NOBLEAI

USE CASE

Early Prediction of Electric Vehicle Battery Lifetime via Science-Based AI (SBAI)

Reduce battery cell testing cycles by 90% through cycle life analysis using SBAI models.

Target

Electric vehicles are being rapidly deployed to replace traditional fossil-fuel based transportation modes. One of the many challenges encountered with electric vehicle battery development is the extensive amount of testing that is required to determine the end of useful life (and similar metrics) of a given battery configuration. Reducing the time required to generate actionable end of life determinations is critical for both battery development and battery management strategies.

Challenge

Each battery configuration requires testing under different charge/discharge profiles to simulate realistic vehicle operation and charging. It is preferable to do such tests while considering the temperature, given its large contribution to capacity and aging/reactivity. Predictive tools that utilize data from only a small portion of the battery's life to predict its remaining useful life would be valuable for accelerating development or for potential integration into battery management systems (e.g., using the actual charge/discharge history and distance per charge to predict current and future distance per charge, state of health, and/or diagnose potential future failure modes).

Solution

At NobleAI, we have utilized real-world Li-ion electric vehicle battery test results coupled with advanced time series processing/filtering and featurization strategies to create science-based AI models. Models that:

- Predict the number of cycles to reach the end of useful life of a given battery configuration by leveraging only a small fraction of the typical number of measured cycles as inputs (e.g. 30, 50 or 100).
- Can be coupled with real-time data acquisition and leveraged as part of battery management systems to predict state of charge, state of health and even diagnose potential failure modes well in advance of actual failure, giving adequate time to seek maintenance before catastrophic events.

NobleAI Battery Use Cases