Dear Editor,

please find attached the paper titled “Comparison of machine learning techniques for SoC and SoH evaluation from impedance data of an aged lithium ion battery” here submitted as extended version of the paper “A machine learning approach for evaluation of battery state of health“ presented at the at the 24th IMEKO TC-4 International Symposium (IMEKO TC-4 2020).

This paper deals about a comparison of different machine learning techniques applied to model both state of charge and capacity loss of the Li-Ion cell and which were trained starting from electrochemical impedance spectroscopy (EIS) measurements.

Following on from the results of the previous proceedings version, we present a greatly improved and comprehensively extended paper (more than 30%, as requested). In particular, the paper has been revised and extended with several new results.

More in details, new contributions are:

1. A detailed and improved description on the importance and use of EIS for battery analysis. In particular several new references, i.e. [5-16], have been added and discussed in Section 1;
2. The relation between capacity loss and state of heath of Li-Ion battery has been better clarified in Section 3;
3. A new subsection (Sec. 5.1) has been included with a detailed analysis on the correlation between impedance measurements and state of health parameters (see Tab. 3 and 4 and related comments);
4. Further results on the accuracy of machine learning techniques have been introduced in Sec. 5.2 (see Tab. 6 and the box plot in Fig.3). In particular we show that it is possible to improve accuracy of machine learning algorithms by training them using only low frequency data;
5. A new subsection (Sec. 5.3) has been included with a detailed analysis on the impact of Random Forest parameters on the absolute mean error (MAE) and the determination coefficient (R2), see Tab. 7 and 8 and related comments.

We hope that this letter has clarified our new contributions. Nevertheless, for a better readability, all new parts are highlighted in red.

Thank you for your consideration of our manuscript that we would like it to be considered for the review process and publication on Acta IMEKO Journal.

Sincerely,

the authors