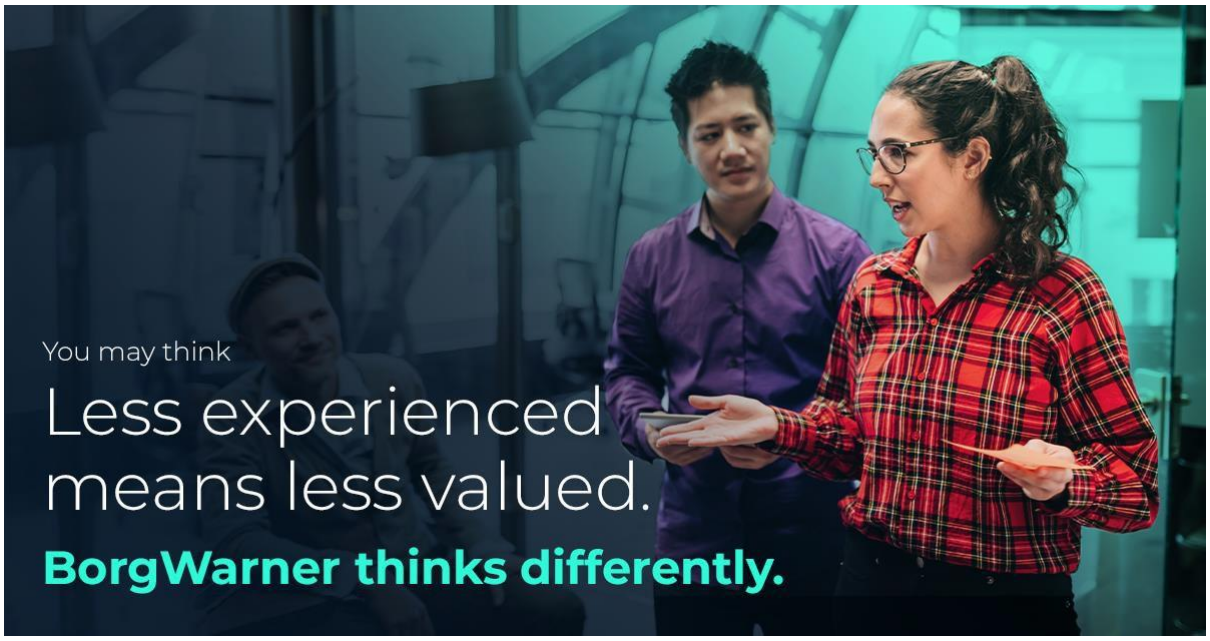
BORGWARNER

On the hunt for thesis work?



BorgWarner i Landskrona utvecklar och tillverkar system och komponenter till de största fordonstillverkarna världen över. Vår vision och mål och är att utveckla rena och energi-effektiva system för framdrivning av förbränningss-, hybrid- och elektriska fordon.

BorgWarner in Landskrona develops and manufactures systems and components for the largest vehicle manufacturers in the world. Our vision and goal is to develop clean and energy-efficient systems for propulsion of combustion, hybrid and electric vehicles.

Content

Software Verification – How can AI be used in software testing?

Background
In the software verification area, there is a lot of requirements and corresponding testcases.
How can we use AI to optimize what to verify and maximize the quality in the build.
Some testcases can be unstable due to timing requirements that our test benches not always can met and thereby give false result. In those cases, would it be possible for an AI for detecting if a run of an unstable testcase resulted in valid result or if the test should be rerun instead of a tester having to make that decision.

Today we base what to verify on experience and what area changed. The high level of automated testcases makes this a complex task. Can AI help create test suite based on results from nightly runs, the changed functionality?

Challenge

- Is it possible to see patterns in the result
- How can AI be beneficial in this area
- What metadata for the build and from test environment to make test suite suggestions
- What is the draw back
- Is it possible to use an AI to suggest a custom test suit for a nightly run to maximize our test benches.

The work will preferably be conducted at BorgWarner in Landskrona and is suitable for 1-2 persons.

Knowledge of AI is required.

Reporting
The master thesis shall be reported as a written report, a complete test environment and an oral presentation at BorgWarner.

Contact
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Software Verification – How can AI be used in software testing Part 2?

Background

In the automotive software validation domain, test engineers rely heavily on CAPL (CAN Access Programming Language) scripts to implement automated test cases for ECU verification. These scripts are derived from OEM requirements and are critical for ensuring compliance and functionality. However, writing CAPL scripts is time-consuming, requires deep domain knowledge, and is prone to human error. The challenge is amplified because:

- CAPL is a niche language, not widely used outside CANoe environments.
- Most Large Language Models (LLMs) have limited or no exposure to CAPL during pre-training.
- There is a lack of large, high-quality CAPL datasets for fine-tuning or supervised learning.

Given these constraints, the idea is to explore whether an AI-powered CAPL expert agent, leveraging LLM technology and domain-specific adaptation, can assist test engineers in:

- Generating CAPL test scripts from OEM requirements, or their test specifications.
- Generalizing scripts for reuse across projects.
- Ensuring compliance with coding standards and test logic integrity.

Challenge

- **Data Scarcity**: How to train or adapt an LLM for CAPL when public CAPL code is almost non-existent?
- **Domain Adaptation**: How to inject automotive testing knowledge into the model?
- **Validation**: How to ensure generated scripts are syntactically correct, logically sound, and executable in CANoe (could be in compilation level)?
- **Integration**: How to embed the AI agent into the existing test development workflow without disrupting compliance and safety processes?

The work will preferably be conducted at BorgWarner in Landskrona and is suitable for 1-2 persons.
Knowledge of AI is required.

Reporting

The master thesis shall be reported as a written report, a complete test environment and an oral presentation at BorgWarner.

Contact

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Open Daq – Investigate if openDAQ adds value to existing measurement systems?

Background
In the measurement area there is a wide range of suppliers of measurement equipment. They tend to be quite expensive, and the supporting software is specific for the manufacturer. This makes it a challenge to support a range of different systems.
This new approach with openDAQ aim at developing a software compatible with a range of suppliers' hardware. Simplifying maintenance of setups, making daily work easier switching between different setups.
Investigate the values added in this approach and support given.

Is it a way forward going over to openDaq and choose hardware independent on history and software knowledge? Not using the same supplier as always.

Challenge

- How is the future for openDAQ
- What features is missing out
- Is it possible to automatically transfer old setups to openDAQ
- What is the draw back
- How is support when having issues

The work will preferably be conducted at BorgWarner in Landskrona and is suitable for 1-2 persons.

Programming experience and measurement knowledge is required

Result
The master thesis shall be reported as a written report, a complete proof of concept and a presentation at BorgWarner.

Contact
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Simulation model of a BLDC motor

Background

BorgWarner is an automotive supplier developing clean and efficient technology solutions for hybrid, electric and combustion vehicles. At the site in Landskrona, driveline and propulsion systems are developed and produced for manufacturers around the world.

BorgWarner Landskrona has several applications of actuators using a Brushless DC, permanent magnet (BLDC) motor in different actuators. In order to improve development and testing of control strategies, the objective of this thesis is to develop a way to estimate motor parameters from measured data for a model of a BLDC motor.

Tasks

- Investigate approaches to estimate the motor parameters from measured data.
- Implement at least one estimation approach.
- Collect measurements on a BLDC motor to verify the approach.

The master thesis shall be performed at BorgWarner, Landskrona. We prefer that two students write the thesis together. Students will get a compensation for completed master thesis, and lunch will be paid by BorgWarner.

Prerequisites: MATLAB Simulink, System Identification

Result

The thesis outcome should be a written report, implemented simulation model, implemented method for estimation of motor parameters and an oral presentation at BorgWarner.

Contact

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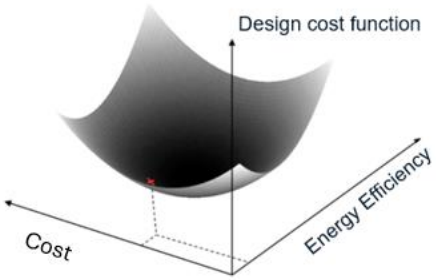
Optimization of Electric Machines for Driveline Actuator Applications

Background

BorgWarner is an automotive supplier developing clean and efficient technology solutions for hybrid, electric and combustion vehicles. At the site in Landskrona, driveline and propulsion systems are developed and produced for manufacturers around the world.

Designing driveline actuators is a complex, multi-variable optimization challenge. It requires aligning e-machine parameters with mechanical transmission design and power electronics to meet vehicle-level performance targets. Simultaneously, minimizing both cost and power consumption is essential to ensure competitiveness.



This thesis aims to approach e-machine design as a mathematical optimization problem, leveraging a large internal database of e-machines. The goal is to identify optimal design solutions and explore trade-offs between cost, size, and performance.

Thesis Assignments

- Develop an e-machine database tailored for actuator optimization using BorgWarner's internal simulation tools.
- Use the database to analyze cost/performance trade-offs in relation to vehicle-level actuator requirements.

Results

The master thesis shall be reported as a written report and an oral presentation at BorgWarner in Landskrona.

Requirements

We are looking for 1-2 motivated students with a background in mechatronics (preferred) or similar and an interest in optimization and sustainability. Matlab experience is required.

Contacts

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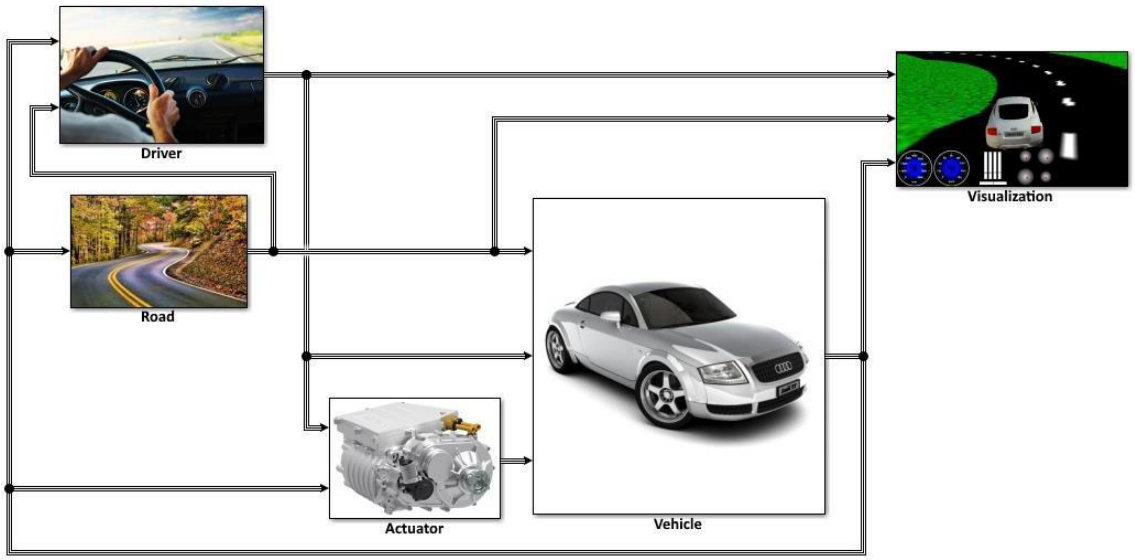
Driver Model

Background

At BorgWarner, we have developed a vehicle model designed to simulate the dynamics of a real car. It includes detailed representations of the chassis, wheel suspension, tires, and drivetrain. Various road and track configurations are available, featuring elements such as slopes and banking. Currently, the vehicle model is controlled by a basic driver model that can navigate around a track but is not capable of pushing the car to its limits, for example, to achieve competitive lap times.



Vehicle model in Simulink

Thesis Assignments

- Develop a controller capable of driving the vehicle model at its performance limits.
- Evaluate whether an AI-based driver, utilizing a neural network, is preferable to a conventional control approach.
- The controller should run in Simulink.

Results

The master thesis shall be reported as a written report and an oral presentation at BorgWarner in Landskrona.

Contact

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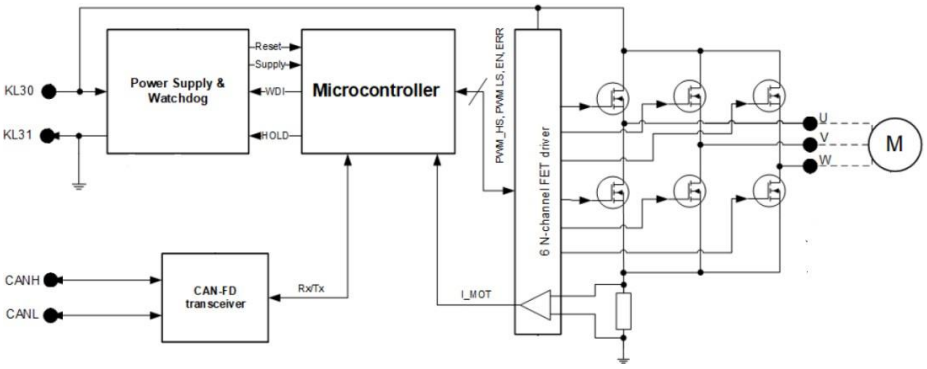
Development of a current estimation model

Background

BorgWarner is an automotive supplier developing clean and efficient technology solutions for hybrid, electric and combustion vehicles. At the site in Landskrona, driveline and propulsion systems are developed and produced for manufacturers around the world.

For some of the products developed by BorgWarner, the performance depends on the temperatures of the components and the oil. There is a trend in car industry to move from melt fuses to electrical fuses which requires supply current to be measured with higher accuracy to support our current limitation. The current sensor is placed to measure motor current which is not the same as the supply current. Therefore, we need a model to accurately estimate supply current based on measured motor current.
The purpose of this thesis is to update the existing model to better estimate supply current in newer products. This includes analyzing sampling methods, rpm, torque and temperature dependencies and from this implementing an estimation model for the supply current.



Tasks

- Investigate approaches to model motor current to supply current translation.
- Examine the performance of the current model, and either suggest possibilities to improve parameter tuning of the current model or suggest a new model with improved estimation accuracy.
- Implement above in software and do comparison between estimation and measurement.

Prerequisites: Signal processing, measurement, embedded programming, and electronic hardware.

Result

The thesis outcome should be a written report, code implementation and an oral presentation at BorgWarner. We prefer that two students write the thesis together.

Contact

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Are you interested in thesis work within another area?

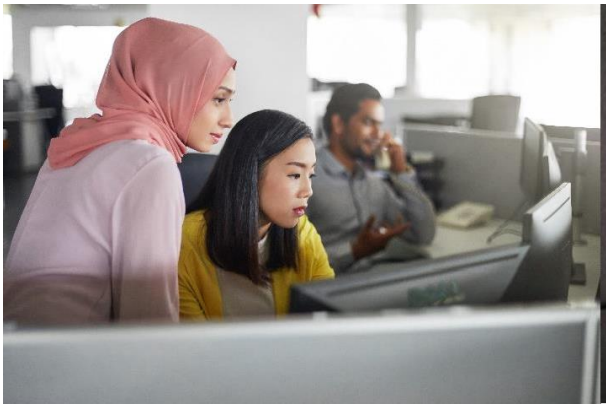
We can also offer master thesis work for product development or similar within the following areas:

- Active suspension
- Torque management systems for (eTMS) for wind- and/or waterpower
- eLSD for heavy vehicles and trucks
- Torque vectoring applications for agriculture machinery
- Torque vectoring for trailer stability
- Power take-offs for e-trucks
- Torque management to reduce tire wear and particle emissions

A master thesis within these areas includes a theoretical study of the product or new concept, including a literature search. You also investigate what requirements of the product would be needed. You may also prepare for physical testing or simulation; in some cases, testing or simulations may also be possible.

For thesis work within other areas such as production technology, logistics, purchasing, marketing, business development and quality.

Send your application with CV and personal letter to Sandra Sööder from HR, ssooder@borgwarner.com with a description of your ideas.



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