SmartBridge -SDSS Galaxy Classification Using Machine Learning

Milestone 1: Project Initialization and Planning Phase

The "Project Initialization and Planning Phase begin by defining project goals, gathering SDSS galaxy data, and selecting relevant features. Develop a project timeline, choose appropriate machine learning models, and establish evaluation metrics for galaxy classification accuracy. Define objectives, gather SDSS galaxy data, select features, choose machine learning models, set evaluation metrics, develop timeline, assign tasks, ensure data preprocessing, and plan for model validation and refinement..

Activity 1: Define Problem statement

The project aims to develop and deploy machine learning models to accurately classify galaxies in the SDSS dataset. The goal is to enhance astronomical research by providing reliable classifications that account for complex patterns in the data, facilitating better understanding of the universe: Click HYPERLINK

Activity 2: Project Proposal (Proposed Solution)

The proposed solution involves applying advanced machine learning techniques to analyze the SDSS dataset. By selecting and training robust models, the project aims to improve the accuracy of galaxy classifications, aiding in astrophysical discoveries and research.

Project Proposal Report: Click HYPERLINK

Activity 3: Initial Project Planning

Description: This involves defining the objective of classifying galaxies, acquiring the SDSS dataset, forming a multidisciplinary team, establishing a structured timeline with milestones, allocating resources, assessing risks, and implementing a communication plan for effective collaboration and progress tracking.
Project Planning Report: Click HYPERLINK

Milestone 2: Data Collection and Preprocessing Phase

Collect spectroscopic and photometric data from the SDSS, clean and normalize the dataset, handle missing values, and apply feature extraction techniques to prepare the data for training machine learning models for galaxy classification.

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

Description: Gather relevant SDSS data, ensuring data quality through verification and addressing missing values. The dataset includes features like redshift, magnitudes, and spectral lines.

Data Collection Report: Click HYPERLINK

Activity 2: Data Quality Report

Description: The collected data from the SDSS is comprehensive and reliable. Data preprocessing techniques such as normalization, handling missing values, and outlier detection further enhance dataset integrity for accurate machine learning model training.

Data Quality Report: Click HYPERLINK

Activity 3: Data Exploration and Preprocessing

Description: Initial exploratory data analysis reveals patterns and correlations within the SDSS dataset. Missing values are handled through imputation methods, and categorical variables are encoded appropriately. Feature scaling is applied to ensure uniformity in data distribution for machine learning model training **Data Exploration and Preprocessing**

Data Exploration and Preprocessing Report: Click HYPERLINK

Milestone 3: Model Development Phase

Split the preprocessed SDSS data into training and test sets, select and train various machine learning models, perform hyperparameter tuning, evaluate model performance, and select the best model for galaxy classification.

Activity 1: Feature Selection Report

Description: Feature selection is performed using techniques such as correlation analysis, recursive feature elimination, and feature importance from ensemble models. Key variables influencing galaxy classification are identified for model development.

Feature Selection Report: Click HYPERLINK

Activity 2: Model Selection Report

Description: After evalrobustness **Model** uating various machine learning algorithms including decision trees, random forests, and support vector machines, the best performing models are selected based on metrics such as accuracy, precision, and recall. Hyperparameter tuning further optimizes model accuracy .

Model Selection Report: Click HYPERLINK

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

The model optimization and tuning phase the selected model is trained on the SDSS dataset, achieving high accuracy and robust performance in classifying galaxies based on the selected features.

Model Development Phase Template: Click HYPERLINK

Milestone 4: Model Optimization and Tuning Phase

The model optimization and tuning phase the selected model is trained on the SDSS dataset, achieving high accuracy and robust performance in classifying galaxies based on the selected features

Activity 1: Hyperparameter Tuning Documentation

Description: The selected model's hyperparameters are optimized using techniques like Research, focusing on parameters such as adept, min_samples_split, and max_features. Cross-validation helps fine-tune the model, achieving improved accuracy and reducing errors.

Activity 2: Performance Metrics Comparison Report

Description: This report contrasts the baseline and optimized metrics for various models, specifically highlighting the enhanced performance of the tuned model. This assessment provides a clear understanding of the refined predictive capabilities achieved through hyperparameter tuning

Activity 3: Final Model Selection Justification

Description: This report articulates the rationale for choosing the final model. Its exceptional accuracy, ability to handle complexity, and successful hyperparameter tuning align with project objectives.

Model Optimization and Tuning Phase Report: Click HYPERLINK

Milestone 5: Project Files Submission and Documentation

For project file submission in Git hub, Kindly click the link and refer to the flow **Click HYPERLINK**

For the documentation, Kindly refer to the link **Click HYPERLINK**

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.