Machine Learning Integration with Battery Management System

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Abstract: *The durability and reliability of battery management systems in electric vehicles to forecast the state of charge (SoC) is a tedious task. As the process of battery degradation is usually non-linear, it is extremely cumbersome work to predict SoC estimation with substantially less degradation. This paper presents the SoC estimation of lithium-ion battery systems using six machine learning algorithms for electric vehicles application. The employed algorithms are artificial neural network (ANN), support vector machine (SVM), linear regression (LR), Gaussian process regression (GPR), ensemble bagging (EBa), and ensemble boosting (EBo). Error analysis of the model is carried out to optimize the battery's performance parameter. Finally, all six algorithms are compared using performance indices. ANN and GPR are found to be the best methods based on MSE and RMSE of (0.0004, 0.00170) and (0.023, 0.04118), respectively.*

Keywords: lithium-ion battery; battery management; sustainable energy; machine learning algorithms; electric vehicles; state of charge