C2P2 FORECASTING

DESIGN DOCUMENT

Certainly! Use cases help to outline the specific scenarios or interactions that your application should support. Here are some potential use cases for your C2P2 forecasting model application:

1. **Training the Forecasting Model:**
   * **Description:** As a data scientist or engineer, I want to train the forecasting model using historical data on ambient temperature (AT), exhaust vacuum (V), ambient pressure (AP), and relative humidity (RH) to predict power output (PE).
   * **Steps:**
     + Upload historical data.
     + Preprocess the data to handle missing values and outliers.
     + Select features and target variable.
     + Choose the forecasting algorithm.
     + Train the model.
2. **Evaluating Model Performance:**
   * **Description:** As a data scientist, I want to evaluate the performance of the trained forecasting model to ensure its accuracy and reliability.
   * **Steps:**
     + Split the dataset into training and testing sets.
     + Deploy the model on the testing set.
     + Evaluate performance metrics (e.g., Mean Squared Error, Root Mean Squared Error).
     + Adjust model parameters if necessary.
3. **Making Power Output Predictions:**
   * **Description:** As an end-user, I want to input current ambient temperature, exhaust vacuum, ambient pressure, and relative humidity values to receive a prediction of the expected power output.
   * **Steps:**
     + Enter current environmental conditions.
     + Submit the data to the forecasting model.
     + Receive the predicted power output.
4. **Data Visualization:**
   * **Description:** As a user or analyst, I want to visualize historical data and predicted power output to gain insights into trends and patterns.
   * **Steps:**
     + Select the time range for historical data.
     + Generate graphs or charts showing actual vs. predicted power output.
     + Analyze trends and anomalies.
5. **Model Hyperparameter Tuning:**
   * **Description:** As a data scientist, I want to optimize the forecasting model by adjusting hyperparameters for better accuracy.
   * **Steps:**
     + Access the model configuration.
     + Experiment with different hyperparameter values.
     + Evaluate the impact on model performance.
     + Save the optimal configuration.
6. **Deployment to Production:**
   * **Description:** As a system administrator, I want to deploy the trained forecasting model to a production environment for real-time predictions.
   * **Steps:**
     + Package the model for deployment.
     + Integrate the model into the production system.
     + Ensure scalability and reliability.
7. **Monitoring Model Performance:**
   * **Description:** As a system administrator or data scientist, I want to monitor the forecasting model's performance in a production environment to detect potential issues.
   * **Steps:**
     + Set up monitoring tools.
     + Track key performance metrics.
     + Receive alerts for deviations from expected behavior.
     + Investigate and address issues promptly.
8. **Updating the Model with New Data:**
   * **Description:** As a data engineer, I want to update the forecasting model with new data periodically to ensure it remains accurate and relevant.
   * **Steps:**
     + Acquire new data.
     + Preprocess the data.
     + Retrain the model with the updated dataset.
     + Deploy the updated model to production.
9. **User Authentication and Authorization:**
   * **Description:** As an administrator, I want to control access to the forecasting model application and ensure that only authorized users can perform certain actions.
   * **Steps:**
     + Implement user authentication.
     + Define user roles and permissions.
     + Restrict access to sensitive features or data.
10. **Compliance Reporting:**
    * **Description:** As a compliance officer, I want the application to generate reports on model performance and data handling to ensure compliance with relevant regulations.
    * **Steps:**
      + Generate compliance reports on a scheduled basis.
      + Include information on data processing, model accuracy, and security measures.
      + Archive reports for auditing purposes.



