MACHINE LEARNING FOR BUILDING ENERGY PREDICTION: A CASE STUDY OF AN OFFICE BUILDING

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Abstract

With the rising population, reliance on automation, and increased time spent indoors, society‘s energy consumption grows at a rapid rate. In the next 30 years, global energy demand is expected to increase by over 50%. It is critical that this increasing energy demand is met by the transition to renewable energy sources [1]. As the integration of traditional energy sources and renewable energy systems become prevalent, it is necessary to understand current energy consumption trends with the goal of achieving higher energy efficiencies overall.With the data currently available, it is possible to create sufficiently reliable and accurate models based on machine learning techniques [2]. These models allow us to understand the behavior of energy use without resorting to complex physical models. This paper aims to compare several approaches to predict the hourly electric energy usage of a mixed-use academic building at the Graz University of Technology accommodating offices, seminar rooms, laboratories and a lecture hall. Four models were compared: Linear Regression, Support Vector Regression, Decision Tree Regression and Multi-Layer Perceptron regressor. Several input features are tested (e.g. month, day, hour, holiday, temperature and week day); the output of model was the energy usage. The model with the best performance was chosen based on statics measurements shown on figure 1. At the conference we will also present the prediction of energy usage based on forecasts of weather data (6h, 12h, 24h, 48h). All developments are openly available (https://github.com/matias-dogliani/energybuild).

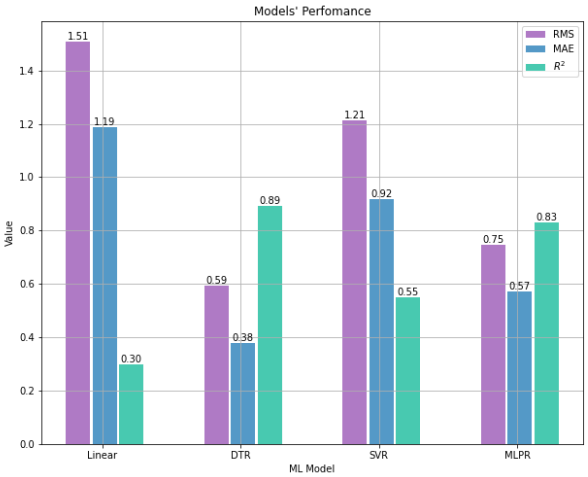

Figure 1: Performance of the model.

Referenzen

[1] Nalley and LaRose. International energy outlook 2021 with projections to 2050. Energy Information Administration, Washington, DC, 2021.

[2] Schweiger et al. Active consumer participation in smart energy systems. Energy and Buildings. 2020.

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