Adaptive Machine Learning for Live Sensor Simulation

Thesis Background

The application of machine learning (ML) methods to predict powertrain systems is increasing sharply. By their design, machine learning models offer tremendous flexibility, capable of capturing complex behavior and patterns, while maintaining a relatively tiny computational footprint. Machine Learning models have been successfully used for predicting engine parameters such as torque, efficiencies and after treatment system. The ML models do have certain drawbacks however; unlike physical models, as any changes to the physical engine hardware would require retraining, and any dramatic changes to the operating conditions would require extra training data to ensure the model responds correctly. At Volvo Penta, we have developed offline machine learing models for simulation of our powertrain system before, SAE 2018-01-0870.

ML applications today are mostly "open-loop" or offline where the models are connected to a data lake to develop models and generate insights for eventual actions. We are ambitious! We are building the next generation of ML models called "In-Stream Analytics (ISA)". The models are generated (or modified) in real time. If we succeed, it is an example of a "closed-loop" system or "Adaptive Machine Learning" or AML.

Thesis scope of work

- Evaluate the possibility and scope of the Adaptive machine learning (AML) model development (data quality, data input intervals, complexity evaluation, AI structure strategies etc.)

- Selection of the focused area: most likely a sensor will be selected to be the case study

- Developing the model based on previous developed models. Neural Network models are strongly preferred for this thesis: ANN, CNN and LSTM networks. In addition, networks in parallel will be investigated, especially if coupled signals are detected. The models will be verified against the test cell data.

- Testing the model: the model should be able to run in the test environment with self-training features

- Integration: This is a validation stage for the developed model. The system will be tested for an ongoing project.

Qualifications & Required Documents

- Two super heroes with a background in mechatronics, signal and systems, automotive engineering or similar
- Knowledge of machine learning is considered advantageous
- Programming, Matlab, Simulink

Please send your application including CV, Cover Letter, and Transcript of grades.

Practical information

Thesis Level: Master (30 ECTS points)
Language: English
Starting date: January 2019
Number of students: 2 students
Last application date: December 1st, 2018
Examiner proposal:

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About us

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With Volvo Penta, a world-leading supplier of engines and complete drive systems for marine and industrial applications, you will be part of a global and diverse team of highly skilled professionals who works with passion, trust each other and embraces change to stay ahead. We make our customers win.

In new Technology Development, our mission is to develop and deliver new innovative solutions and driving Volvo Penta transformation towards future technology. We are a light setup with few own resources, but with a budget and mandate over a large number of appointed resources. We are an agile and scalable entity that adapt over time to reflect the changing needs. We deliver Technology strategy, Innovation and Mature technology ready for product projects.

Entity: AB Volvo Penta
State / Province: Västra Götaland
City/Town: Göteborg
Employment/Assignment Type: Thesis
Functional Area: Technology

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