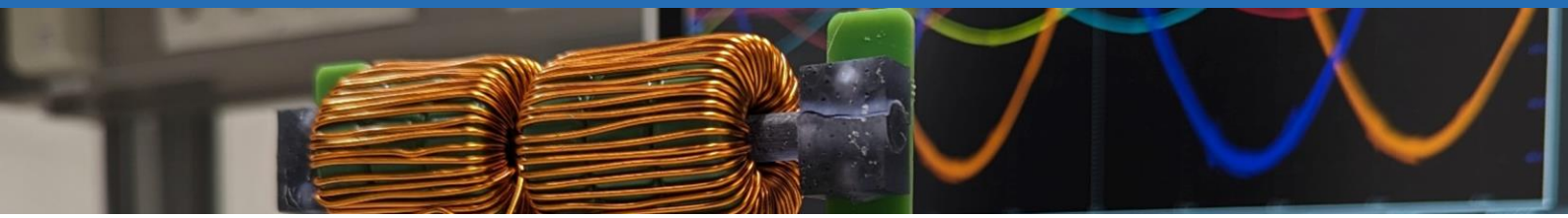
Master's Thesis

AI Based Thermal Estimation of Junction Temperatures of Discrete 3-Level TNPC Power Stage

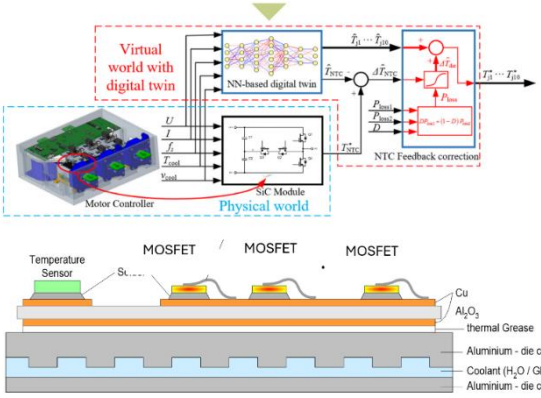


MOTIVATION

The goal of this master thesis is to develop an accurate AI based junction temperature T_j estimation strategy for power semiconductor switches of a three-Level T-type inverter for traction applications.

The work shall investigate whether an AI based estimation strategy is able to achieve a better result in the sense of accuracy, dynamic response time and identification effort than the current model-based estimation approach. The junction temperature estimation includes

- Estimation of average junction temperature.
- Estimation of peak junction temperatures



The power switch of a phase-leg is not integrated in a power module but rather consists of 4 discrete switching elements whereas every switching element is built by 3 power switches in parallel. Thus, the system consists in total of 36 power switches for the three phases, which are distributed on a single heat sink and the individual junction temperatures are challenging to predict.

RESEARCH TOPICS and TASKS

- Development of a novel junction temperature estimation strategy based on AI methods or combinations with AI methods and classical observer design.
- How to generate effective training data + training process?
- What is the achievable benefit over classical analytical methods?

- State-of-the-art literature research
- Modelling of the electro-thermal system
- Develop an estimation strategy
- Training the neural network with FEM and measurement data
- Practical implementation on existing eval board
- Verification of the method

ORGANISATIONAL MATTERS

Start: Immediately

Support from motivated team of the institute and SPSC team as well as Hofer Powertrain

Workplaces and lab-space available at the institute.

Workplace at Hofer Powertrain (Liechtenstein) possible

- Writing in German or English possible
- Compensation possible in form of success bonus.

CONTACTS

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