



# Detecting Credit Card Fraud with Machine Learning

PRESENTATION BY GROUP 3  
DSF-PT09



## OVERVIEW

- With the rise of **digital payments** and online transactions, detecting **fraudulent activities** in real-time has become a major priority.
- This project aimed to **analyse** credit card transaction data to **detect potential fraud using data analytics and machine learning techniques**.

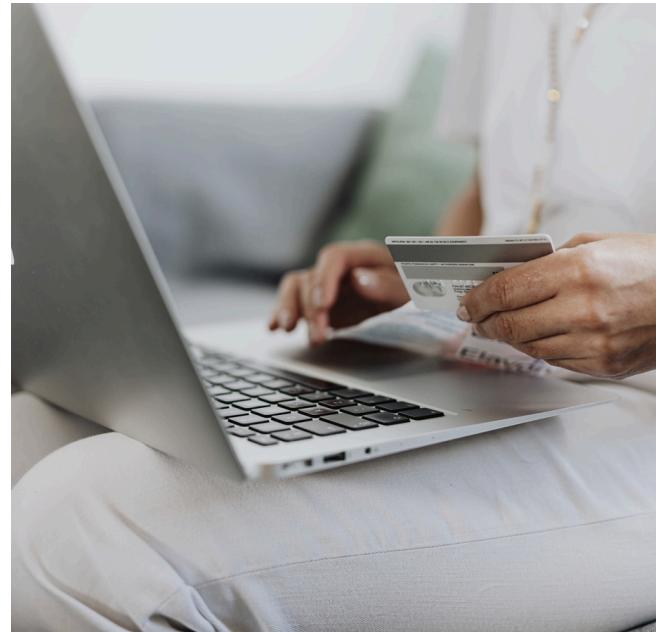


# BUSINESS PROBLEM

- Financial institutions face **high risks** from fraudulent transactions, which can lead to substantial **financial losses** and damaged customer trust.
- **Traditional fraud detection methods**, such as rule-based systems, are often not sufficient to catch increasingly sophisticated fraudulent behaviour. Therefore, businesses require **intelligent systems** that can automatically and accurately detect anomalies in transaction data.

# OBJECTIVES

- **Analyse** credit card transaction data for fraud detection.
- **Develop** and compare multiple machine learning models for fraud classification.
- **Evaluate** model performance by improving accuracy and reduce false positives.
- **Deploy** the model for real-time use.





# METRICS OF SUCCESS

- **Recall** (Fraud Class)  $\geq 90\%$  : Correctly identify most fraudulent transactions.
- **Precision** (Fraud Class)  $\geq 70\%$  : Limit false alarms to reduce customer disruption.
- **AUC-ROC Score**  $\geq 90\%$  : Strong ability to distinguish fraud vs non-fraud.

# METHODOLOGY

## Data Collection:

- Dataset was gotten from Kaggle.

## Data Preprocessing:

- Perfromed data cleaning, feature engineering and selection, scaling and dimensionliaty reduction.

## Modeling:

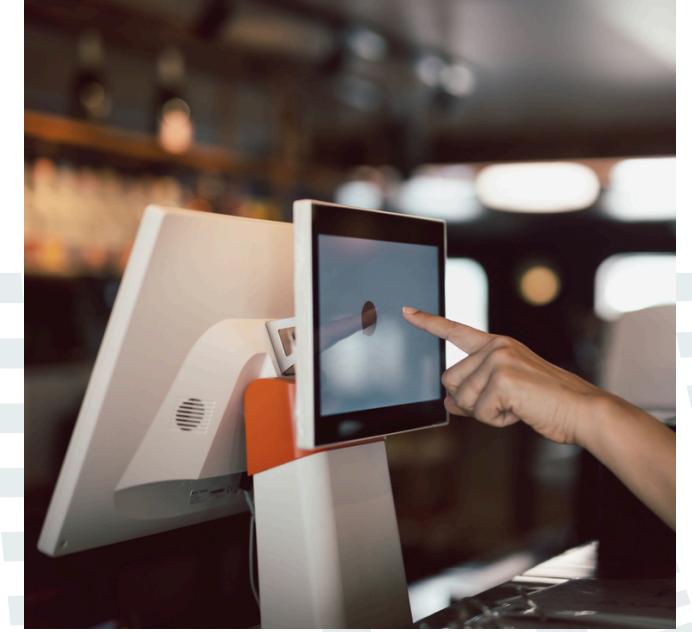
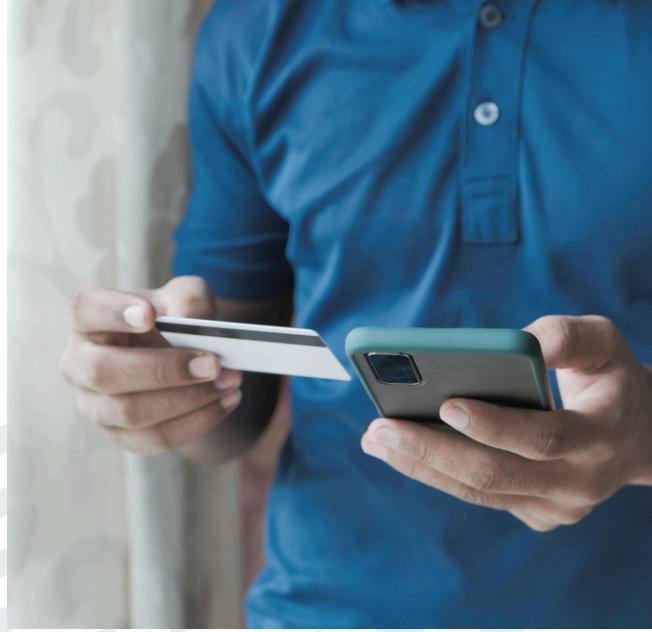
- Trained traditional and advanced models.

## Evaluation:

- Recall, Precision and AUC-ROC assessed model performance.

## Deployment:

- Model was deployed on a web application using streamlit.





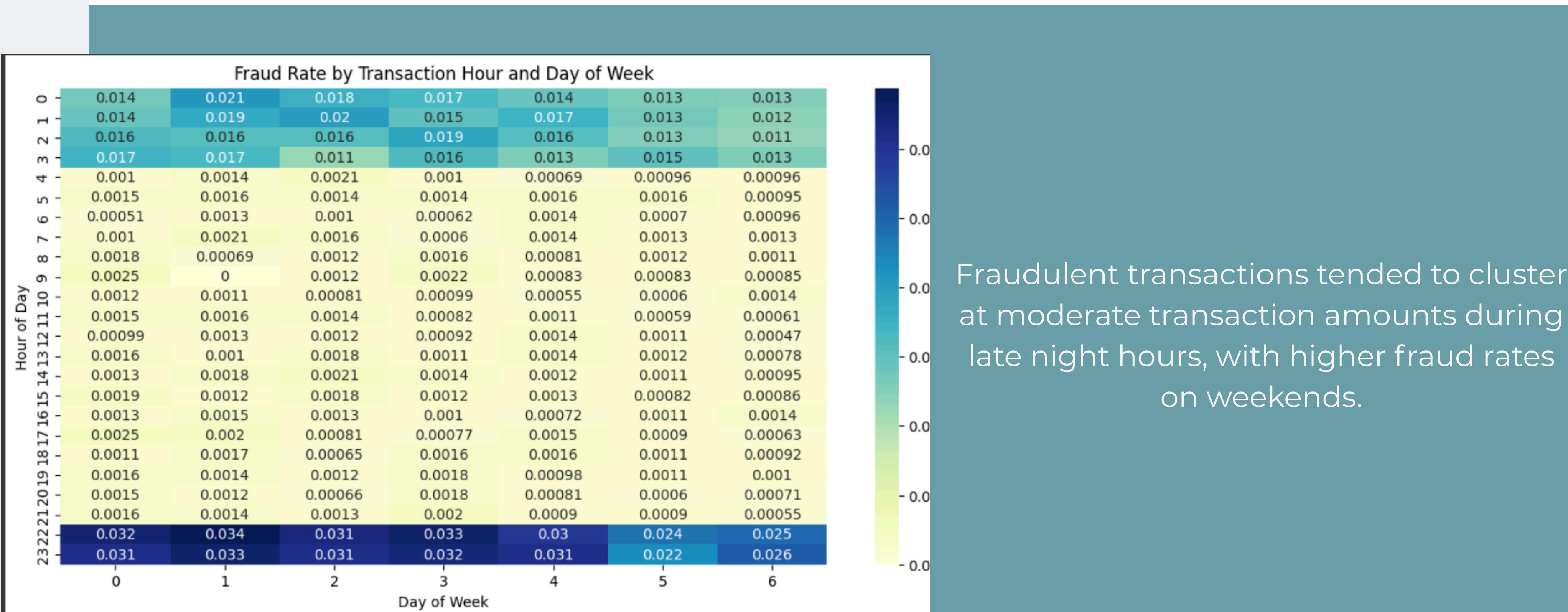
# MODELING APPROACH

## Models evaluated :

- **Baseline** : Logistic Regression
- **Traditional**: Decision Tree, Random Forest
- **Advanced**: Neural Network, XGBoost Classifier

Class imbalance was addressed using **SMOTE** and **cost-sensitive learning via** class weights.

# FRAUD RATE BY TRANSACTION HOUR AND DAY OF WEEK





# MODEL PERFORMANCE SUMMARY

Model	Precision (Fraud)	Recall (Fraud)	AUC-ROC
Logistic Regression	0.04	0.75	0.8691
Decision Tree	0.54	0.54	0.7701
Random Forest	0.67	0.48	0.9232
Neural Network	0.48	0.60	0.8844
XGBoost Classifier	0.63	0.68	0.9306



## PERFORMANCE ANALYSIS AND BEST MODEL

- The **XGBoost Classifier** slightly outperformed the **Random Forest Classifier** with a marginally higher AUC-ROC score (**0.9306 vs 0.9304**) and a higher recall (**0.68 vs 0.65**).
- Given that minimising missed fraudulent transactions (false negatives) is paramount in fraud detection, the **XGBoost Classifier** is the preferred model for this project.



# CONCLUSION

- The project achieved its **core objective** of building and evaluating machine learning models for fraud detection and showcased promising initial results with high AUC-ROC scores.
- **Further work** is required to enhance the models' ability to detect a higher percentage of fraud(recall) while maintaining a low false positive rate (precision) to meet the defined business and technical success criteria.



# RECOMMENDATIONS

- **Handling Data Imbalance**

Use advanced resampling such as ADASYN, Borderline-SMOTE, NearMiss

- **Threshold Tuning**

Optimise thresholds using ROC and precision-recall analysis.

- **Deep Learning Exploration**

Test neural network architectures (MLPs, RNNs for sequential data, autoencoders for anomaly detection) to learn complex fraud patterns,

- **Real-time Implementation Considerations**

Consider streaming data frameworks if real-time fraud detection is a business priority.

# DEPLOYMENT

Navigation  
Choose a page  
Fraud Detection

Credit Card Fraud Detection System

Model loaded successfully! Using 11 features: amt, lat, long, city\_pop, merch\_lat, merch\_long, gender, hour, day\_of\_week, amt\_outlier, log\_amt

### Real-Time Fraud Detection

Transaction Details

Transaction Amount (\$)  
75000.50

Transaction Date  
2025/06/04

Transaction Time  
22:42

Location Details

Cardholder Latitude  
40.7128

Merchant Latitude  
40.7589

Cardholder Longitude  
-74.0060

Merchant Longitude  
-73.9851

City Population  
50000

Additional Information

Gender  
F

Check for Fraud

Prediction Results

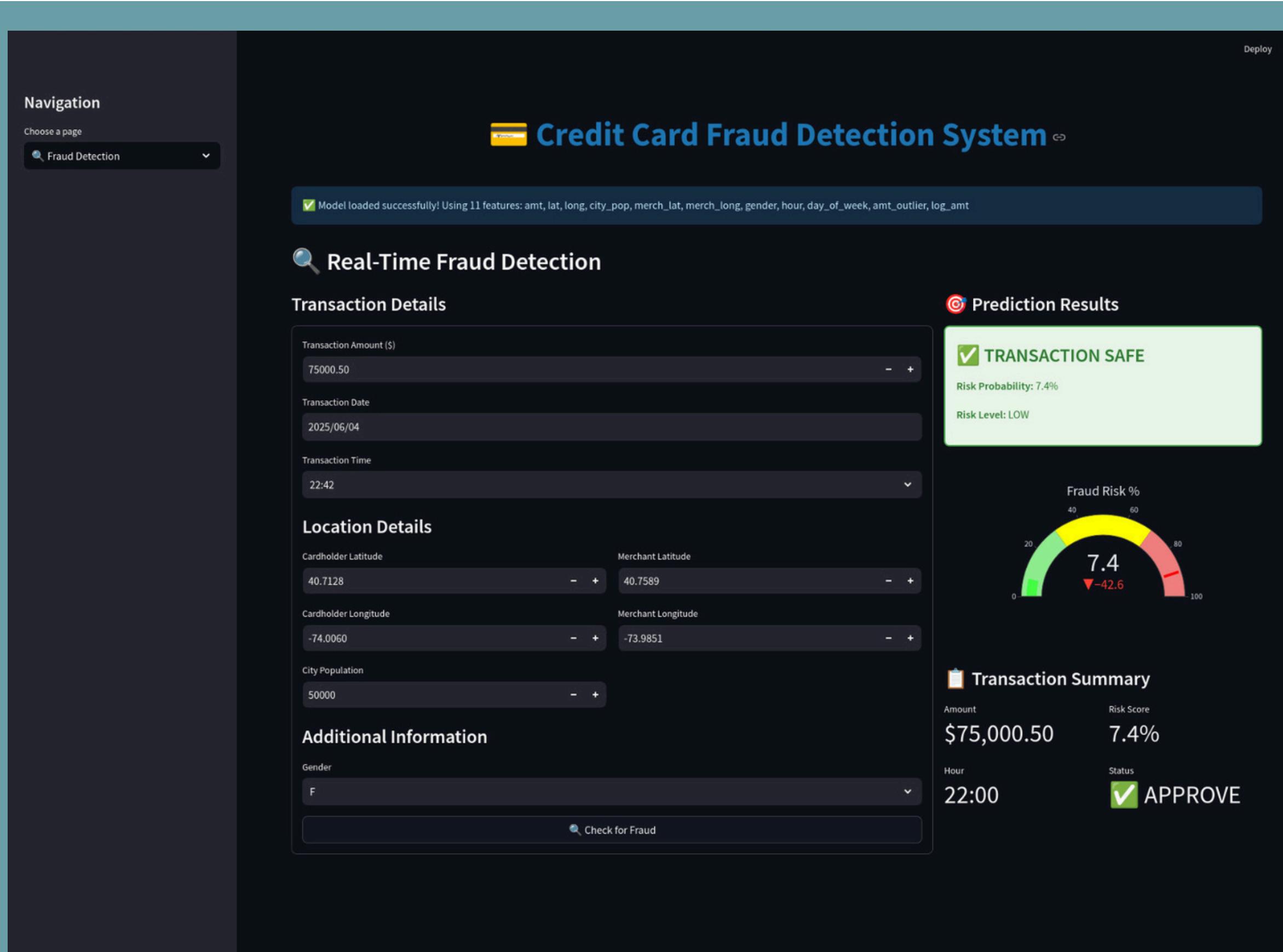
TRANSACTION SAFE  
Risk Probability: 7.4%  
Risk Level: LOW

Fraud Risk %  
7.4  
▼ -42.6

Transaction Summary

Amount	Risk Score
\$75,000.50	7.4%
Hour	Status
22:00	APPROVE

Deploy



A photograph showing a person's hands interacting with a smartphone and a credit card. The person is wearing a light-colored shirt. In the foreground, there is a desk with a calculator, some papers, and a pen. The lighting is warm and focused on the hands and the devices.

Thank you!