EPFL algorithmic team

We specialize in advanced battery state-estimation development. Our work frequently leverages electrochemical impedance spectroscopy (EIS) to enhance model accuracy and robustness. We have extensive expertise in estimating the State of Charge (SoC), State of Temperature (SoT), State of Power (SoP), State of Energy (SoE), and State of Health (SoH)—collectively referred to as SoX.

Our methodology is based on periodic estimator recalibration using EIS data, complemented by additional diagnostic approaches when appropriate. Once validated, our SoX estimators are deployed into real-time operating battery management systems (BMS).

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EPFL role in the project

In BATTERY2LIFE EPFL works in close collaboration with CSEM and SUNLIGHT to develop the 1st pillar. EPFL is in charge of providing novel electrochemical impedance spectroscopy (EIS) base state of charge (SoC) and state of temperature (SoT) based estimators. During the first phase of the project EPFL has developed the algorithms on the cells provided by SUNLIGHT and that will be used in the Pillar 1 demonstrator. This work was initially carried out using laboratory EIS equipment. One functional, the algorithms were tested using the first electronics that were developed by CSEM. In parallel to the state estimation algorithm related work, EPFL also put in place the framework to allow interoperable BMS architecture to allow efficient code integration between partners. These elements will now be assembled in the second phase of the project in the Pillar 1 demonstrator.

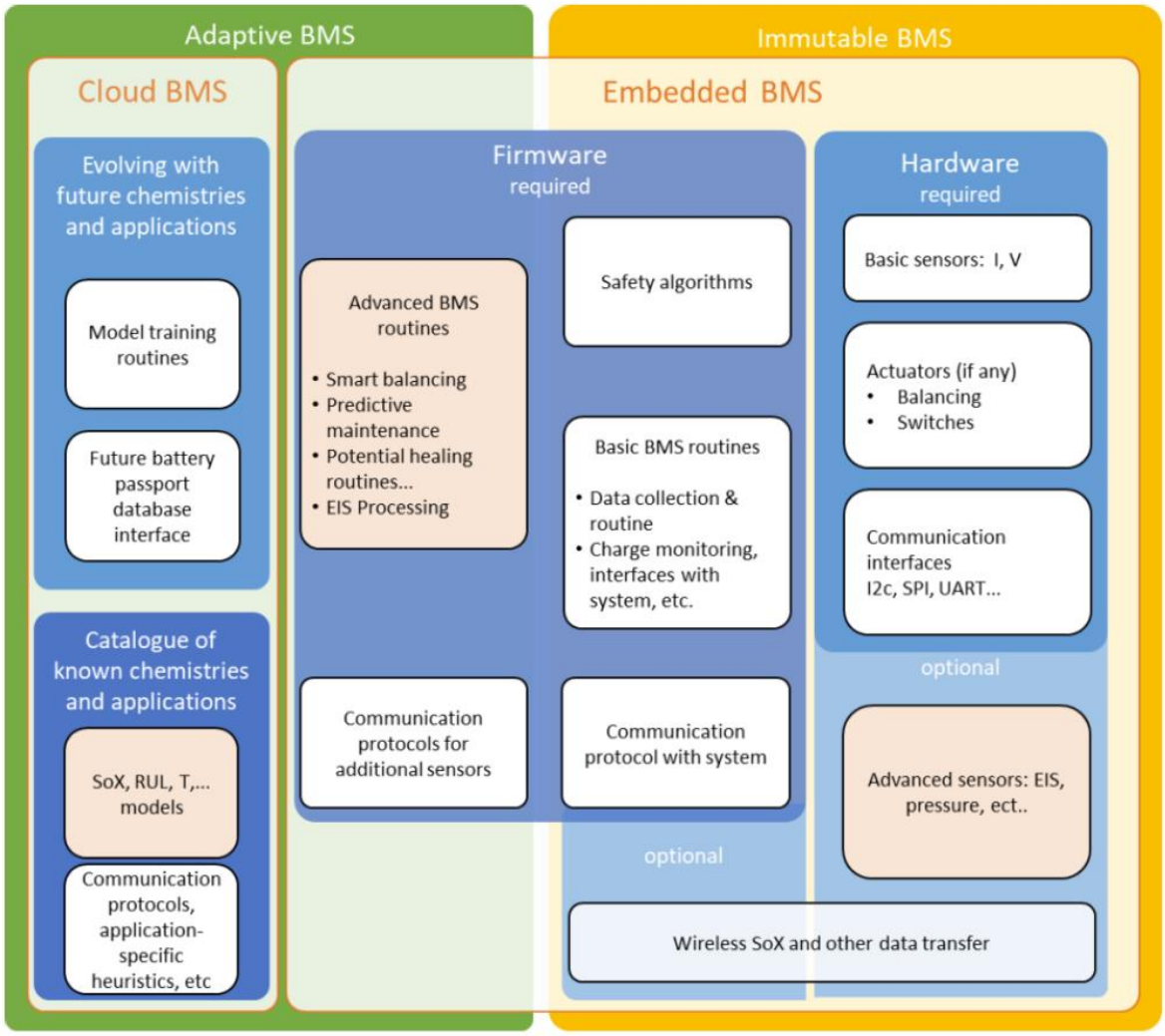

Figure 1: high level architecture for the open and adaptable BMS

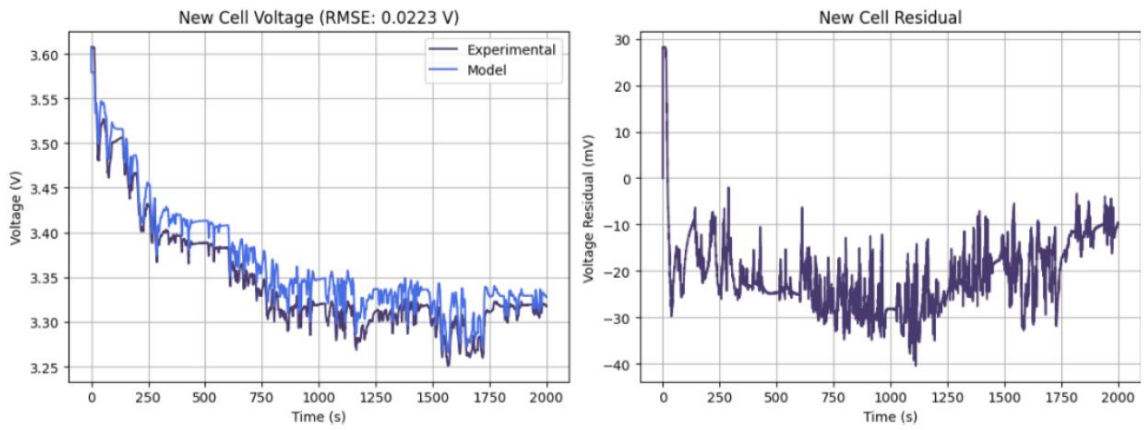

Figure 2: voltage estimator based on EIS and true voltage during a Worldwide Harmonized Light Vehicle (WLTC) discharge (left), error between the estimator and measured voltage (right).