ELECTRICITY PRICES PREDICTION

ABSTRACT:

The process for creating a predictive model that predicts future power costs using historical data and pertinent variables is described in this document. Offering a tool to help energy suppliers and customers make educated decisions about consumption and investment using suitable analytic methods is the goal.

PROBLEM STATEMENT:

Create a predictive model capable of forecasting future electricity prices. This model will utilize historical electricity price data and relevant factors, enabling energy providers and consumers to anticipate price fluctuations. By doing so, we aim to empower stakeholders to make informed decisions about their electricity usage and investments in the energy sector.

PROBLEM DEFINITION:

The problem is to develop a predictive model that uses historical electricity prices and relevant factors to forecast future electricity prices. The objective is to create a tool that assists both energy providers and consumers in making informed decisions regarding consumption and investment by predicting future electricity prices. This project involves data preprocessing, feature engineering, model selection, training, and evaluation.

DATASET INFORMATION:

The dataset contains historical electricity prices and relevant factors, including:

- **Date:** Timestamps for each data point.
- **Demand:** Electricity demand information.
- **Supply:** Electricity supply data.
- **Weather Conditions:** Weather-related factors that may impact electricity prices.
- **Economic Indicators:** Economic data that could influence electricity prices.

DESIGN THINKING:

i. **Data Source:**

We will make use of a dataset that includes historical power prices and other pertinent information, such as date, supply, demand, weather, and economic indicators. Our predictive model is built on top of this dataset.

- Dataset Link: [Historical Electricity Prices Dataset] - https://www.kaggle.com/datasets/chakradharmattapalli/electricity-price-prediction

ii. **Data Pre-processing:**

- Clean and preprocess the dataset to ensure data quality.
- Handle missing values by imputation or data removal.
- Convert categorical features (if any) into numerical representations through encoding techniques

iii. Feature Engineering:

- Create additional features that capture temporal patterns, seasonality, and external influences on electricity prices.
- Features may include time-based features (day of the week, month), lagged variables (previous price data), and weather-related factors.

iv. Model Selection:

- Taking into account variables like data complexity and prediction accuracy, we will choose appropriate time series forecasting algorithms
- Potential algorithms include:
  - ARIMA (AutoRegressive Integrated Moving Average)
  - LSTM (Long Short-Term Memory)
  - Random Forest for regression
  - XGBoost for regression

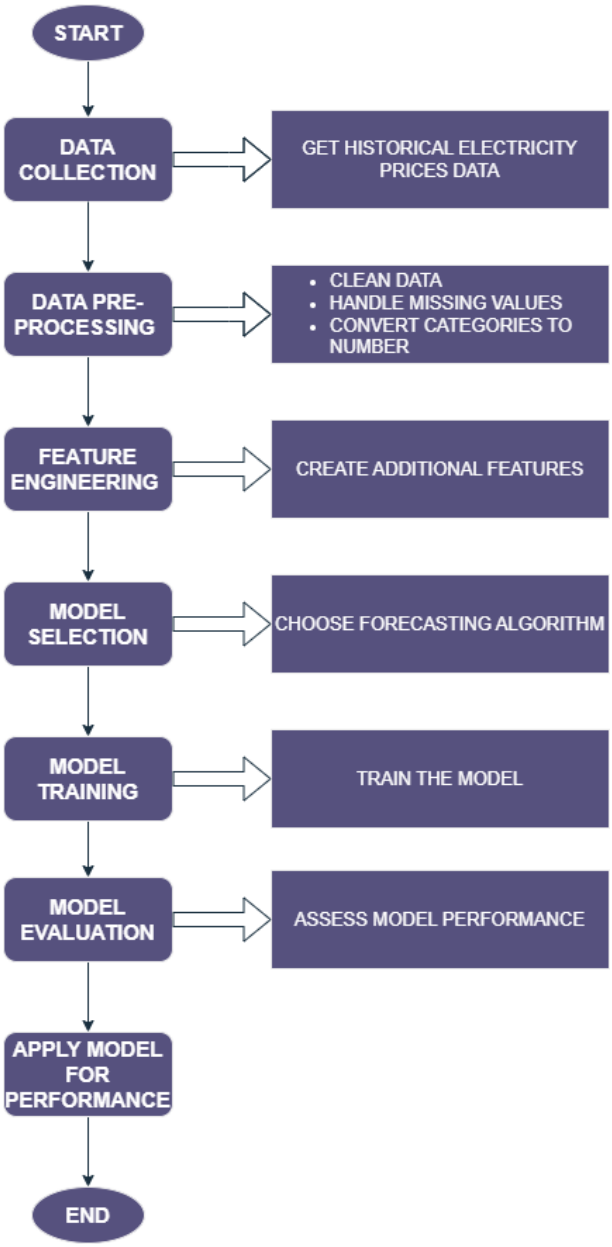
v. Model Training:

- Train the selected forecasting model using the pre-processed dataset to make sure the model catches the underlying trends in the historical data,
- Use historical electricity price data and relevant factors to build a model capable of predicting future electricity prices.

vi. Evaluation:

- Assess the model's performance using suitable time series forecasting metrics, including but not limited to:
  - Mean Absolute Error (MAE)
  - Root Mean Squared Error (RMSE)
  - Mean Absolute Percentage Error (MAPE)
  - R-squared (R^2)

Design flowchart:



BENEFITS:

- Energy suppliers: better supply-demand management, pricing tactics, and investment choices.
- Energy Customers: Making wise choices about when to consume electricity could result in cost savings.
- Environmental welfare: Improved demand planning reduced energy waste.
- Economic Efficiency: Increased energy market efficiency, which could lower overall costs.

CONCLUSION:

The creation of a predictive model for predicting future electricity prices is an essential first step toward enabling consumers and energy suppliers to make well-informed choices. This project seeks to increase the effectiveness of the energy market, decrease waste, and promote overall economic and environmental sustainability by utilizing historical data and pertinent aspects. The basis for the effective application of this predictive model is the design thinking methodology described in this document.