
GONÇALO DOS REIS, University of Edinburgh

State of Health for the capacity and internal resistance of Li-ion cells: A machine learning approach with knees and elbows

Degradation of lithium-ion cells with respect to increases of internal resistance (IR) has negative implications for rapid charging times and thermal management of cell in electric vehicles and energy storage applications. Despite this, IR and associated IR State of Health have received much less attention than the State of Health with respect to capacity degradation in Li-ion research. We address this by building on recent developments on "knee" identification for capacity degradation curves. We propose the concepts of "elbow-point" and "elbow-onset" for IR degradation curves, and create an identification algorithm for these variables.

We use machine learning Neural Network techniques to build independent capacity and IR predictor models achieving a MAPE of 0.4% and 1.6%, respectively. We then use the IR model to synthesize internal resistance data to complete the dataset from Attia et al 2020 for which no IR data was logged.