Estimating the stock keeping units 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: Develop a model to accurately predict the demand for each stock SKUs in our inventory over the next month . The model should take into account historical sales data ,product attributes to forecast the quantity of each SKUs that to be sold.

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Estimating The Stock Problem Statement Report:

Activity 2: Project Proposal (Proposed Solution)

The proposed solution involves creating a machine learning model that utilizes historical sales data to predict stock keeping units. The model will incorporate features such as seasonality indicators ,product attributes , historical trends and lagged values. We will use advanced algorithms like regression models ,time series forecasting methods(e.g., ARIMA ,Prophet) ,more advanced techniques like gradient boosting or neural networks to enhance prediction accuracy. The solution will be generalised to provide real-time prediction estimates. Continuous model training and validation will ensure the system adapts to changing conditions and maintains high accuracy.

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Estimating The Stock Project Proposal Report:

Activity 3: Initial Project Planning

Initial Project Planning involves outlining key objectives, defining scope, and identifying stakeholders for a stock prediction system. 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 prediction accuracy, and plans the workflow for data collection and preprocessing. Effective initial planning lays the foundation for a systematic and well-executed project, ensuring successful outcomes.

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Estimating The Stock Initial Project Planning Report: Milestone 2: Data Collection and Preprocessing Phase

The Data Collection and Preprocessing Phase involves executing a plan to gather relevant loan application data 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 "Estimating the Stock keeping units using Machine Learning" is sourced from Kaggle. The download data set is not suitable for training the machine learning model as it might have so much randomness so we need to clean the dataset properly in order to fetch good results. This activity includes the following steps.

- Handling missing values
- Handling categorical data
- Handling Outliers

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Estimating The Stock Data Collection Report:

Activity 2: Data Quality Report

The dataset for " Estimating the Stock keeping units using Machine Learning " is sourced from Kaggle. It includes customer, stock details. Data quality is ensured through thorough verification, addressing missing values, and maintaining adherence to ethical guidelines, establishing a reliable foundation for predictive modeling.

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Estimating The Stock Data Quality Report:

Activity 3: Data Exploration and Preprocessing

Data Exploration and Preprocessing for estimating stock prediction involves thoroughly examining the collected historical SKUs data to understand its structure, quality, and key characteristics. This phase includes identifying and handling missing values, outliers, and inconsistencies to ensure data integrity. Key features such as order details, stock units, and external factors like sales and price are extracted and transformed as needed.

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Estimating The Stock Data Exploration and Preprocessing Report:

Milestone 3: Model Development Phase

The Model Development Phase involves selecting appropriate machine learning algorithms training them on the pre processed historical SKUs data. This phase includes evaluating and selecting models(Demand Forecasting, Linear Regression ,KNN ,Decision Tree, XGBoost, Ridge, SVM), hyperparameter tuning, cross-validation, and model evaluation to ensure high prediction accuracy. The development process also involves feature selection and engineering to enhance model performance. Once the model is trained, it is validated using a separate test dataset to confirm its predictive capabilities.

Activity 1: Model Selection Report

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

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Estimating The Stock Model Selection Report:

Activity 2: Initial Model Training Code, Model Validation and Evaluation Report

The initial model training in the estimating stock prediction project, we utilized historical SKUs data to train a gradient boosting regressor. The code included data preprocessing steps such as handling missing values and encoding categorical variables. We split the dataset into training and validation sets, using cross-validation to optimize hyperparameters and ensure robust performance.

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Estimating The Stock Model Development Phase Template:

Milestone 4: Model Optimization and Tuning Phase

During the model optimization and tuning phase for estimating stock prediction, the focus is on refining and enhancing the predictive performance of the models developed in earlier stages. This involves fine-tuning hyperparameters, such as learning rates and tree depths for gradient boosting models, and adjusting architecture and layers for neural networks. Techniques like grid search and randomized search are employed to explore various combinations of hyperparameters efficiently.

Activity 1: Hyperparameter Tuning Documentation

The Gradient Boosting 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.

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Estimating The Stock Model Development Phase Template:

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 Gradient Boosting 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 Gradient Boosting as the ultimate model. Its exceptional accuracy, ability to handle complexity, and successful hyperparameter tuning align with project objectives, ensuring optimal loan approval predictions.

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Estimating The Stock Model Optimization and Tuning Phase Report:

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.