Cafeteria Load Prediction

Overview

Cafeteria Load Prediction is a time-series based analytics project that estimates lunch-hour electricity surges using weather temperature data and a linear regression model. The system identifies peak usage hours, learns the relationship between outdoor temperature and energy consumption, and visualizes predicted load through a live updating line chart on a Streamlit dashboard.

Problem Statement

Cafeterias experience sudden increases in electricity demand during lunch hours due to higher occupancy and active kitchen equipment. The objective is to predict these lunch-hour surges using environmental data so that peak demand can be anticipated and managed effectively.

Dataset

The project uses the School_data.csv dataset containing building energy and environmental variables. Key columns used are Hour, Outdoor Temp (°C), and Use [kW]. Outdoor temperature is used as the primary predictor since it strongly influences HVAC load and overall electricity consumption during busy periods.

Workflow

Load the dataset and clean column names. Select Hour, Outdoor Temp (°C), and Use [kW]. Filter records corresponding to lunch hours between 11 AM and 2 PM. Train a Linear Regression model using temperature as the input feature and energy consumption as the target. Predict the expected lunch-hour load using the latest temperature value. Continuously generate predicted values from recent temperature readings to simulate a real-time load trend and display them as a live line chart on the Streamlit dashboard.

Technologies Used

Python, Pandas, Scikit-learn (Linear Regression), Matplotlib, Streamlit.

Installation

Install dependencies using: pip install pandas scikit-learn matplotlib streamlit

How to Run

Place School_data.csv in the project directory and run: streamlit run app.py

Key Features

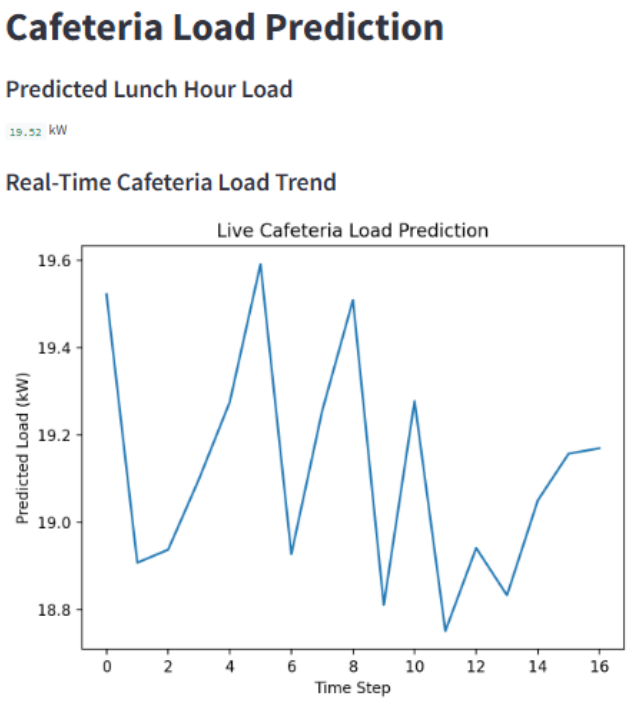
Predicts lunch-hour electricity surge, uses temperature as a key environmental predictor, applies a simple and interpretable linear regression model, and visualizes live load trends for quick monitoring.

Applications

Smart campus energy management, cafeteria power planning, peak load prevention, and operational scheduling of high-energy equipment.

Output

The dashboard displays the predicted cafeteria load during lunch hours in kW and a real-time updating line chart showing predicted load variations based on recent temperature values.



Limitations

Uses temperature as the primary predictor without direct occupancy data, assumes a linear relationship between temperature and load, and the real-time chart is a simulation based on recent historical values.

Future Enhancements

Integrate real occupancy or footfall data, include additional weather variables such as humidity, implement multivariate regression, and connect to a real WebSocket stream for true live monitoring.

Conclusion

The project demonstrates that temperature-driven linear regression can effectively estimate cafeteria lunch-hour electricity surges and provide real-time visual insights, supporting proactive energy management in campus facilities.