SmartBridge – Trip-Based Modelling of Fuel Consumption in Modern Fleet Vehicles 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: To predict fuel consumption based on trip data helps optimize fleet management, reduce costs, and lower environmental impact.
  Problem Statement Report: [Click Here](#)

Activity 2: Project Proposal (Proposed Solution)
The proposed project, "Trip-Based Modelling of Fuel Consumption in Modern Fleet Vehicles " aims to leverage machine learning for more accurate fuel consumption predictions. Using a comprehensive dataset including different parameters for a trip the project seeks to develop a predictive machine learning model that utilizes trip data to accurately predict fuel consumption in modern fleet vehicles. This solution aims to optimize fleet operations, reduce fuel costs, and minimize environmental impact. The model will be trained on historical trip data and continuously improved for greater precision and reliability.

Project Proposal Report: [Click Here](#)

Activity 3: Initial Project Planning

The initial project planning involves collecting and preprocessing historical trip data from fleet vehicles, followed by selecting and training appropriate machine learning algorithms. Key milestones include data collection, feature engineering, model development, validation, and deployment. Regular evaluations and adjustments will be conducted to ensure the model's accuracy and effectiveness in predicting fuel consumption.

  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 fuel prediction

application data from Drive, ensuring data quality through verification and addressing missing values. Preprocessing tasks include cleaning, encoding, and organizing the dataset for subsequent exploratory analysis and machine learning model development.

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

The dataset for " Trip-Based Modelling of Fuel Consumption in Modern Fleet Vehicles " is sourced from google drive. It includes applicant details and financial metrics. Data quality is ensured through thorough verification, addressing missing values, and maintaining adherence to ethical guidelines, establishing a reliable foundation for predictive modeling.

Data Collection Report: [Click Here](#)

Activity 2: Data Quality Report

The Data Quality Report will assess the completeness, accuracy, and consistency of historical trip data, including GPS coordinates, vehicle speed, engine metrics, and fuel consumption records. It will identify and address any missing or erroneous data points, ensuring the dataset is robust and reliable for machine learning model training. Regular audits and data validation processes will be implemented to maintain high data quality throughout the project..

Data Quality Report: [Click Here](#)

Activity 3: Data Exploration and Preprocessing

Data Exploration involves analyzing the prediction dataset to understand patterns, distributions. Preprocessing includes handling missing values, scaling, and encoding categorical variables. These crucial steps enhance data quality, ensuring the reliability and effectiveness of subsequent analyses in the fuel consumption project.

Data Exploration and Preprocessing Report: [Click Here](#)

Milestone 3: Model Development Phase

The Model Development Phase entails crafting a predictive model for fuel consumption. It encompasses strategic feature selection, evaluating and selecting models (Random Forest, Decision Tree, linear regression, lasso regression, SVM), initiating training with code, and rigorously validating and assessing model performance for informed decision-making in the lending process.

Activity 1: Feature Selection Report

The Feature Selection Report outlines the rationale behind choosing specific features (distance , speed, and temperature)for the fuel consumption prediction model. It evaluates relevance, importance, and impact on predictive accuracy, ensuring the inclusion of key factors influencing the model's ability to discern credible fuel prediction.

Feature Selection Report: [Click Here](#)

Activity 2: Model Selection Report

The Model Selection Report details the rationale behind choosing Random Forest, Decision Tree, Linear Regression, and SVM models for fuel consumption 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.

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 fuel consumption prediction dataset, setting the foundation for predictive modeling. The subsequent Model Validation and Evaluation Report rigorously assesses model performance, employing metrics like accuracy and precision to ensure reliability and effectiveness in predicting fuel consumption outcomes.

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 Decision tree model was selected for its superior performance, exhibiting high accuracy. 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 Decision Tree model. This assessment provides a clear understanding of the refined predictive capabilities.

Activity 3: Final Model Selection Justification

The Final Model Selection Justification articulates the rationale for choosing Decision Tree as the ultimate model. Its exceptional accuracy, ability to handle complexity, and align with project objectives, ensuring optimal fuel consumption predictions.

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.