Master's thesis in machine learning with application to vehicle dynamics CAE

Background

In the field of Computer Aided Engineering (CAE) modelling of complex dynamic systems is a central part. The developed models are used to predict behavior of the system to enable improvement of the design and to generate understanding of the system. Models are often constructed using so called physical modeling where behavior is based on physics foundation and mathematical equations are derived based on knowledge of the physical mechanisms involved. The resulting models constructed in this way are often the most accurate but unfortunately also quite slow. The classical opposite of a physics based model is a quantitative model. Quantitative models often use physical data as the starting point and are constructed by asserting a purely mathematical relation between input and output. These models are faster but lack in accuracy.
An example of a component in a mechanical system that has well established models of the two types is a tire of a vehicle. Fast data-based models like the Pacjeka model, such as PAC2002, and slower physical models, like FTire and CD-Tire are all very common in the industry. With this master's thesis we wish to explore the possibility to create a machine learning based tire which hopefully can exhibit the speed of a data based model and the accuracy and parameterization of a physical model based on mechanical understanding.

Topic:

The goal of this Master thesis is to develop a machine learning based model of a passenger car tire. This approach will be able to generate a fast-solving model with accuracy that can be continuously improved using training data generated from an advanced model.
The model should be built in Python or C++ and should be adapted for inclusion in the multibody CAE software Adams.

Prerequisites: One student with Computer science, AI/ML background, and one student with Mechanical or Physics engineering and modeling background would be an excellent team.

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