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Load Forecasting in Microgrid Systems with R and Cortana Intelligence Suite

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Abstract : <p class="Abstract">Energy production optimization has been traditionally very important for utilities in order to improve resource consumption. However, load forecasting is a challenging task, as there are a large number of relevant variables that must be considered, and several strategies have been used to deal with this complex problem. This is especially true also in microgrids where many elements have to adjust their performance depending on the future generation and consumption conditions. The goal of this paper is to present a solution for short-term load forecasting in microgrids, based on three machine learning experiments developed in R and web services built and deployed with different components of Cortana Intelligence Suite: Azure Machine Learning, a fully managed cloud service that enables to easily build, deploy, and share predictive analytics solutions; SQL database, a Microsoft database service for app developers; and PowerBI, a suite of business analytics tools to analyze data and share insights. Our results show that Boosted Decision Tree and Fast Forest Quantile regression methods can be very useful to predict hourly short-term consumption in microgrids; moreover, we found that for these types of forecasting models, weather data (temperature, wind, humidity and dew point) can play a crucial role in improving the accuracy of the forecasting solution. Data cleaning and feature engineering methods performed in R and different types of machine learning algorithms (Boosted Decision Tree, Fast Forest Quantile and ARIMA) will be presented, and results and performance metrics discussed.<o:p></o:p>

Keywords : time-series, features engineering methods for forecasting, energy demand forecasting, Azure Machine Learning
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