Imperial College London | WMG THE UNIVERSITY OF WARWICK | BREATHE BATTERY TECHNOLOGIES | THE FARADAY INSTITUTION

Design of real-time model predictive control algorithms for advanced battery management systems

Project description

Charging speed and cost of ownership are two of the most important factors affecting electric vehicle purchasing decisions. However, fast charging can often cause accelerated degradation, which leads to shorter vehicle life and higher cost of ownership. Currently, manufacturers limit the maximum allowable current during charging based on empirical data that does not fully consider physical constraints such as the electrochemical states of the cell. This leads to overly conservative charging profiles and premature failures in the best case, and to safety incidents in the worst case.

Physics-based battery modelling can potentially solve these issues by providing insight into the cell's electrochemical states, guiding battery control strategies in real-time. By using this approach, the degradation can be minimised by tracking the internal states and the best charging strategy determined in real-time. This project aims to develop real-time model predictive control algorithms that can use the information provided by a simplified physics-based battery model in real-time. The student will be supervised by Dr Greg Offer (ESE Group, Imperial College) and co-supervised by Dr Dhammika Widanalage (WMG). The student will work closely with Dr Yan Zhao, CTO at Breathe Battery Technologies.

Due to the ongoing COVID-19 situation, the entire project will be running remotely, unless the existing restrictions are removed.

Who we are looking for and what can you learn

You should be comfortable with MATLAB or a similar scripting language such as Python. Experience in Simulink is desirable but not essential. Similarly, experience with control engineering is desirable, but not essential.

You will have the opportunity to learn about batteries and the development of advanced battery management algorithms. You will be working with both with an exciting start-up company and leading battery research groups. As part of The Faraday Institution's 2020 intern cohort you will enter an end-of-project poster competition – the winners of which will be invited to present their poster at the Faraday Institution Conference in November 2020.

Eligibility

- Be a registered full-time undergraduate student at a UK university.
- Undertake the internship within the years of undergraduate study (i.e. student must not be in final year).

Funding

A salary of £9.30/hour across the UK or £10.75/hour in London will be provided. This will be determined by the working address, not the university's location. The internship is a full-time role for 8 weeks, beginning in early July. The funding is provided by The Faraday Institution.

Deadline

June 1st 2020, please send your CV and brief cover letter to yan.zhao10@imperial.ac.uk