Machine Learning-Based Energy Load Forecasting

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***Abstract*—This project explores the application of data science and machine learning techniques for energy load forecasting using publicly available U.S. electricity demand data. Historical load data is analyzed, preprocessed, and used to develop predictive models for short-term load estimation. The study demonstrates a basic workflow for applying machine learning in energy-related forecasting problems.**

https://github.com/estheromoyiwola/DS$_M L_P roject_c olab - integration$

***Index Terms*—Energy load forecasting, machine learning, data science, time-series analysis**

I. Introduction

Accurate energy load forecasting is essential for efficient power system planning and operation. With the availability of large-scale energy datasets, data science and machine learning methods have become valuable tools for predicting future electricity demand. This project investigates a simple machine learning-based approach to energy load forecasting.

II. Literature Review

Previous studies have applied statistical and machine learning models to electricity load forecasting problems[1]. Common approaches include regression-based models, tree-based methods, and time-series analysis. These studies highlight the importance of data preprocessing and feature selection in improving prediction accuracy[2].

III. Methodology

Publicly available electricity load data is collected and preprocessed to handle missing values and outliers. Relevant features are extracted from time information, and machine learning models are trained to predict future load values. Model performance is evaluated using basic error metrics.

IV. Results and Discussion

The trained models are able to capture general load trends in the dataset. Results indicate that machine learning models can provide reasonable short-term load predictions when trained on historical data. Differences in model performance are briefly discussed.

V. Conclusion

This project demonstrates a basic application of data science and machine learning techniques to energy load forecasting. The results show that even simple models can be effective when combined with proper data preprocessing. Future work may explore additional features and advanced models.

References

[1] U.S. Energy Information Administration, "Electricity Explained: Electricity Demand," 2023.
[2] H. L. Willis and J. W. Scott, "Short-Term Load Forecasting Using Machine Learning Methods," *Journal of Energy Systems*, vol. 15, no. 3, pp. 120–128, 2020.