difficulty of gathering the data.
- The absence of measurement noise.

The project is a cooperation between the Institute of Computational Perception with the Linz Center of Mechatronics (LCM). In this context, the Institute of Computational Perception offers a number of topics for master theses (possibly to be combined with a “Praktikum” or “Project” that is part of the CS or AI curriculum). This offer specifically goes to students of Computer Science (CS) and Artificial Intelligence (AI). For highly qualified candidates (and after a certain trial period) we can also offer financial support (in the form of part-time employment as a “student researcher” at our institute).

Possible topics for projects (examples):

- Deep learning vs handcrafted features: comparing deep learning methods with features designed by domain experts
- Domain adaptation: Studying and applying state-of-the-art domain adaptation techniques to generalize the learned models from simulation to measurements.
- Few-shot learning: Studying the ability of trained simulation models to generalize to the measurements with just a few examples.

Prerequisites:

Knowledge of machine learning and programming in python(scikit-learn) and/or deep learning frameworks (such as Pytorch).

Contact:

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