



# K2DM – LIL Experiment Outline

## Electro-chemical Battery Modelling Validation

Validation and parametrisation in electro-chemical battery modelling using the software from UptimAI

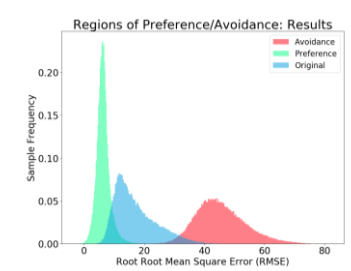
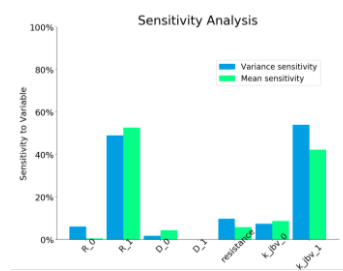
### THE CHALLENGE

At least one suitable set of parameters should be found to describe measurements by a simple “Single-Particle” model (SPM) of a battery cycle.

It was expected that a useful estimate along with ranges on each parameter would match the measurements closely. Dependencies between the parameters setting and the model quality should be defined.

### SOLUTIONS AND METHODOLOGY

The difference of the model result compared to the measurement result was considered as a quality measure. Considering 31 parameters of the SPM, a very large input domain was defined to test the statistical approach of UptimAI. The result of a



successful optimization was computed as a reference target solution. The UptimAI algorithm creates a metamodel of the solved problem, while automatically adapting to it and thus speeding up the whole process. Subsequent analysis of the problem takes increasing advantage of the improving metamodel, thus executing much faster.

### RESULTS AND IMPACT

Several iterations have been performed under guidance of the experts at UptimAI whilst the domain knowledge was provided by Virtual Vehicle. Even though input parameter

ranges were significantly restricted, there was still a large variance of results. Yet, powerful insights were gained about the importance of the dynamic parameters, as well as regions of preference and of avoidance suggesting global improvement. This new knowledge will be integrated into the future workflow of parameter estimation and model calibration.

On the other hand, the user experience and the complexity of the problem led to valuable feedback to further improve the software and provided an additional use case to test the software limits.

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|-------------------------|-------------------------|-------------------------|-------------------------|
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| <b>Experiment No.</b>   | A5334st                 | <b>Dept./Group</b>      | Dept. E / Battery Group |

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