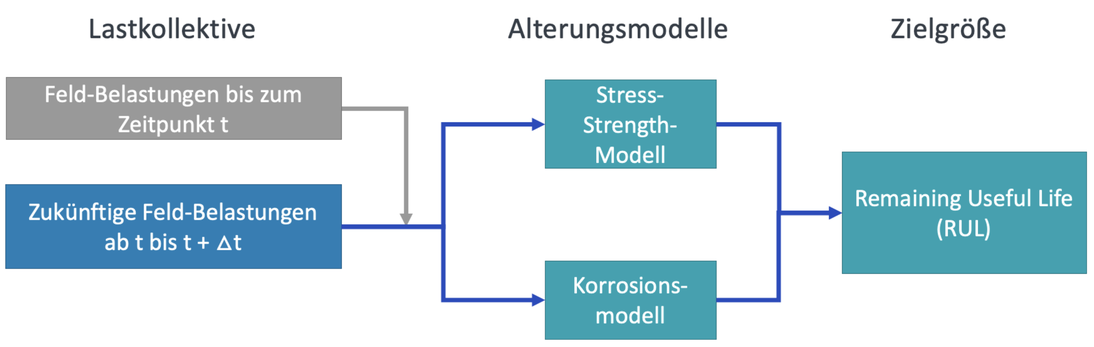
UNI STUTTGART

Reliability Department

Function development to form representative load collectives based on past load for predictive diagnosis of lead-acid batteries

Aging models and remaining useful life

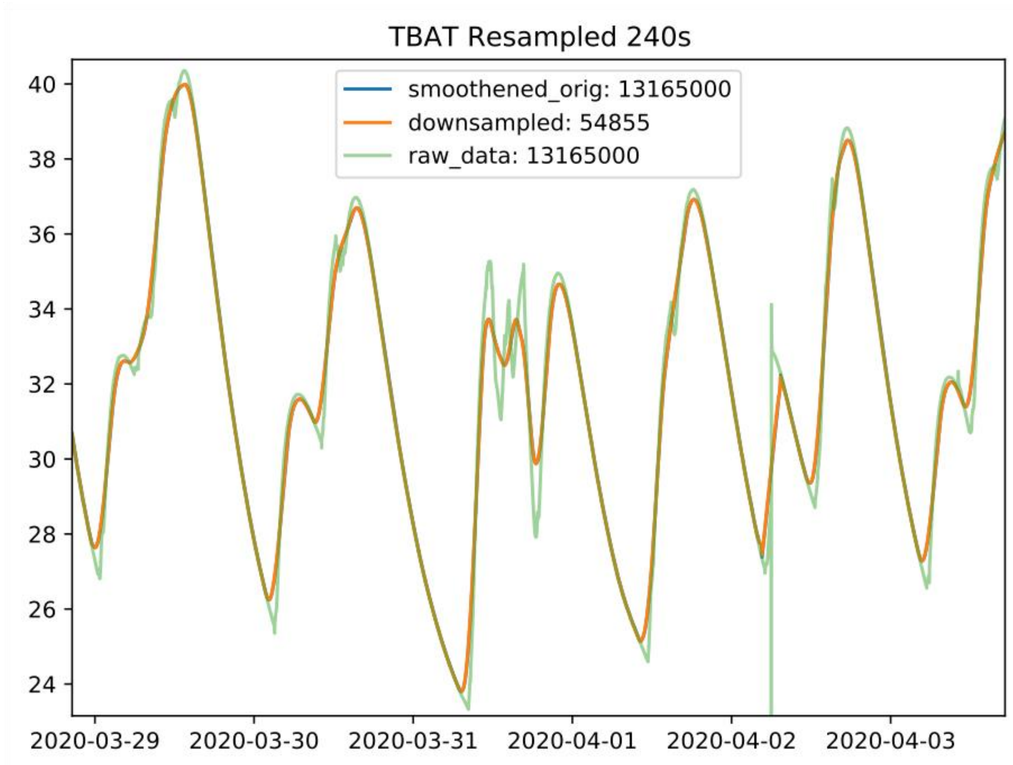
Past loads can provide an indication of the current remaining useful life (RUL) of the AGM battery. If predicted loads are also taken into account, the RUL can be determined even more precisely.



The future load model makes it possible to predict future loads based on past signal data. If past and predicted data are now fed into the battery aging models, the RUL can be determined.

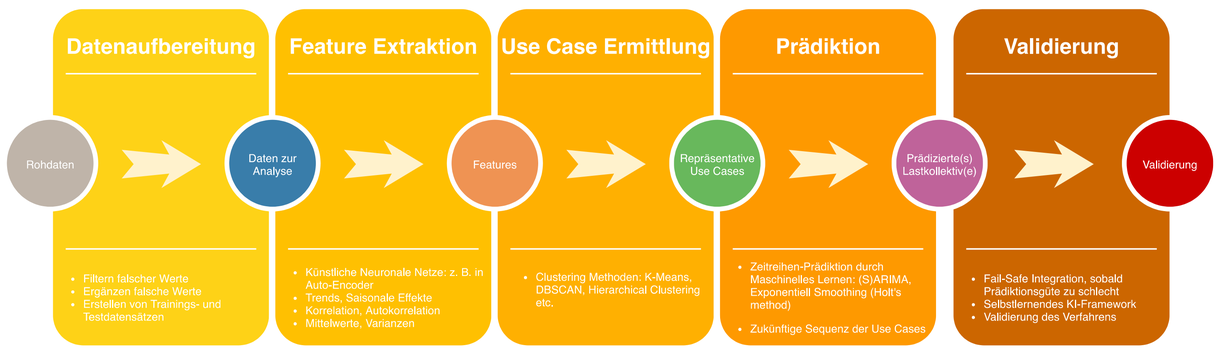
Pre-Processing

The signal data from the battery is available as time series data. This raw data needs to be pre-processed to increase its information content, to adjust sampling rates, to correct erroneous segments in the data, and to put the data into the correct format for the next step.



Prediction of representative load spectra

The available signal data are combined into a so-called stress vector. After data processing, features are extracted from the data and used to determine representative load spectra. Subsequently, a feedback neural network (RNN) based on a so-called long short-term memory (LSTM) is trained and used to predict future signal data. The now predicted data is assigned to the representative load cases by a classifier, e.g. Random Forest. By scattering the data points within a load case, the confidence intervals of the predicted signal data are derived. Now the remaining lifetime can be calculated based on the future loads.



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