



# Remote monitoring systems for electric vehicle technology

The Science and Technology Facilities Council (STFC) Hartree<sup>®</sup> Centre worked worked with local SME, Faraday Battery as part of the ERDF-funded CW4.0 programme using data science and AI techniques for remote predictive maintenance of batteries in electric vehicles.

## Challenge

Faraday Battery are a start-up company looking to manufacture rechargeable battery packs for large electric vehicles like trains and buses. At the moment, battery packs are designed to last for ten years after installation however, this relies on their ongoing ability to perform reliably. Optimising when to replace battery cells is a key problem for industry as doing this too late results in an unreliable service for customers and replacing cells too early means that healthy cells are not used to their full potential. The company were looking for a way to measure and quantify the health of a cell in real-time and display warnings of cell health through a user dashboard.

## Approach

The Hartree Centre's data science team worked with operational data from individual battery cells to develop tools to measure their normal operation. They used machine learning to predict and quantify variables affecting cell health, highlighting cells needing maintenance in real-time. To visualise the data and warning alerts, the team developed a dashboard to display key cell health statistics that could be accessed anywhere within a company from a cloud-based server. This was packaged into reusable, well-documented software that enabling Faraday Battery to offer cell monitoring tools to their customers on demand.

## **Benefits**

Centralised remote monitoring of the health of rechargeable batteries will enable future net zero transport providers to keep track of their resources more efficiently. This helps providers understand how well their batteries are performing overall, enabling them to detect failures sooner and preventing catastrophic issues. It allows for fleet-level monitoring that can be controlled at a company headquarters and will help with overall maintenance scheduling and cost-saving by being able to replace individual cells when needed rather than full battery packs. The accessible dashboard is designed to present operational data easily to engineers and planners who can act quickly on the information they see.

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We needed to develop Machine Learning models to predict the state of perations of the battery, and didn't have internal expertise to develop such complex models. This project provided funding and the opportunity to work with one of the best teams in the UK.

Sanjay Gupta Faraday Battery

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European Union European Regional Development Fund The Hartree Centre has deep expertise in machine learning and helped us train the models based on the data we had already collected. I would recommend any startup who needs help in this area to contact the Hartree Centre's team of experts.

Sanjay Gupta Faraday Battery

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## At a glance

- Used data science techniques for remote monitoring of individual cells in large electric vehicles
- Predicting and quantifying variables affecting cell health, using machine learning to highlight cells in need of maintenance in real-time
- Centralised remote monitoring will enable future net zero transport providers to keep track of their resources more efficiently
- Can understand how well batteries are performing overall, enabling them to detect failures sooner

#### Who we are

- 70+ computational scientists and technologists
- · World-leading supercomputing and AI infrastructure
- Bespoke small teams built around your project
- Tailored business development support
- Access to our network of industry, academic and technology partners

#### What we do

- Boost productivity and enhance innovation for industry
- Big data analytics and artificial intelligence (AI)
- High performance computing and quantum simulation
- Training and skills development
- Insights into future technologies



## Our impact on UK industry and society

The Hartree Centre was created by UK Government to help businesses and public sector organisations accelerate the adoption of high performance computing (HPC), big data analytics and artificial intelligence (AI) technologies. We play a key role in realising UK Government's Industrial Strategy by stimulating applied digital research and innovation, creating value for the organisations we work with and generating economic and societal impact for the UK.

The Science and Technology Facilities Council (STFC) Hartree Centre is part of UK Research and Innovation.