HUAWEI

TECHARENA

Global Talent Building the Future Together

Huawei 2024 Nuremberg Tech Arena

September to December, 2024

20000€ in Prizes

WELCOME TO
#NurembergTechArena

Agenda:

- Introduction to the Techarena by BeMyApp
- Challenge Introduction by Huawei
- Q&A session

THE BEMYAPP TEAM

Greta Paulsen
Project Manager

Amandine Durand
Communications Manager

TIMELINE


Registration Phase
Until November 10, 2024
Preliminary Competition
September 16 > November 10, 2024
First Evaluation
November 11 > November 23, 2024
Final Competition
November 24 > December 15, 2024
Award Ceremony in Nuremberg
December 19, 2024

JURY - HUAWEI GERMANY

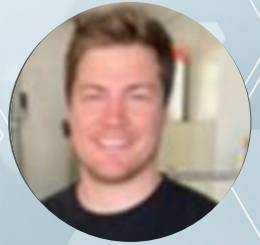
Dr. Matthias Vetter
Chief Expert, Energy Storage Systems

Dr. Xie Jie
Technical Expert, Energy Storage Systems

Dr. Mansour Alramlawi
Senior Engineer, Energy Storage Algorithms

Dr. Paolo Gabrieli
Principal Engineer, Energy Storage Algorithms

Dr. Arsalan Asif
Senior Engineer, Battery Simulations



Steffen Bockrath
Senior Battery Modeling & Algorithms Engineer

DETAILED PHASES

Preliminary Phase:

- You will each receive your access to the submission platform after forming your team - enter your team here
- Download the data sets and guidelines
- Build your algorithm and upload as many ZIP files you like
- Run your code locally and test it

  From 14th October: BeMyApp will provide for each team a private+public SSH key to download on the competition interface so each participant can access an online cloud CLI server per team
- **Latest submission date: 10th November 23:59pm CET**

Evaluation Phase: 11th November - 23th November

- Huawei Team will run tests with the code the teams submitted
- You might be invited by Huawei for a short meeting to discuss or clarify
- **On the 25th November** you will be notified if your team has made it to the 10 selected finalists

Final Phase: 25th November - 15th December

- 10 finalist teams receive more details and more time to improve their code

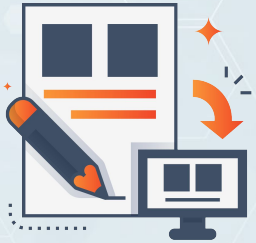
19th December - Final Awards Day in Nuremberg:

- 10 finalists pitch their solution in front of the jury - 6 winning teams will win the prizes

DELIVERABLES

Starts now:
TEAM CREATION
here

Starts now:
DEVELOP THE ALGORITHM:
Try to minimize the error between the estimated SoC and the real SoC on the real operation data



From 14th October:
SET UP YOUR CODE and Test

By 10th November
SUBMIT YOUR CODE AND TEST

PRIZE POOL

Gold prize

The sum of 6,000 €
(divided equally between each member of the winning team)

One winning team in total.

Silver prize

The sum of 4,000 €
(divided equally between each member of the winning team)

There will be two winning teams.

Bronze prize

The sum of 2,000 €
(divided equally between each member of the winning team)

There will be three winning teams.

Opportunity for future research collaboration with Huawei.

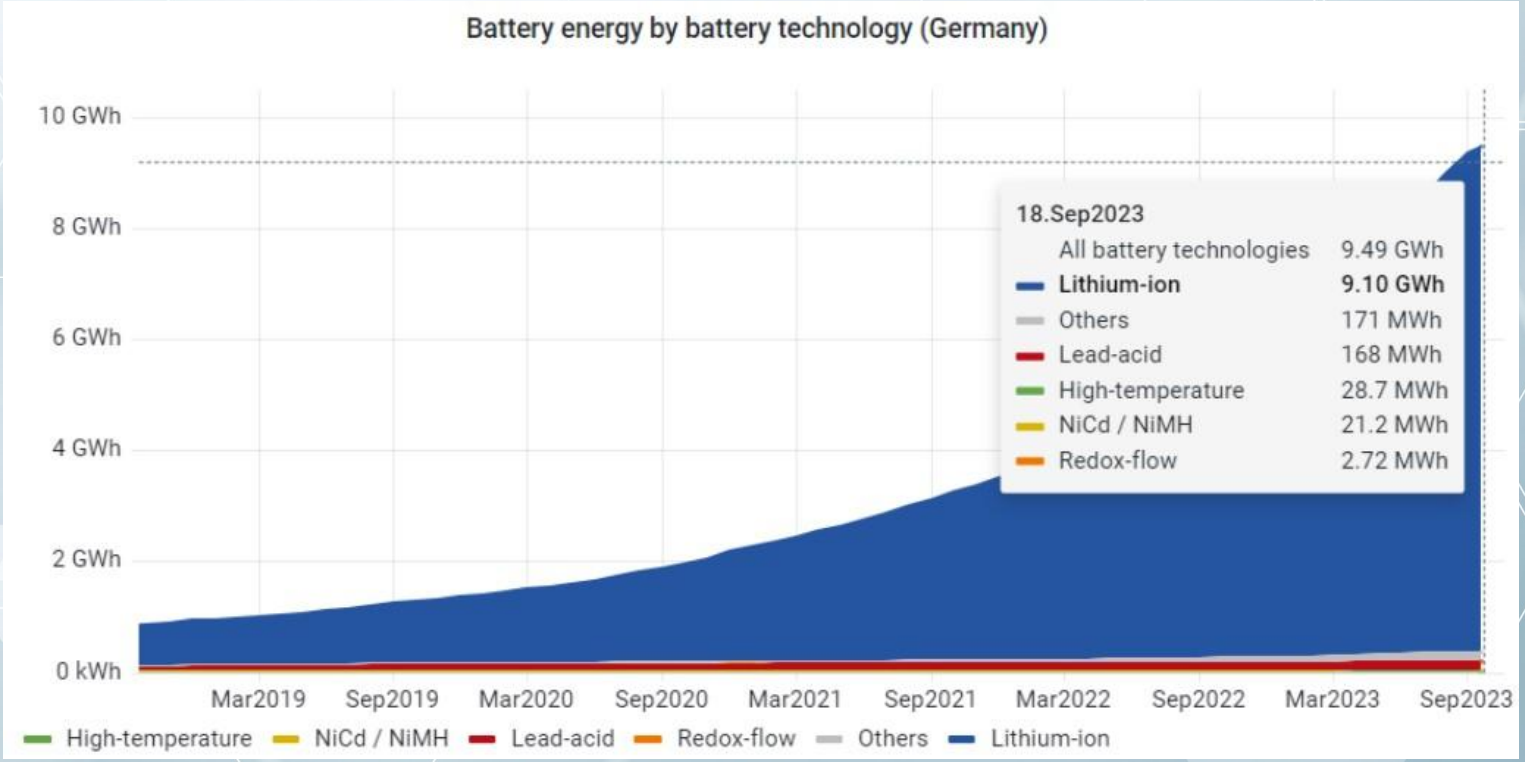
WELCOME

Dr. Mansour Alramlawi

Senior Engineer - Energy Storage System Algorithm

CHALLENGE

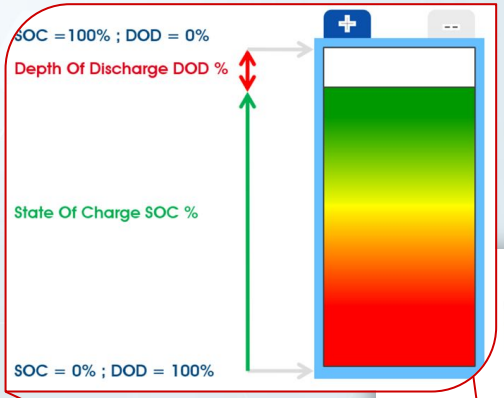
Market of Energy Storage Technology

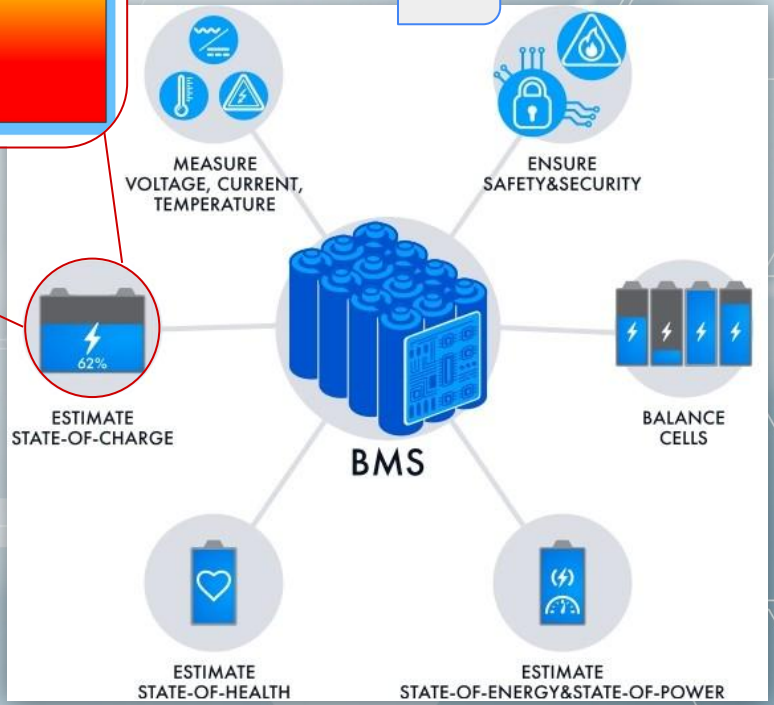


CHALLENGE

State of Charge (SoC) estimation refers to the process of determining the remaining charge in a battery. Accurate SoC estimation is crucial for several reasons:

- **Preventing Overcharge and Deep Discharge**: Ensures the battery operates within safe limits, to prevent capacity loss or permanent damage.
- **Optimizing Performance and Longevity**: Helps manage the battery's charge cycles efficiently, extending its operational lifespan.
- **Energy Efficiency and Grid Management**: Facilitates better energy utilization in applications like renewable energy storage, ensuring that energy is stored and released at optimal times.
- **Ensuring Safety**: Prevents potentially hazardous conditions, such as overheating or thermal runaway, by maintaining the battery within safe operating parameters

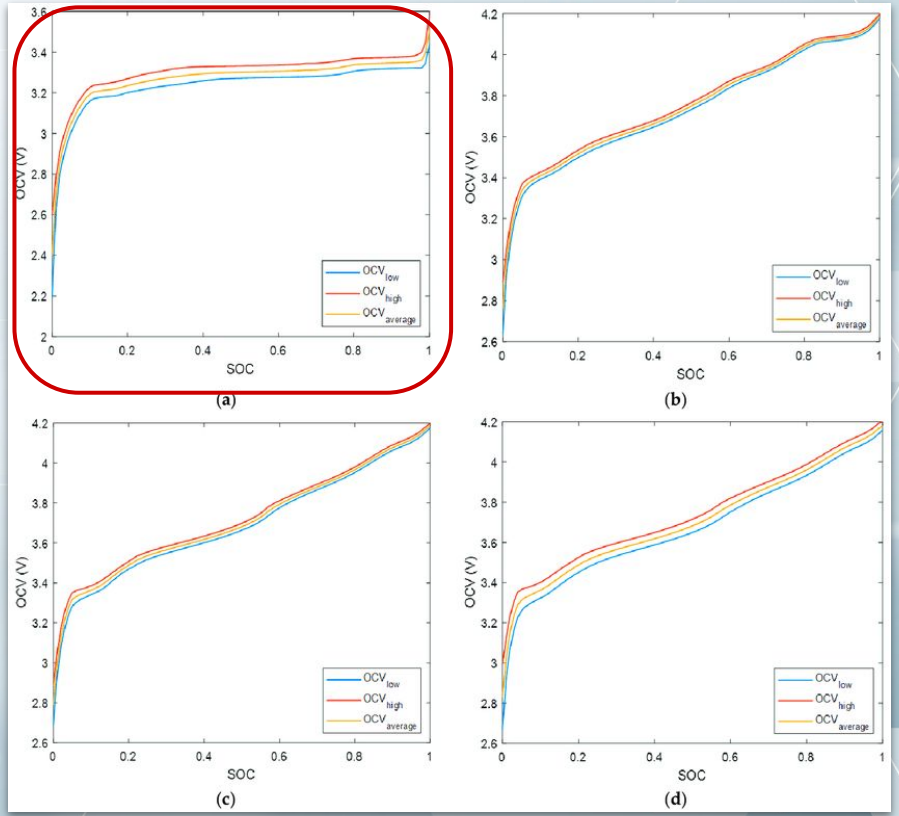




CHALLENGE

Challenges in SoC Estimation for LFP Batteries

- **Flat Voltage Discharge Curve**:
  - **Problem**: Voltage-based SoC estimation becomes less reliable because the voltage changes very little over a large SoC range.
- **Temperature Sensitivity**:
  - **Problem**: Even though LFP is more thermally stable, temperature changes still impact charge/discharge behavior.
- **Capacity Fading**:
  - **Problem**: Over time, the battery's usable capacity decreases, affecting the accuracy of SoC estimation.
- **Hysteresis**:
  - **Problem**: The voltage response during charging and discharging differs, making it harder to estimate SoC accurately from voltage alone.



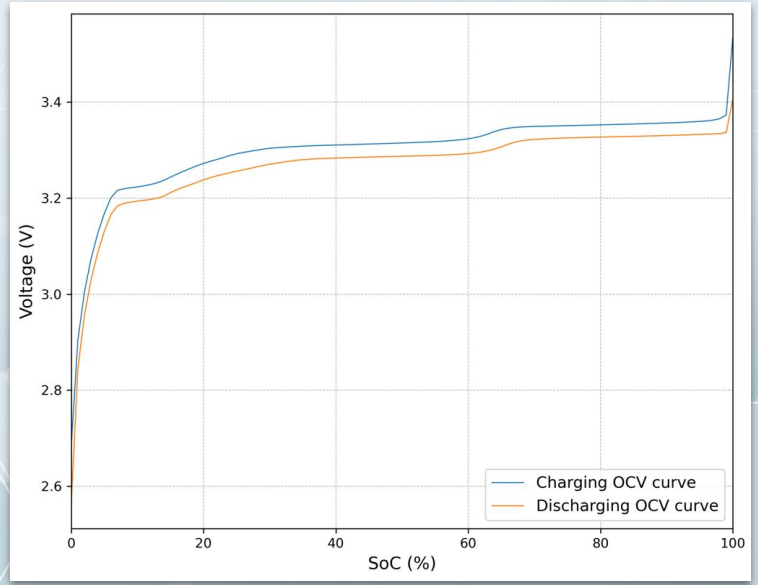
SOC-OCV curves for each lithium-ion battery chemistry tested: (a) LFP, (b) NMC, (c) LMO, and (d) NCA.

Data Format

Basic information about the battery	
Battery Type	lithium iron phosphate(LFP)
Battery capacity	280Ah
Battery charge upper limit voltage	3.65V
Battery discharge lower threshold voltage	2.5V
Rated voltage	3.2V
Current rate range	0~1C
Rated current rate	0.2C

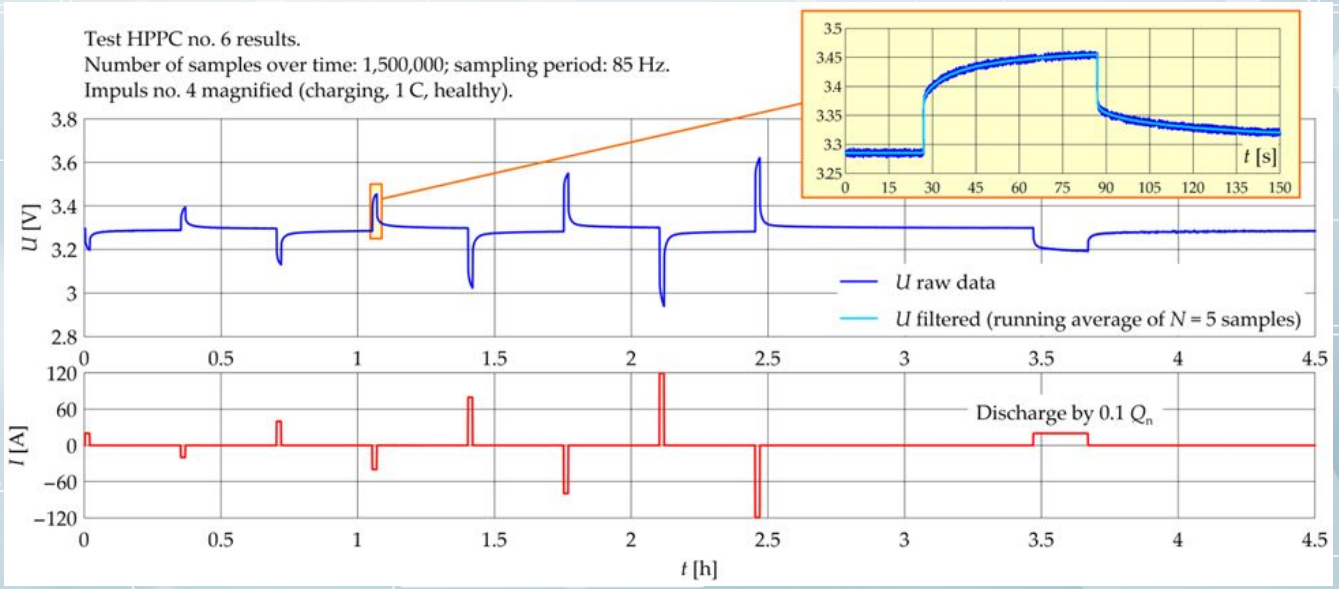
Data Format

The OCV-SOC relationship test measures how the open circuit voltage of a battery correlates with its state of charge. By allowing the battery to rest and stabilize at different charge levels, the test provides a profile of how the voltage changes as the battery charges or discharges.



Data Format

The **Hybrid Pulse Power Characterization (HPPC) test** is a standardized method used to estimate the battery parameters by analyzing voltage drops during the discharge pulse and recovery during charge pulses.



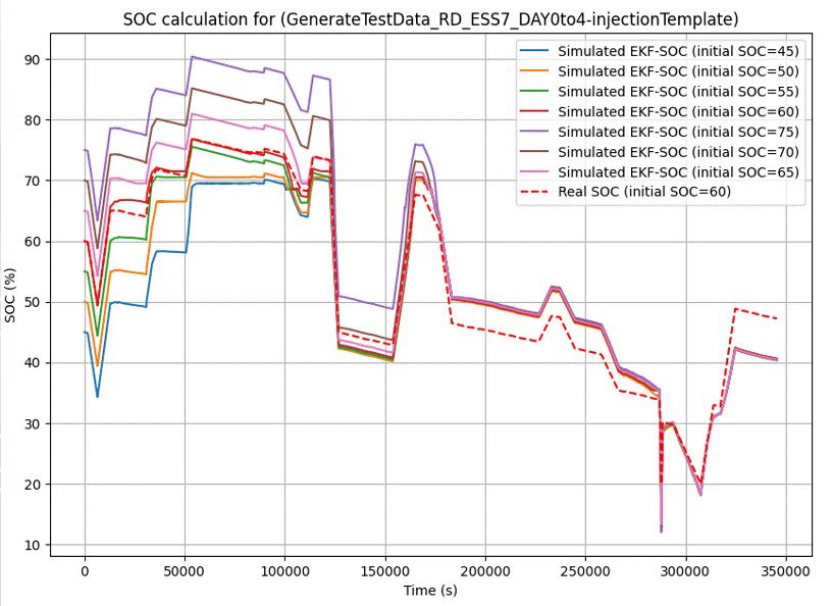
Data Format

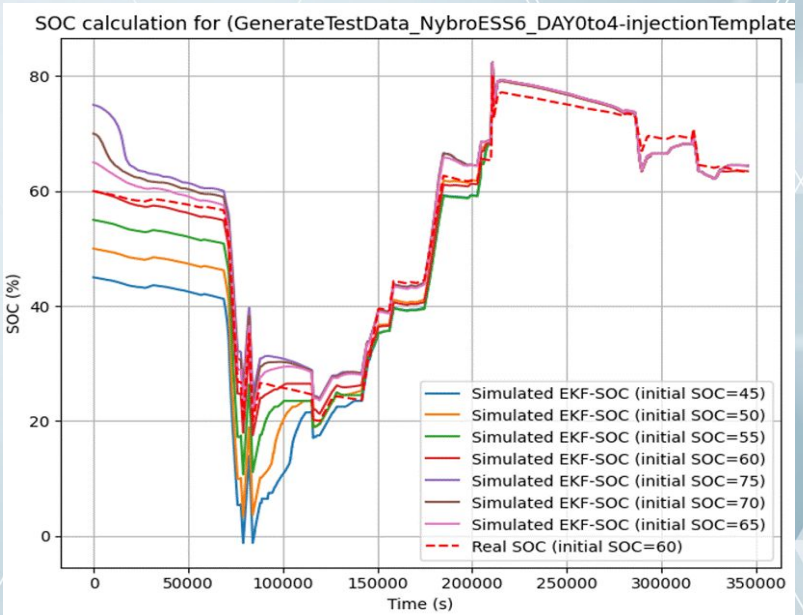
Mode	Inputs						Comment
Step	Voltage	Current_inv	SOC_true	SOC_Calc	Error	Temp	
	float	float	float	float	float	float	
0	3.2996	0	47.2436012	47.2668852	-0.0233	26.6	
1	3.2996	0	47.2436012	47.2668852	-0.0233	26.6	
2	3.2996	0	47.2436012	47.2668852	-0.0233	26.8	
3	3.2996	0	47.2436012	47.2668852	-0.0233	26.8	
4	3.2996	0	47.2436012	47.2668852	-0.0233	26.8	
5	3.2996	0	47.2436012	47.2668852	-0.0233	26.8	
6	3.2996	0	47.2436012	47.2668852	-0.0233	26.6	

Time Step is 1 second

Data Format

Testing Example





Submission on the platform

Submission on the platform:

Please upload/submit a **.ZIP file** containing

1. The ZIP file can't be >10MB;
2. Its internal file architecture must contain the following files (but not limited to those files).
    - **Readme.txt** (should contain a high-level description of the code)
    - **Requirements.txt** (A list of all necessary Python libraries, including their versions)
    - **main.py** (the main python entry point, executing it should load a test.csv file and generate the out.csv file)
    - **one .ppt file** (any name) (should be a PowerPoint file describing the team members and the developed approaches, with a theoretical maximum of 10 slides)
3. The ZIP filename will have the name format generated : **teamid_ddmmyyyy_Vx.zip** (where team id is the team's id, ddmmyyyy is the submission date, and Vx is the version number).

Please Note

1. You document should includes the theoretical models, and all required engineering aspects.
2. Algorithm Code: The code should be well-readable, commented and executable.

JUDGING CRITERIA

1. **Accuracy:**
   Maximum Absolute Error (MaxAE) measures the largest deviation between estimated and actual SoC values, assessing worst-case scenarios.

2. **Robustness:**
   Evaluates the algorithm's stability and accuracy across different conditions.

3. **Efficiency:**
   Assesses execution time, memory usage, and consistency across a uniform testing environment.

4. **Transient Convergence:**
   Measures the algorithm’s ability to quickly correct incorrect initial SoC values.

5. **Documentation:**
   Evaluates clarity, organization, and code quality.

HUAWEI

THE STAGE IS YOURS!

Any questions?

Communication via Slack

Stay up to date with all announcements, general information and exchange of ideas on our slack community only for this Techarena!

It’s the easiest way to create teams and stay in touch with your teammates throughout the challenge.

Join here:

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GOOD LUCK!

THANK YOU FOR YOUR TIME