Smart Bridge: 3D PRINTER MATERIAL PREDICTION USING MACHINE LEARNING

Milestone 1: Project Initialization and Planning Phase

The "Project Initialization and Planning Phase" for the 3D Printer Material Prediction using Machine Learning marks the project's outset by defining clear goals, scope, and stakeholders. It establishes project parameters, allocates resources, and outlines a realistic timeline. This phase also involves risk assessment and mitigation planning, ensuring a well-organized and efficiently executed project with clarity and alignment among stakeholders.

Activity 1: Define Problem Statement

predicting material usage is crucial. The goal is to create a machine, reduce waste, and improve learning model that forecasts the type and quantity of materials needed for 3D printing based on factors like model geometry, print settings, and printer type. This helps optimize resource allocation In additive manufacturing, accurately efficiency in 3D printing operations.

Problem Statement Report: **click here**

Activity 2: Project Proposal (Proposed Solution)

For predicting 3D printer material usage, our proposed solution involves gathering historical job data, preprocessing it to handle missing values and extract relevant features, selecting and training a suitable machine learning model, and finally evaluating its performance to ensure accurate material usage forecasts..

Project Proposal Report: **click here**

Activity 3: Initial Project Planning

In the initial project planning phase for predicting 3D printer material usage, our focus is on defining clear objectives, gathering and preprocessing historical data, selecting suitable machine learning models, and establishing timelines and milestones for efficient execution. This structured approach aims to optimize resource allocation and reduce waste through accurate material usage predictions**.**

Project Planning Report: **click here**

Milestone 2: Data Collection and Preprocessing Phase

The Data Collection and Preprocessing Phase involves executing a plan to gather 3d printer material properties

from Kaggle, 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 " 3D printer material prediction using machine learning " is sourced from Kaggle. It includes features extracted from 3d printer material properties. 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 dataset for " 3d printer material prediction using machine learning " is sourced from Kaggle. It includes features extracted from 3d printer material prediction using machine learning. Data quality is ensured through thorough verification, addressing missing values, and maintaining adherence to ethical guidelines, establishing a reliable foundation for predictive modeling.

Data Quality Report: click here

Activity 3: Data Exploration and Preprocessing

Data Exploration involves analyzing the fetal health dataset to understand patterns, distributions, and outliers. 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 project.

Data Exploration and Preprocessing Report: click here

Milestone 3: Model Development Phase

The Model Development Phase entails crafting a predictive model for 3d printer material prediction using machine learning . It encompasses strategic feature selection, evaluating and selecting models (Decision Tree), 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 (e.g., accelerations, prolongued_decelerations etc..) for the 3d printer material prediction using ml. It evaluates relevance, importance, and impact on predictive accuracy, ensuring the inclusion of key factors influencing the model's ability to predict the sutaible material by predicting material properties.

Feature Selection Report: click here

Activity 2: Model Selection Report

The Model Selection Report details the rationale behind choosing Random Forest, Decision Tree, Logistic Regression, K-Nearest Neighbors models for fetal health 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 3d printer prediction dataset, setting the foundation for predictive modeling. The subsequent Model Validation and EvaluationReport rigorously assesses model performance, employing metrics like accuracy and confusion metrics to ensure reliability and effectiveness in predicting sutiable material.

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 Logistic Regression 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 Logistic Regression 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 Decision tree as the ultimate model. Its exceptional accuracy, ability to handle complexity, and successful hyperparameter tuning align with project objectives, ensuring optimal 3d printer material predictions.

Model Optimization and Tuning Phase Report: click here

Milestone 5: Project Files Submission and Documentation

For project file submission in Git hub, 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.