**Low Level Design (LLD)**

**Money Laundering Prevention System**

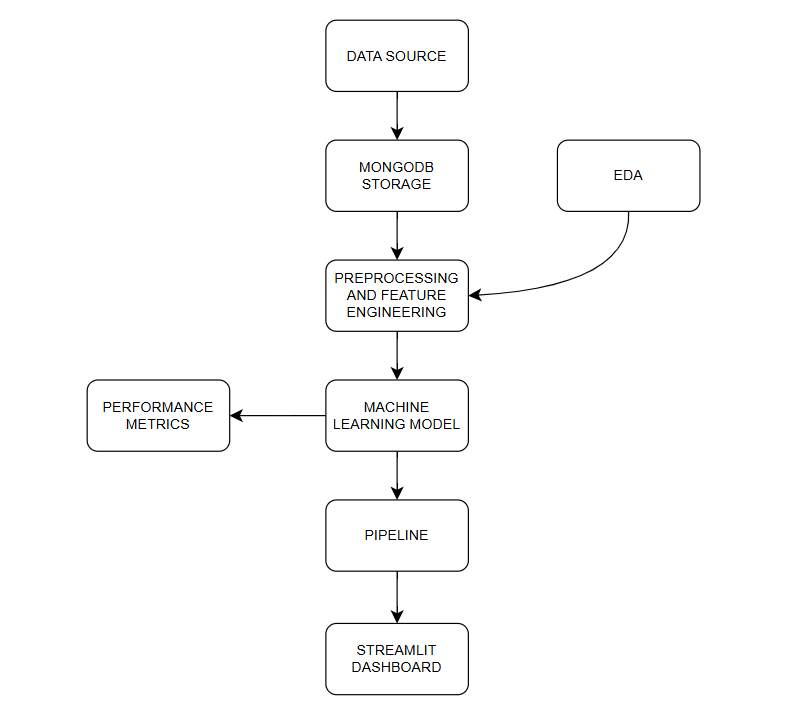
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**1. Problem Statement**

The objective of this project is to develop a machine learning model capable of predicting whether a user is involved in money laundering. The model will achieve this by continuously analyzing their money transfer activities and other financial behaviours.



**2. System Architecture**

The system architecture consists of the following key components:

* Data Ingestion Module
* Data Validation Module
* Data Transformation Module
* Model Training Module
* Model Evaluation Module
* Model Deployment Module

**3. Data Ingestion Module**

The dataset is taken from google. The module will:

* Upload the data into a database using Python.
* Implement a function to collect/import data from the database and convert it into a DataFrame for further processing.
* Split the preprocessed data into training and testing sets and export them separately for further processing.

**4. Data Validation Module**

This module ensures data quality by:

* Validating the integrity and accuracy of the ingested data.
* Handling missing and erroneous values.
* Ensuring data consistency and adherence to predefined standards.

**5. Data Transformation Module**

The Data Transformation Module performs the following tasks:

* Feature engineering to create meaningful features from raw data.
* Data normalization to scale numerical features appropriately.
* Encoding categorical variables to make them suitable for machine learning models.
* Handling class imbalance using the SMOTE (Synthetic Minority Over-sampling Technique) method.

**6. Model Training Module**

This module is responsible for training the predictive model:

* Various machine learning algorithms such as Random Forest, Gradient Boosting, and Support Vector Machines (SVM) will be explored.
* Hyperparameter tuning will be conducted using GridSearchCV to achieve optimal performance.

**7. Model Evaluation Module**

The model's performance will be assessed using the following evaluation metrics:

* Accuracy Score
* F1 Score
* Precision Score
* Confusion Matrix

**8. Model Deployment Module**

This module focuses on deploying the trained model into a production environment:

* The model will be deployed via an API endpoint for real-time predictions.
* Users can submit new transaction data and receive instant predictions on potential money laundering activities.

**9. User Interface**

The project will feature a user interface where users can input transaction details. The model will analyze the input data and return predictions regarding potential money laundering risks.

**10. Model Monitoring and Maintenance**

To ensure continuous effectiveness, the deployed model will be:

* Regularly monitored for performance degradation.
* Retrained and updated as needed to maintain high accuracy and reliability.

**11. Documentation**

* The entire project, including source code, data, and model documentation, will be hosted on GitHub.

**12. Conclusion**

This document outlines the system architecture, key modules, and workflow for the money laundering prediction model. It serves as a foundational guide for the development, implementation, and maintenance of the project, ensuring a well-structured and systematic approach.