



CARISSMA

Institute of Electric,  
Connected and Secure Mobility



Technische Hochschule  
Ingolstadt

July 2022

## Thesis

# Study on the identification of stress factors in battery testing

### **Description:**

Testing under normal operating conditions is time-consuming because batteries need to be tested under different cycling and storage conditions to simulate the battery in operation and in stand-by situations. This means that the test matrix and operation contain many associated stress parameters such as temperature, charge current, discharge current, discharge depth, and rest time. Although several works have investigated the effects of these parameters, there are still many uncertainties about the stress factors that can be used to accelerate battery testing and gain insights into battery performance, safety, lifetime, and reliability due to the wide variety of materials, size and format of batteries available on the market. Therefore, this master's thesis will go beyond the state of the art by identifying the most accelerated stress factors through machine learning algorithms in order to propose new test profiles capable of reducing battery testing time.

### **Your tasks:**

- First phase: Test development, data collection, structuring and imputation of missing data, data cleaning, and inferential statistics.
- Second phase: Developing data-driven models, Meta-Algorithms: Boosting, AdaBoost and Gradient Boosting, Evolving Fuzzy System, Algorithms for machine learning (supervised/unsupervised learning, neural networks) (offline and online algorithms). Deep Learning Algorithms.
- Third phase: Writing the text document of the thesis, presentation of the results.

### **Your profile:**

- MatLab or Python experience and knowledge is desirable but not required.
- Basic knowledge of battery systems is desirable.
- Confident use of MS Office.
- Excellent communication and organizational skills.

### **Interested? Any questions? - Contact us!**

#### **Contact:**

Carlos Antônio Rufino Júnior

E-Mail: carlos.rufino@carissma.eu

Prof. Dr. Hans-Georg Schweiger

Hans-Georg.Schweiger@thi.de

