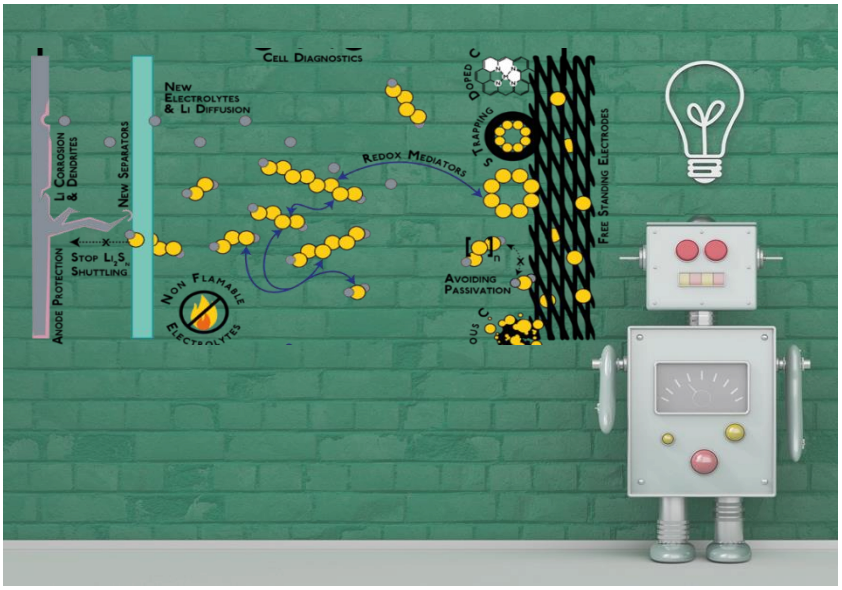
Using Machine Learning Techniques to Discover Lithium-Sulfur Battery Models



https://www.listar.ac.uk/about

Project description:

The need for high-capacity batteries is increasing rapidly due to our more electrified and mobilised world. Lithium-ion batteries have served use-cases such as phones and electric vehicles well, but the demand for greater performance requires the next generation of beyond-Lithium-ion batteries. One promising new battery technology is the Lithium-Sulfur battery. Such batteries have a theoretical specific energy capacity 3-5 times larger than traditional Lithium-ion batteries and are far more environmentally friendly. However, the current understanding of Li-S batteries is limited due to their highly complex internal electrochemical processes. The difficulty in understanding such batteries hinders the ability to enhance the technology enough for widespread adoption.

The project aims to incorporate techniques frequently used in machine learning to discover a correct model for Li-S batteries. These techniques will be applied to experimental data in order to create a model which both matches the data and is physically interpretable. This project will directly help to increase the applicability of Li-S models to a wider range of purposes, such as cell design for improved performance.

Supervisor: Dr. Monica Marinescu, Dr. Michael Cornish
University: Imperial College London
Location: *In-person, hybrid, or remote positions are available.*
Start date: The internship is a full-time role for 8 weeks during June – September 2022.

Eligibility:

• Be registered full-time undergraduate student from a UK university.
• Undertake the internship within the years of their undergraduate study (i.e., not in final year or during a subsequent Masters' programme).
• Not have been a FUSE intern in a previous year

Funding:

A salary of £9.90 / hour across the UK or £11.05 / hour in London will be provided. This will be determined by the working address of the appointee, not the university's location. The funding is provided by the Faraday Institution.

Additional activities:

During the FUSE internship you will be able to attend Faraday Masterclasses and cohort events which will focus on a variety of topics to further develop your understanding of career opportunities in battery sector. At the end of the programme, you will be invited to to share a poster about your work and prizes will be awarded.

Application:

In order to apply for a Faraday Undergraduate Summer Experience (FUSE) 2022 internship, you should be comfortable with Python and Multivariate Calculus. Familiarity with the Gradient Descent method and Ordinary Differential Equations (ODEs) will be beneficial. An understanding of how batteries work is desirable, but not essential.

You will be working with a leading research group to develop models in Python which can be cited by subsequent researchers. You will become more familiar with Python, ODEs, techniques used in Machine Learning, physical modelling, and battery technology. As part of The Faraday Institution's 2022 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 2022.

To express your interest, please fill out this form by April 8th, 2022. We will be in contact shortly thereafter.

Diversity:

The Faraday Institution is committed to creating a dynamic and diverse pool of talent for the fields of battery technology and energy storage. We at Imperial College are committed to equality of opportunity, to eliminating discrimination and to creating an inclusive working environment for all. We therefore encourage candidates to apply irrespective of age, disability, marriage or civil partnership status, pregnancy or maternity, race, religion and belief, gender identity, sex, or sexual orientation. We are an Athena SWAN Silver Award winner, a Disability Confident Leader and a Stonewall Diversity Champion.