Prediction Of Full Load Electrical Power Output Of A Base Load Operated Combined Cycle Power Plant Using Machine Learning.

Milestone 1: Project Initialization and Planning Phase

The "Project Initialization and Planning Phase" marks the project's outset, defining goals, scope, and stakeholders. This crucial phase establishes project parameters, identifies key team members, allocates resources, and outlines a realistic timeline. It also involves risk assessment and mitigation planning. Successful initiation sets the foundation for a well-organized and efficiently executed machine learning project, ensuring clarity, alignment, and proactive measures for potential challenges.

Activity 1: Define Problem Statement

Problem Statement: The problem statement of Combined Cycle Power Plants (CCPP) are widely used for their efficiency and ability to operate on a variety of fuels. Predicting the electrical power output of these plants under full load conditions is critical for optimizing performance, managing energy distribution, and planning maintenance. Accurate prediction models can enhance operational efficiency, reduce costs, and ensure reliable power supply.

Prediction Of Full Load Electrical Power Output of A Base Load Operated Combined Cycle Power Plant Using Machine Learning Problem Statement Report: Click Here

Activity 2: Project Proposal (Proposed Solution)

The "Prediction of Full Load Electrical Power Output of a Base Load Operated Combined Cycle Power Plant Using Machine Learning" aims to Combined Cycle Power Plants (CCPP) are a key component of modern power generation due to their high efficiency and low emissions. Predicting the full load electrical power output of a CCPP can optimize operations, reduce costs, and enhance energy efficiency. This project aims to develop a machine learning model to accurately predict the full load electrical power output of a base load operated CCPP using historical operational data.

Prediction Of Full Load Electrical Power Output Of A Base Load Operated Combined Cycle Power Plant Using Machine Learning Problem Project Proposal Report : Click Here

Activity 3: Initial Project Planning

Initial Project Planning involves outlining key objectives, defining scope, and identifying the ambient pressure, atmospheric temperature, vaccum, relative humidity. It encompasses setting timelines, allocating resources, and determining the overall project strategy. During this phase, the team establishes a clear understanding of the dataset, formulates goals for analysis, and plans the workflow for data processing. Effective initial planning lays the foundation for a systematic and well-executed project, ensuring successful outcomes.

Prediction Of Full Load Electrical Power Output Of A Base Load Operated Combined Cycle Power Plant Using Machine Learning Project Planning Report: Click Here

Milestone 2: Data Collection and Preprocessing Phase

The data collection and preprocessing phase involves executing a plan to gather relevant data from the residents of the city for their happiness and gathering the required dataset from Kaggle. Ensured data quality is high with no missing values. Categorical data in the dataset is high, encoding is not required.

Activity 1: Data Collection Plan, Raw Data Sources Identified, Data Quality Report

The dataset for "Prediction of Full Load Electrical Power Output of a Base Load Operated Combined Cycle Power Plant Using Machine Learning": Machine Learning Delving into this data collection plan is to gather relevant and high-quality data for developing machine learning models to predict the full load electrical power output of a combined cycle power plant. This plan outlines the primary and secondary data sources, data collection methods, and data quality considerations is sourced from Kaggle. It includes info of output of electrical power plant. Data qualities ensured high with no missing values.

Prediction Of Full Load Electrical Power Output Of A Base Load Operated Combined Cycle Power Plant Using Machine Learning Data Collection Report: Click Here

Activity 2: Data Quality Report

The dataset for " Prediction of Full Load Electrical Power Output of a Base Load Operated Combined Cycle Power Plant Using: Machine Learning " is sourced from Kaggle. It includes Information about ambient pressure, atmospheric temperature, vaccum, relative humidity. Data quality is ensured high with no missing values.

Prediction Of Full Load Electrical Power Output of a Base Load Operated Combined Cycle Power Plant Using Machine Learning Data Quality Report: Click Here

Activity 3: Data Exploration and Preprocessing

Data exploration and preprocessing are critical steps in predicting the full load electrical power output of a base load operated combined cycle power plant using machine learning.

Data Exploration involves understanding the structure and characteristics of the dataset. This includes summarizing the data through statistical measures such as mean, median, standard deviation, and range for each variable. Visualizing the data through histograms,

scatter plots, and correlation matrices helps identify patterns, trends, and relationships among variable . Detecting anomalies and outliers is also essential as they can significantly impact the model's performance.

Prediction Of Full Load Electrical Power Output of a Base Load Operated Combined Cycle Power Plant Using Machine Learning Data Exploration and Preprocessing Report: Click Here

Milestone 3: Model Development Phase

The Model Development Phase entails crafting a predictive model of Full Load Electrical Power Output of a Base Load Operated Combined Cycle Power Plant Using Machine Learning: for electrical output.It encompasses strategic feature selection, evaluating and selecting models (Decision Tree, Random Forest Tree, Linear Regression) initiating training with code, and rigorously validating and assessing model performance for informed decision-making for the happiness level.

Activity 1: Feature Selection Report

The Feature Selection Report outlines the rationale behind choosing specific features (e.g., ambient pressure, atmospheric temperature, vaccum, relative humidity) for the electric output level of the power plant. It evaluates relevance, importance, and impact on predictive accuracy, ensuring the inclusion of key factors influencing the model's ability to predict the output level of the combined power plant.

Prediction Of Full Load Electrical Power Output of a Base Load Operated Combined Cycle Power Plant Using Machine Learning Feature Selection Report: Click Here

Activity 2: Model Selection Report

The Model Selection Report details the rationale behind choosing Random Forest, Decision Tree and Linear Regression models for electrical power output level prediction. It considers each model's strengths in handling complex relationships, interpretability, adaptability, and overall predictive performance, ensuring an informed choice aligned with project objectives.

Prediction Of Full Load Electrical Power Output of a Base Load Operated Combined Cycle Power Plant Using Machine Learning Model Selection Report: Click Here

Activity 3: Initial Model Training Code, Model Validation and Evaluation Report

The Initial Model Training Code employs selected algorithms on the power output dataset, setting the foundation for predictive modelling. The subsequent Model Validation and Evaluation Report rigorously assesses model performance, employing metrics like accuracy and precision to ensure reliability and effectiveness in predicting electrical power output.

Prediction Of Full Load Electrical Power Output of a Base Load Operated Combined Cycle Power Plant Using Machine Learning Model Development Phase Template: Click Here

Milestone 4: Model Optimization and Tuning Phase

The Model Optimization and Tuning Phase involves refining machine learning models for peak performance. It includes optimized model code, fine-tuning hyperparameters, comparing performance metrics, and justifying the final model selection for enhanced predictive accuracy and efficiency.

Activity 1: Hyperparameter Tuning Documentation

The Random Forest model was selected for its superior performance, exhibiting high accuracy during hyperparameter tuning. Its ability to handle complex relationships, minimize overfitting, and optimize predictive accuracy aligns with project objectives, justifying its selection as the final model.

Activity 2: Performance Metrics Comparison Report

The Performance Metrics Comparison Report contrasts the baseline and optimized metrics for various models, specifically highlighting the enhanced performance of the Random Forest model. This assessment provides a clear understanding of the refined predictive capabilities achieved through hyperparameter tuning.

Activity 3: Final Model Selection Justification

The Final Model Selection Justification articulates the rationale for choosing Random Forest Model as the ultimate model. Its exceptional accuracy, ability to handle complexity, and successful hyperparameter tuning align with project objectives, ensuring optimal electrical level predictions.

Prediction Of Full Load Electrical Power Output of a Base Load Operated Combined Cycle Power Plant Using Machine Learning Model Optimization and Tuning Phase Report: Click Here

Milestone 5: Project Files Submission and Documentation

For project file submission in GitHub, kindly click the link and refer to the flow. **Click Here**

For the documentation, kindly refer to the link. **Click Here**

Milestone 6: Project Demonstration

In the upcoming module called Project Demonstration, individuals will be required to record a video by sharing their screens. They will need to explain their project and demonstrate its execution during the presentation.