Money Laundering Prevention

Introduction

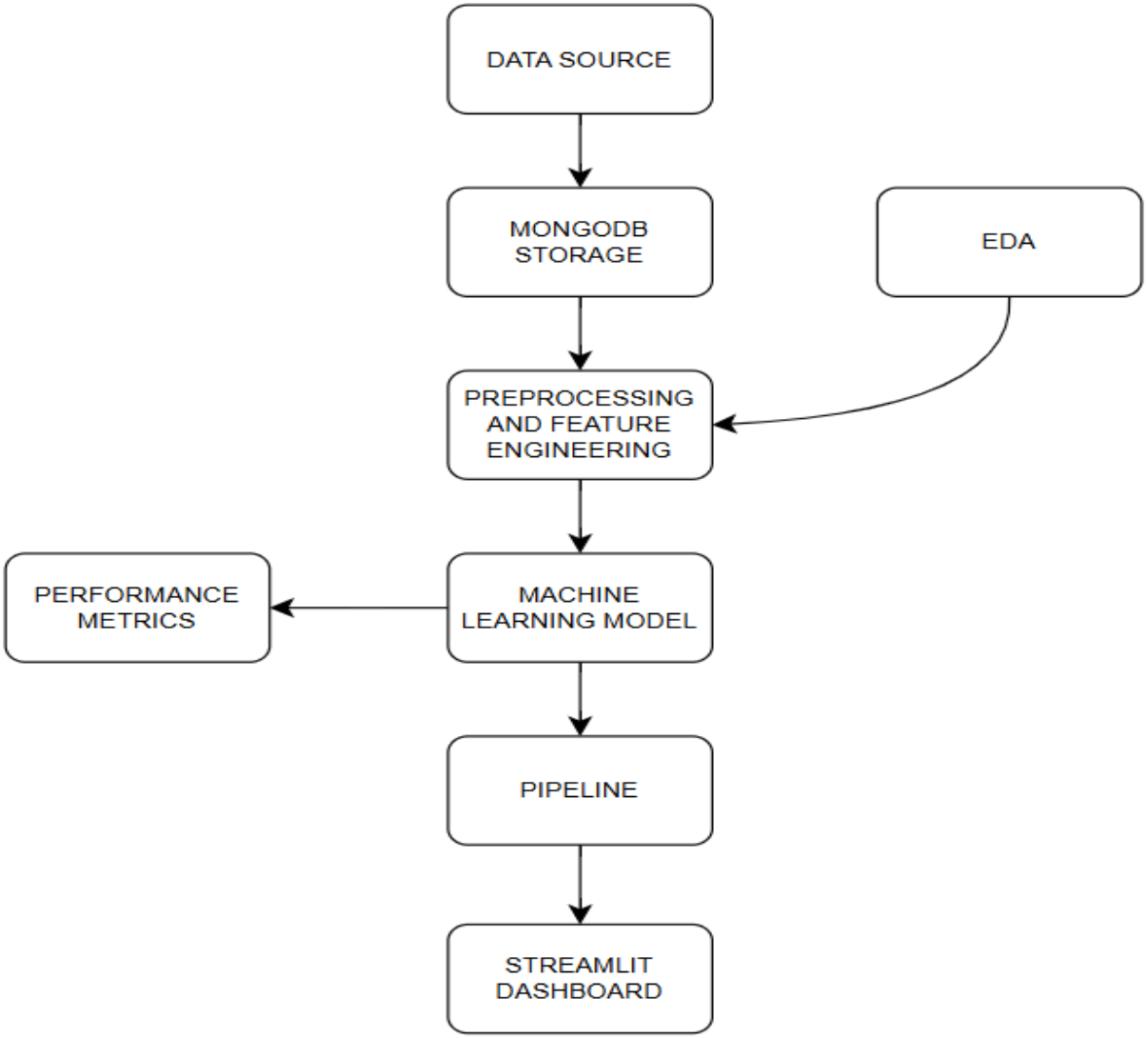
- Money laundering disguises illegal funds as legitimate income.

- A global financial crime impacting economic stability.

- Traditional methods struggle with evolving laundering tactics.

- Machine learning provides automated fraud detection capabilities.

- In this project, we built a machine learning-based system to detect suspicious financial transactions and prevent money laundering.


DATA SOURCE
MONGODB STORAGE
EDA
PREPROCESSING AND FEATURE ENGINEERING
PERFORMANCE METRICS
MACHINE LEARNING MODEL
PIPELINE
STREAMLIT DASHBOARD

Challenges in Detecting Money Laundering

- Large volumes of financial transactions make manual detection impractical.

- Money laundering strategies constantly evolve, making detection difficult.

- Highly imbalanced data – very few fraudulent cases compared to legitimate transactions.

- Need for real-time monitoring and quick response to prevent illicit activities.

- High false positive rates in traditional rule-based methods lead to inefficiencies.

- Our system addresses these challenges by leveraging machine learning for automated detection.

Role of Machine Learning in AML

- Identifies suspicious transaction patterns using historical data.
- Learns from past fraud cases to detect emerging money laundering techniques.
- Reduces false positives by understanding transaction behaviors.
- Enables real-time monitoring and automated alerts for suspicious activities.
- Helps banks and financial institutions comply with Anti-Money Laundering (AML) regulations.
- Our approach integrates multiple algorithms to enhance detection accuracy.

Data Collection and Preprocessing

- Collected financial transaction data, including attributes like transaction amount, source id, destination id, type of action and fraud level.

- Handled missing values and inconsistencies in the dataset.

- Applied feature engineering to extract key insights such as transaction velocity and account behavior.

- Used data balancing techniques to address the class imbalance problem.

- Normalized numerical data to improve model performance.

- Split the data into training and testing sets for model evaluation.

Algorithms Used for Fraud Detection

- Decision Trees: Simple, interpretable classification model.

- Random Forest: Ensemble method that improves accuracy by combining multiple decision trees.

- Support Vector Machine (SVM): Effective for high-dimensional data and fraud classification.

Naïve Bayes: Probabilistic classifier based on Bayes' theorem, useful for text-based fraud analysis.

K-Nearest Neighbors (KNN): Non-parametric algorithm that classifies transactions based on similarity to past cases.

- We experimented with different models and tuned hyperparameters for optimal performance.

Model Training and Evaluation

- Trained models on preprocessed transaction data.
- Used cross-validation to avoid overfitting.
- Evaluated models using key performance metrics:
- Accuracy: Measures overall correctness.
- Precision: Percentage of flagged fraud cases that are actual fraud.
- Recall: Percentage of actual fraud cases detected by the model.
- F1 Score: Balance between precision and recall.

Implementation Using Streamlit

- Streamlit is an open-source Python framework for web-based data visualization.

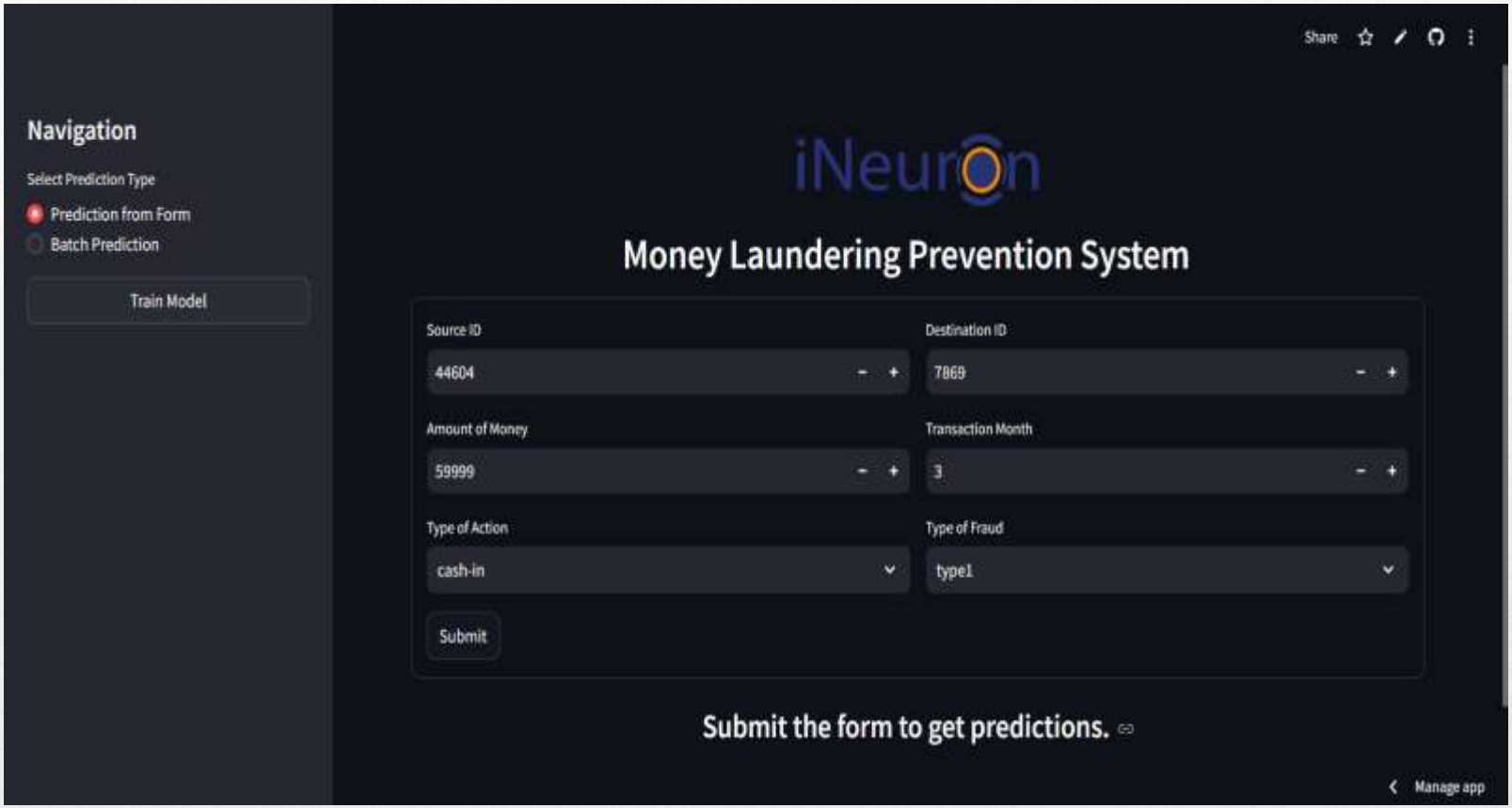
- Built an interactive web application for fraud detection.

- Users can upload transaction datasets and analyze fraud predictions.

- The dashboard provides real-time insights, charts, and tables for AML monitoring.

- Includes options to filter transactions based on risk levels and visualize fraud trends.

- Enables financial analysts to make data-driven decisions efficiently.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Navigation
Select Prediction Type
Prediction from Form
Batch Prediction
Train Model
iNeuron
Money Laundering Prevention System
Source ID
44604
Destination ID
7869
Amount of Money
59999
Transaction Month
3
Type of Action
cash-in
Type of Fraud
type1
Submit
Submit the form to get predictions.
Manage app

Conclusion

- Money laundering is a major financial crime requiring advanced detection methods.

- Machine learning significantly improves fraud detection accuracy and efficiency.

- We utilized algorithms like Random Forest, Decision Tree, Naïve Bayes, Support Vector Machine and K-Nearest Neighbor to detect fraudulent transactions.

- Performance metrics ensured that our model was both accurate and reliable.

- Streamlit simplified visualization and deployment of AML models.

- Our system provides a scalable and effective solution for financial institutions to combat money laundering.