Machine learning for energy consumption prediction

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Abstract. *In response to global climate change and increased energy demands, new international initiatives have been introduced aimed at reducing energy consumption and carbon emissions by promoting innovative approaches to urban energy planning. A key aspect of these initiatives involves collecting high-quality building data and improving the accuracy of energy demand forecasting across large building stocks. This paper presents a case study that supports these goals by leveraging generated city-level building energy consumption datasets and a range of supervised machine learning algorithms to predict overall electricity demand across urban areas. The evaluated algorithms include XGBoost, LightGBM, Random Forest Regressor, Decision Trees, and Neural Networks, with several achieving R^2 scores approaching 1.0. The methodology adopts a data-driven approach tailored to real-world scenarios, where building data is often outdated, incomplete, or unavailable, making physics-based models impractical. The results are presented in the context of scalability and effectiveness for large-scale prediction tasks.*

Keywords. *urban energy planning, machine learning, data-driven approach, energy prediction*

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