Entri Software Pvt Limited
Kakkanad Kerala

Time Series Forecasting for Energy Consumption

Heading:

Time Series Forecasting for Energy Consumption: Optimizing Resource Allocation in Smart Grid Systems

Problem Statement:

This project aims to develop a time series forecasting model for predicting energy consumption patterns in smart grid systems. By leveraging historical data on energy usage, weather conditions, holidays, and other relevant factors, the model seeks to forecast future energy consumption accurately. The goal is to optimize energy distribution and resource allocation, enabling efficient management of electricity grids. By forecasting energy consumption patterns, this project contributes to reducing costs, improving grid reliability, and promoting sustainability in energy management.

Expected Outcome:

- Development of an accurate time series forecasting model for energy consumption.
- Optimization of energy distribution and resource allocation in smart grid systems.
- Reduction in operational costs and improved grid reliability.
- Enhanced sustainability through efficient energy management practices.

Dataset:

energy_consumption_dataset

Features:

- Date/Time

- Temperature

- Humidity
- Day of Week
- Time of Day
- Season
- Holiday Indicator
- Previous Day's Energy Consumption
- Previous Week's Energy Consumption
- Energy Price
- Daylight Hours
- Wind Speed
- Solar Irradiance
- Population Density

Target Variable:

- Energy Consumption

Data Preprocessing:

- Handling Missing Values
- Dealing with Duplicate Data
- Outlier Detection and Treatment
- Feature Scaling/Normalization

Exploratory Data Analysis (EDA):

- Descriptive Statistics
- Visualization using plots (histograms, box plots, scatter plots)
- Identifying patterns, correlations, and relationships between variables

Feature Engineering:

- Creating new features

- Transforming existing features

- Encoding categorical variables

Data Splitting:

- Splitting the dataset into training and testing sets (80-20 split)

Model Selection:

- Time Series Forecasting models like ARIMA, SARIMA, Exponential Smoothing

- Machine Learning models such as Support Vector Regression (SVR), Random Forest, Gradient Boosting

Model Training:

- Training selected models using the training dataset

- Hyperparameter optimization using techniques like grid search or randomized search

Model Evaluation:

- Evaluating model performance using metrics like MAE, MSE, RMSE, R^2 Score

- Comparing the performance of different models to select the best one

Model Deployment:

- Predicting energy consumption for the test dataset and saving the model

Documentation and Reporting:

- Documenting the entire process, including data sources, preprocessing steps, model selection, and evaluation

- Preparing a comprehensive report summarizing project findings, insights, and recommendations

- Communicating the results effectively to stakeholders, including non-technical audiences.