Innovation Phase: Electricity Prices Prediction

#### Step 1: Data Understanding and Preparation\*

Data Exploration:

Analyze the provided dataset from Kaggle, understanding the structure and features related to historical electricity prices and relevant factors.

Data Cleaning and Preprocessing:

Handle missing values, outliers, and inconsistencies in the dataset to ensure data quality.

Convert categorical features into numerical representations for model compatibility.

#### Step 2: Feature Engineering and Selection

Feature Enhancement:

Create additional features such as time-based variables (hourly, daily, monthly patterns) to capture temporal trends.

Implement lagged variables to incorporate historical price trends, which might influence future prices.

Feature Selection:

Utilize techniques like correlation analysis and feature importance scores to select the most relevant features for the predictive model.

#### Step 3: Model Selection and Training

Algorithm Selection:

Choose appropriate time series forecasting algorithms (e.g., ARIMA, LSTM) considering the dataset's characteristics and complexity.

Experiment with ensemble methods or deep learning architectures for enhanced prediction accuracy.

Model Training:

Train selected models using the preprocessed data, ensuring proper validation techniques to avoid overfitting.

#### Step 4: Evaluation and Optimization

Model Evaluation:

Assess model performance using time series forecasting metrics like Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and Mean Absolute Percentage Error (MAPE).

Validate the model's accuracy across different time horizons to ensure robust predictions.

Optimization:

Fine-tune model hyperparameters and explore different architectures to optimize prediction accuracy.

Implement cross-validation techniques to validate the model's stability and reliability.

#### Step 5: Documentation

Documentation:

Document the entire analysis process, including data preprocessing, feature engineering, model selection, training, evaluation, and optimization.

Provide clear explanations of chosen algorithms, parameters, and evaluation metrics.

### Output:

Predictive Electricity Price Tool:

A user-friendly web application providing real-time electricity price predictions based on historical data and relevant factors.

Predicted electricity prices accessible through an intuitive interface, assisting both energy providers and consumers in making informed decisions regarding consumption and investment.