Project 4: Electricity Prices Prediction

Phase 1: Problem Definition and Design Thinking

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Introduction:

The objective of this document is to define and address the problem of developing a predictive model for forecasting future electricity prices. This project aims to assist energy providers and consumers in making informed decisions regarding consumption and investment by predicting future electricity prices. The process of solving this problem involves several phases, including problem understanding, data preprocessing, feature engineering, model selection, training, and evaluation. This document will outline the steps we will take to address the problem effectively.

Problem Statement:

Problem: Develop a predictive model that utilizes historical electricity prices and relevant factors to forecast future electricity prices.

Objective: Create a tool that assists both energy providers and consumers in making informed decisions regarding consumption and investment by predicting future electricity prices.

Design Thinking Process:

Step 1: Empathize

- Understand the perspective of energy providers and consumers.
- Identify their pain points and needs related to electricity price forecasting.
- Gather feedback from stakeholders to align the project with their requirements.

Step 2: Define

- Clearly define the problem statement and objectives.
- Identify the key success criteria for the predictive model.
- Determine the relevant factors that may affect electricity prices (e.g., weather, demand, market trends).

Step 3: Ideate

- Brainstorm potential data sources for historical electricity prices and relevant factors.
- Explore different modeling approaches, algorithms, and techniques for price forecasting.
- Consider the scalability and interpretability of the chosen model.

Step 4: Prototype

- Develop a data pipeline to collect and preprocess historical data.
- Create initial data visualizations to gain insights into the data.
- Implement a basic predictive model as a starting point for experimentation.

Step 5: Test

- Evaluate the initial model's performance using appropriate metrics (e.g., RMSE, MAE).
- Collect feedback from stakeholders and make necessary adjustments.
- Consider incorporating additional features or data sources to improve the model.

Step 6: Implement

- Refine the predictive model based on the feedback and evaluation results.
- Develop a user-friendly interface or API for stakeholders to access predictions.
- Implement a robust data update mechanism to keep the model up to date.

Step 7: Iterate

- Continuously monitor the model's performance and update it as needed.
- Collect feedback from users and adapt the tool to changing requirements.

- Explore advanced techniques such as time series forecasting, machine learning, or deep learning models for improved accuracy.

Project Workflow:

1. Data Collection:
- Collect historical electricity price data.
- Gather relevant factors data (e.g., weather, demand, market data).

2. Data Preprocessing:
- Clean any unwanted data
- Preprocess the data to handle missing values and outliers.

3. Feature Engineering:
- Create meaningful features that may impact electricity prices.
- Explore time-based features, seasonal patterns, and lag variables.

4. Model Selection:
- Experiment with various predictive models (e.g., regression, time series models).
- Assess the model's performance using cross-validation techniques.

5. Model Training:
- Train the selected model on historical data.
- Fine-tune hyperparameters for optimal performance.

6. Model Evaluation:
- Evaluate the model's accuracy and reliability using appropriate metrics.
- Validate the model against out-of-sample data.

Conclusion:

In summary, this document outlines the problem definition and design thinking process for developing a predictive model to forecast future electricity prices. By following this structured approach and involving stakeholders throughout the project, we aim to create a valuable tool that empowers energy providers and consumers to make informed decisions in the dynamic electricity market. The iterative nature of the project ensures that the model remains accurate and relevant over time.