

AI Assignment - Part 1: Short Answer Questions (30 Points)

1. Problem Definition (6 points)

Hypothetical AI Problem:

Detecting fraudulent transactions in mobile money platforms.

Objectives:

1. Identify suspicious transaction patterns in real time.
2. Minimize financial loss caused by fraud.
3. Improve user trust and platform security.

Stakeholders:

1. Mobile money service providers (e.g., M-PESA, Airtel Money).
2. End users/customers.

Key Performance Indicator (KPI):

Fraud Detection Precision - the percentage of correctly identified fraud cases out of all flagged transactions.

2. Data Collection & Preprocessing (8 points)

Two Data Sources:

1. Mobile money transaction logs (amount, location, time, device ID).
2. User profiles (transaction history, account type, KYC details).

Potential Bias:

Behavioral bias - users in rural areas or with irregular usage patterns may be falsely flagged due to less common transaction behaviors.

Three Preprocessing Steps:

1. Handling missing values in user profile data.
2. Normalizing transaction amounts to standardize scale.
3. Encoding categorical variables like transaction type and device ID using one-hot encoding.

3. Model Development (8 points)

Chosen Model:

Random Forest - It is robust to noise, handles high-dimensional data well, and provides interpretable feature importance.

Data Splitting:

Split the dataset into 70% training, 15% validation, and 15% test sets.

Two Hyperparameters to Tune:

1. `n_estimators`: Number of trees in the forest - affects performance and overfitting.
2. `max_depth`: Controls tree complexity to balance bias and variance.

4. Evaluation & Deployment (8 points)

Two Evaluation Metrics:

1. Precision - Important to reduce false positives, so genuine users aren't blocked unnecessarily.
2. Recall - Ensures the system catches as many actual fraudulent cases as possible.

What is Concept Drift?

Concept drift refers to changes in transaction patterns over time, which can reduce the model's accuracy if not addressed.

Monitoring Concept Drift:

Monitor performance metrics over time and implement periodic retraining with recent data.

Deployment Challenge:

Latency and scalability - ensuring the model processes large volumes of transactions in real-time without slowing down the system.