High-precision battery diagnostics for large-scale lithium-ion batteries

AccuVice

## Wasted battery potential: 3 limitations of today's diagnostic models

Lack of accuracy

- Existing models on BMS or in the cloud show deviations of up to 10%
- Lack of standardization

Limited computational resources

- AI models are too complex for direct BMS integration
- Cloud dependency is partly not real-time capable and causes high costs
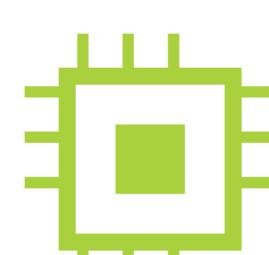
No single-cell diagnostics

- Monitoring is limited to pack or module level
- Invisible individual cell states promote poor balancing

High-precision battery diagnostics by **AccuVice**
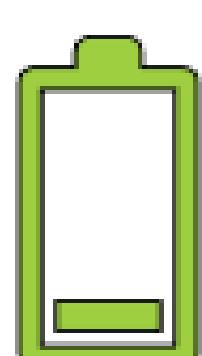
Voltage
Current
Temperature
Cycle
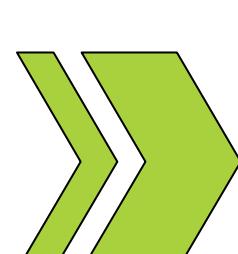
➤➤ **AccuVice** ➤➤
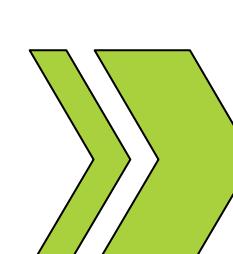
State of charge (SOC)
State of health (SOH)
Single-cell properties
Cell and module imbalances

We offer a **higher accuracy** and a **higher reliability** with **lower server cost**, compared to state-of-the-art battery diagnosis technology.

The state of the art: **Current-controlled** battery model

Current → Model → Voltage → Kalman filter → SOC SOH IR
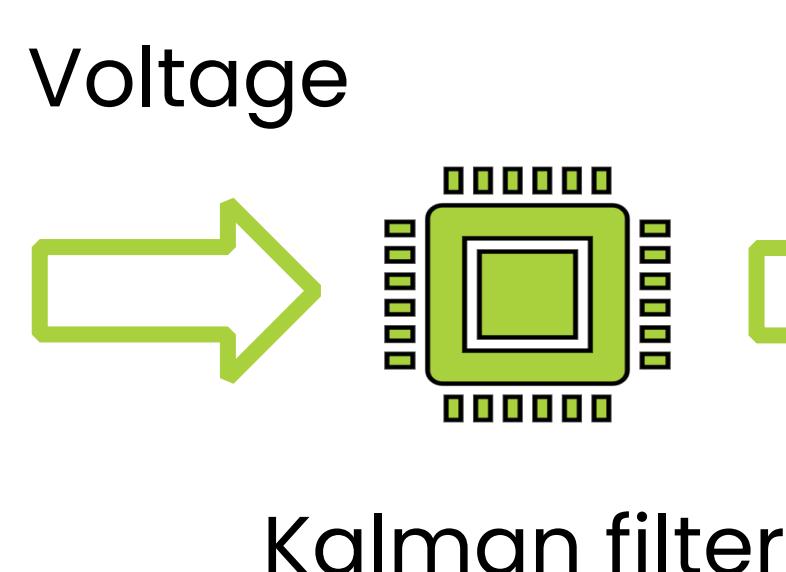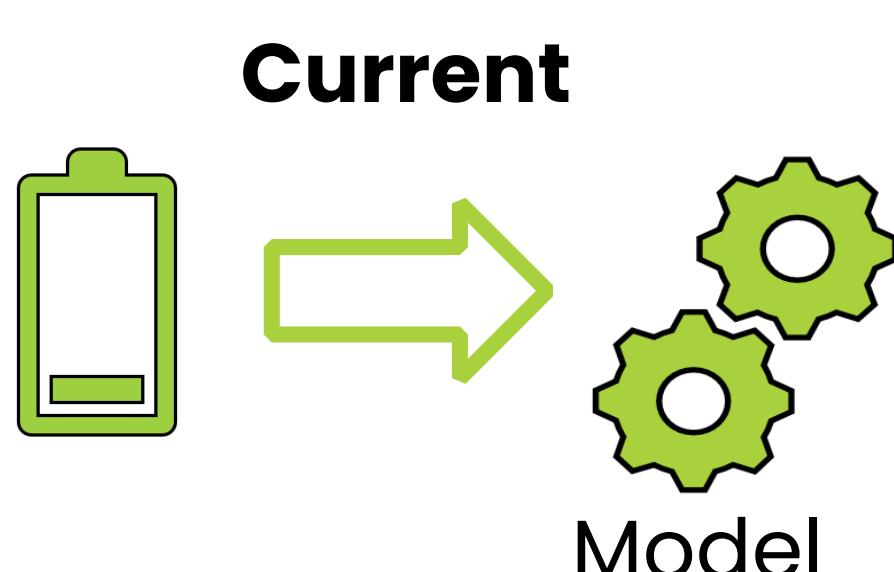
- High effort of settings and parameterization
- Knowledge of battery required (lab experiments)

AccuVice: Precision pioneered by a **voltage-controlled** battery model

Voltage → Model → Current → SOC SOH C IR V^0
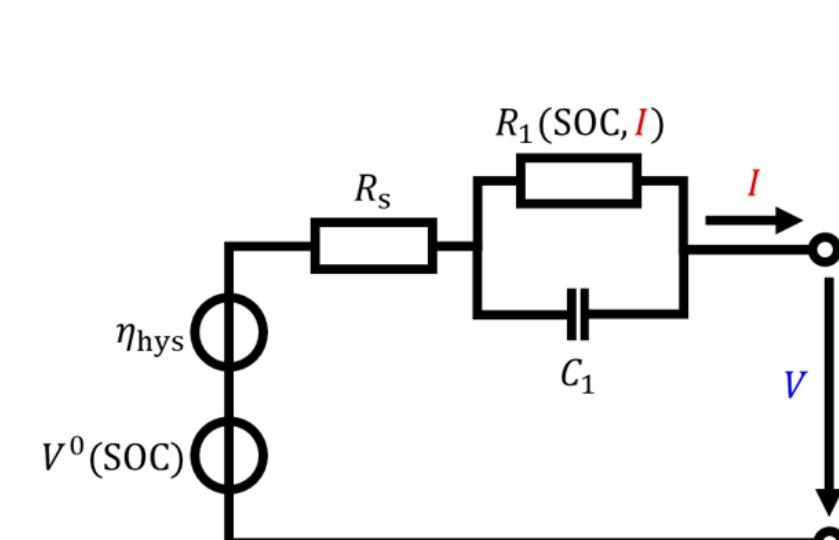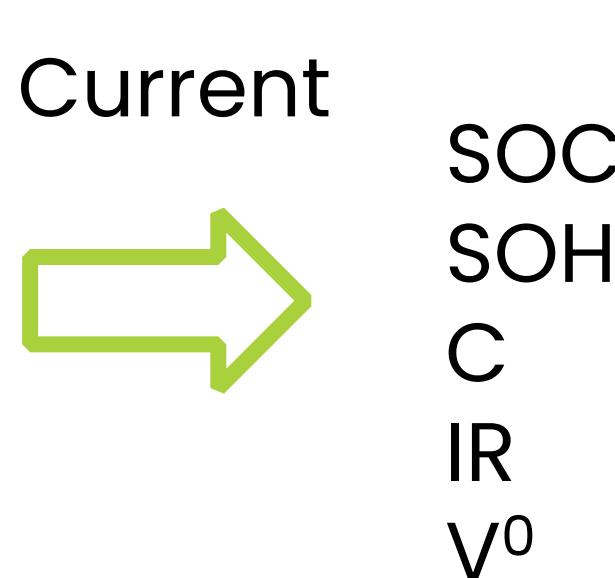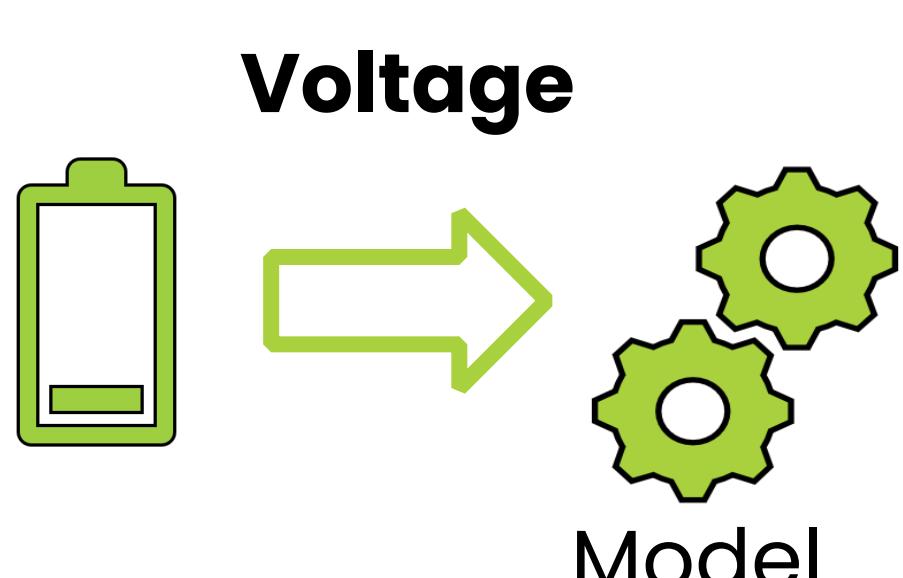
$$V = V^0(\text{SOC}) - R_s I - V_{\text{RC}}(I)$$

$$\frac{dV_{\text{RC}}}{dt} = \frac{1}{C_1}\left(I - \frac{V_{\text{RC}}}{R_1(\text{SOC},I)}\right)$$

$$\frac{d\text{SOC}}{dt} = -\frac{I}{C_{\text{N}}}$$

Circuit elements: R_s, $R_1(\text{SOC},I)$, C_1, η_{hys}, $V^0(\text{SOC})$, I, V

- Lower setting effort
- Higher sensitivity
- No influence of current inaccuracy
- Self-calibrating – no lab experiments

≡ **AccuVice**   ⊘ AccuVice Demo ▾

🔲 Smartphone ▾

🏠 Health Analysis

🔋 State of Charge

🔊 Measurement Data

🔀 Battery Architecture

📄 Details

Health Analysis   📅 Ever   ↻

State of Health (%)
Calculated from internal resistance and capacity

100 %
75 %
50 %
25 %
0 %
Jan 2023   Jan 2024   Jan 2025
● Trend Line ○ Individual Values

Internal Resistance (mΩ)
Internal resistance at 25°C

200 mΩ
150 mΩ
100 mΩ
50 mΩ
0 mΩ
Jan 2023   Jan 2024   Jan 2025
● Trend Line ○ Individual Values

Capacity (Ah)
Capacity at open circuit

8 Ah
6 Ah
4 Ah
2 Ah
0 Ah
Jan 2023   Jan 2024   Jan 2025
● Trend Line ○ Individual Values
● Design Capacity