

Smart Energy Consumption Prediction and Optimization

The continuous increase in household energy consumption has become a major concern due to rising electricity costs, limited energy resources, and the growing demand placed on power generation systems. Inefficient usage of electrical appliances in residential buildings often leads to unnecessary energy wastage and increased peak load demand. Predicting and optimizing household energy consumption can play a significant role in improving energy efficiency and promoting sustainable energy usage. This project focuses on developing a smart energy consumption prediction and optimization system for residential households using historical electricity consumption data. The proposed system analyzes past energy usage records along with influencing factors such as time of day, day of the week, seasonal variations. Deep learning and statistical techniques are applied to identify energy consumption patterns and accurately forecast future household energy demand. The prediction model helps in understanding how energy usage varies over time and assists in planning efficient energy usage strategies. The optimization aims to reduce overall electricity consumption and shift flexible loads away from peak hours while ensuring user comfort is maintained. This approach helps in lowering electricity bills and reducing stress on the power grid. The system is evaluated using simulation results and comparison with traditional energy usage methods. The results demonstrate that the proposed approach can effectively reduce peak demand and improve energy . The outputs of the project include predicted energy consumption values, graphical comparisons of actual and predicted usage, identification of peak and off-peak periods, and optimized energy consumption plans. Additionally, the system provides an analysis of energy and cost savings achieved after optimization.

Keywords: Python ,MATLAB , machine learning models and statistical techniques , and streamlit.

TEAM MEMBERS:

23241A1296 K.Srikari

24245A1212 S.Vyshnavi

24245A1208 B.Nandini