



Thesis - Development of Electro-Chemical-Mechanical Battery Models

The automotive industry's role in curbing carbon emissions and addressing climate change is vital. Electric vehicles offer an efficient and eco-friendly transportation solution. Understanding automotive batteries is key to enhancing their performance and reliability. Electro-chemical-mechanical models help capture the intricate dynamics of battery performance, aging, and mechanical impacts.

This master's thesis opportunity involves developing and validating precise electro-chemical-mechanical models using the Python tool PyBaMM, an open-source resource enabling tailored modeling of lithium-ion batteries and their aging processes.

YOUR RESPONSIBILITIES:

- Review state-of-the-art electro-chemical-mechanical modeling approaches for automotive batteries
- Investigate the fundamental electrochemical aging processes and their coupling with mechanical deformation and cell thickness growth (swelling)
- Develop mathematical and computational models for battery behavior under different mechanical conditions
- Validate the developed models using experimental data.

YOUR PROFILE:

- Strong proficiency in Python
- Knowledge of battery technology is a plus
- Experience in mechanical FEA simulations is beneficial but not required
- High level of self-reliance with the ability to work in a team, as well as autonomously
- Fluent English language skills are essential, fluent German is beneficial



WHICH STUDY TRACKS WE PREFER:

You are successfully studying in a masters program (FH/UNI) in the field of:

- Engineering
- Technical (computer science) or
- Natural science studies (physics, mathematic ...)

WE OFFER:

- A small, focused team with motivated devops engineers
- Flexible working hours (faculty is on first place)
- Remote work options
- The possibility of increasing the student hourly rate

You don't want to write your final thesis just for the books, then explore the mobility of the future together with us! Maybe you will be a part of it soon!

At AVL, we foster and celebrate diversity: We recognize that diverse ways of thinking are required to achieve our vision of a greener, safer, and better world of mobility. Different backgrounds, attitudes, interests, and experiences make us successful. As Equal Opportunity Employer we consider all qualified applicants without regard to ethnicity, religion, gender, sexual orientation or disability status.

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