

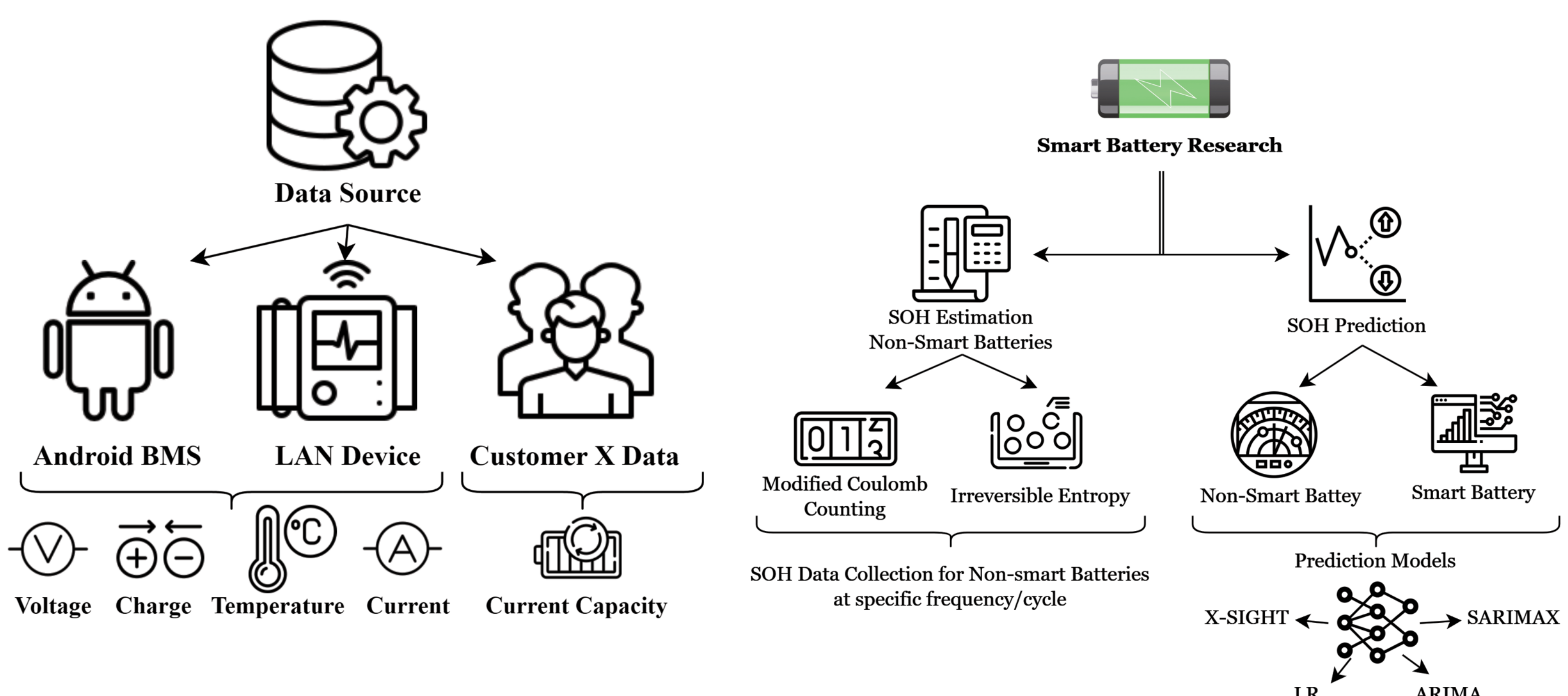
## MABS: Make All Batteries Smart

Enhancing Battery Performance and Health Prediction: Smart Solutions for Smart and Non-Smart Lithium-ion Batteries

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### PROJECT SUMMARY

Lithium-ion batteries are extensively utilized in devices like mobile phones and electric vehicles due to their cost-effectiveness and high energy density. However, their performance deteriorates over time due to physical damage and chemical reactions during charge and discharge cycles, resulting in a gradual capacity decline. Monitoring battery capacity is a challenge, but the Smart Battery concept aims to solve this by providing real-time capacity updates. SOTI utilizes the XSight Smart Battery dashboard and advanced analytics to leverage these updates for their clients. Unfortunately, many batteries in use lack Smart Battery functionality, which excludes them from thorough assessments.

To confront this challenge, our research focuses on collecting a substantial volume of real-time data alongside meticulously controlled laboratory data to assess battery health. Our objectives encompass validating an existing battery health prediction model designed for Smart Batteries, estimating the State of Health (SOH) for non-smart batteries using Coulomb counting and entropy measurement, and predicting battery degradation rates via machine learning.

Our findings validate the regression model for predicting Smart Battery capacity and introduce methods to estimate SOH for non-smart batteries, with entropy emerging as a superior health-monitoring parameter compared to traditional voltage and current measurements. By integrating mathematical modeling, battery entropy calculations, and machine learning, our research seeks to forecast both the state of health and degradation rates for non-smart batteries. This multidisciplinary approach advances our understanding of lithium-ion battery behavior, enhancing battery management strategies.

### REFERENCES

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