ACCURE
Battery Intelligence

Welcome to the ACCURE battery data challenge

Battery experts vary greatly in their speciality and experience; therefore, we have created this challenge to help us have a productive discussion with you.

This is not a test with fixed answers. Focus on your reasoning!

Three field data sets are included, which come from three different battery applications. The data is in .csv format and contains data from several days with similar but slightly different signals (columns). We would like you to examine the data sets and answer the questions about the battery data to the extent that you can.

What we want to see

There are many diverse approaches to handling battery data, and we are interested in how you do it. Please prepare some kind of document (Word, PowerPoint, OneNote, Markdown notebook, …) to structure your thoughts. You should be able to explain your solution path - as a small hint: A plot is often very helpful there.

ACCURE uses Python, but you are free to use the programming language your most familiar with. If you want to use python, we recommend the jupyter browser extension (Project Jupyter | Home) or to install jupyter on your machine (installation instructions below if interested).

Battery Data Questions

A little explanation in advance: You received system level data. The column voltage refers to the overall system voltage and the columns voltage_cell_min and voltage_cell_max represent the minimal or maximal cell voltage within the system.

Capacity per dataset:

1. 300 Ah per system, 25 Ah per cell
2. 27.2 Ah per system, 3.4 Ah per cell
3. 126 Ah per system, 63 Ah per cell

For each of the three data sets, we would like you to answer the following questions:

1. What percentage of the time does the battery spend in charging / discharging / idle mode?
   Hint: In the field, a true zero current is rare.
2. Which types and form factors of batteries do you expect for each dataset? Based on the given signals, give a rough estimation, how many single battery cells are installed in the system.
3. Which dimensions can you think of to rate the quality of the data sets?
4. Point out obvious differences in the usage profiles between the data sets.
   Bonus question: Can you think of a specific application per battery system?

How to read the data and convert the timestamps using python & pandas:

```
data = pd.read_csv(input_path + file, index_col=[0])
data['timestamp'] = pd.to_datetime(data['timestamp'])
data = data.set_index('timestamp')
```

Feedback

If you have major problems running anything with the data, that is valuable information too (and a common experience with real-world data…). Be ready to explain the problems you had; we are just as interested in these issues as any insights into the data.

One of the things we want is to improve our recruitment process. You can even suggest improvements in the interview!

Jupyter Notebook installation

1. Install Anaconda
   a. [Anaconda | Individual Edition](#)
2. Install Jupyter (use the anaconda prompt, usually found by typing "anaconda" into your search/start menu)
   a. [Project Jupyter | Installing Jupyter](#)
3. Start Jupyter Notebooks by typing "jupyter notebook" into the anaconda prompt and pressing enter
4. Get started