ThinkClock Battery Labs
Sensing, Modelling, Analytics

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Please refer to this data source.

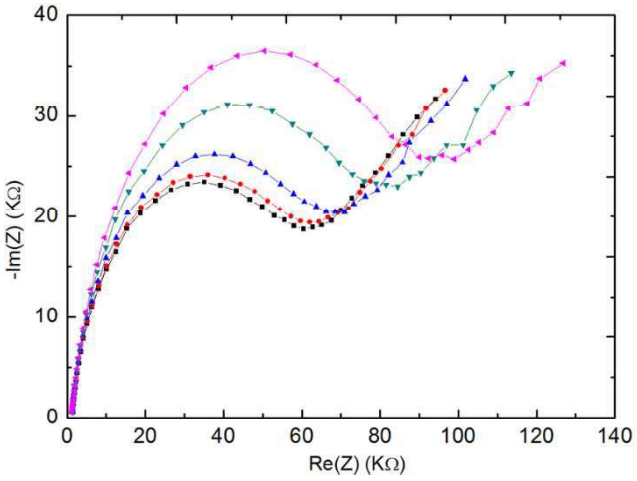
https://www.kaggle.com/datasets/patrickfleith/nasa-battery-dataset/data

Data description:

A set of Li-ion batteries were run through different operational profiles (charge, discharge and impedance) at various temperatures. Impedance measurement was carried out through an electrochemical impedance spectroscopy (EIS) frequency.

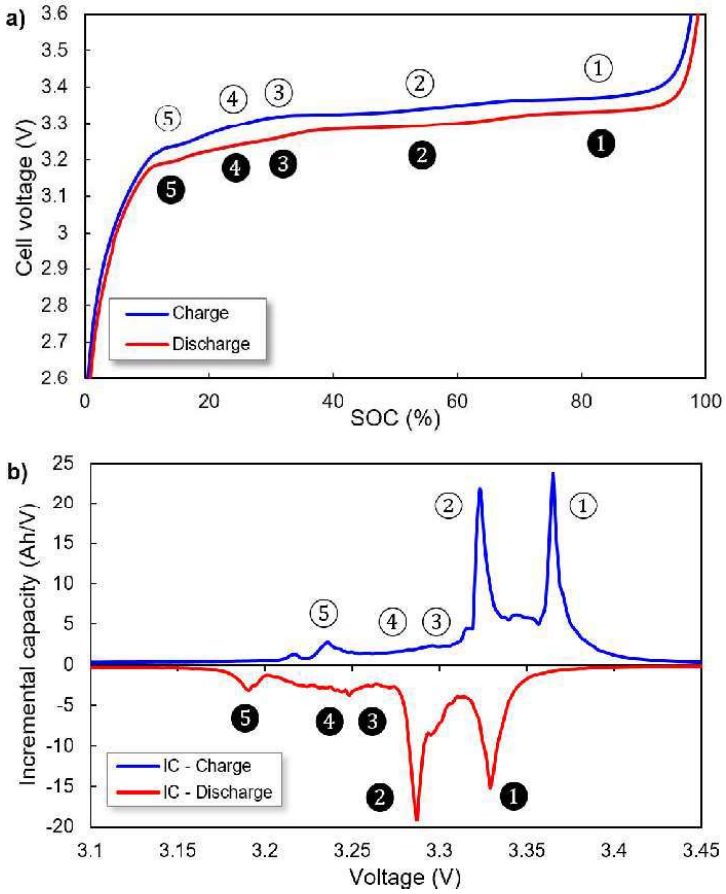
Repeated charge and discharge cycles result in accelerated aging of the batteries while impedance measurements provide insight into the internal battery parameters that change as aging progresses. The experiments were stopped when the batteries reached end-of-life (EOL) criteria. These datasets can be used for the prediction of both remaining charge (for a given discharge cycle) and remaining useful life (RUL). Data are in Batch of 6 experiments, data provided in .mat files with experiment details in associated READEME.txt -

a) From the given dataset, could you create a 3D plot from the EIS measurements showing how Impedance (R(Z) on X-axis, Im(Z) on Y-axis) is changing w.r.t. Aging (Cycle count on Z axis) assuming Temperature, etc. to be the same. A sample EIS plot is shown below without the Z-axis.



b) A typical charge/discharge cycle data for a battery cell looks like the plot below a). From a), could you derive plot b) for incremental capacity analysis showing dQ/dV versus V which indicates how the rate of capacity increment w.r.t. Voltage changes w.r.t. Voltage as the cell is charged or discharged?

Could you create a 3D plot showing how peaks in b) change w.r.t. Aging (cycle count).



c) Could you train a machine learning model to predict the current capacity of the battery Cell from the current EIS signature?

Please share the snapshots of the final plots. Also, provide a link to your Jyputer Notebook.