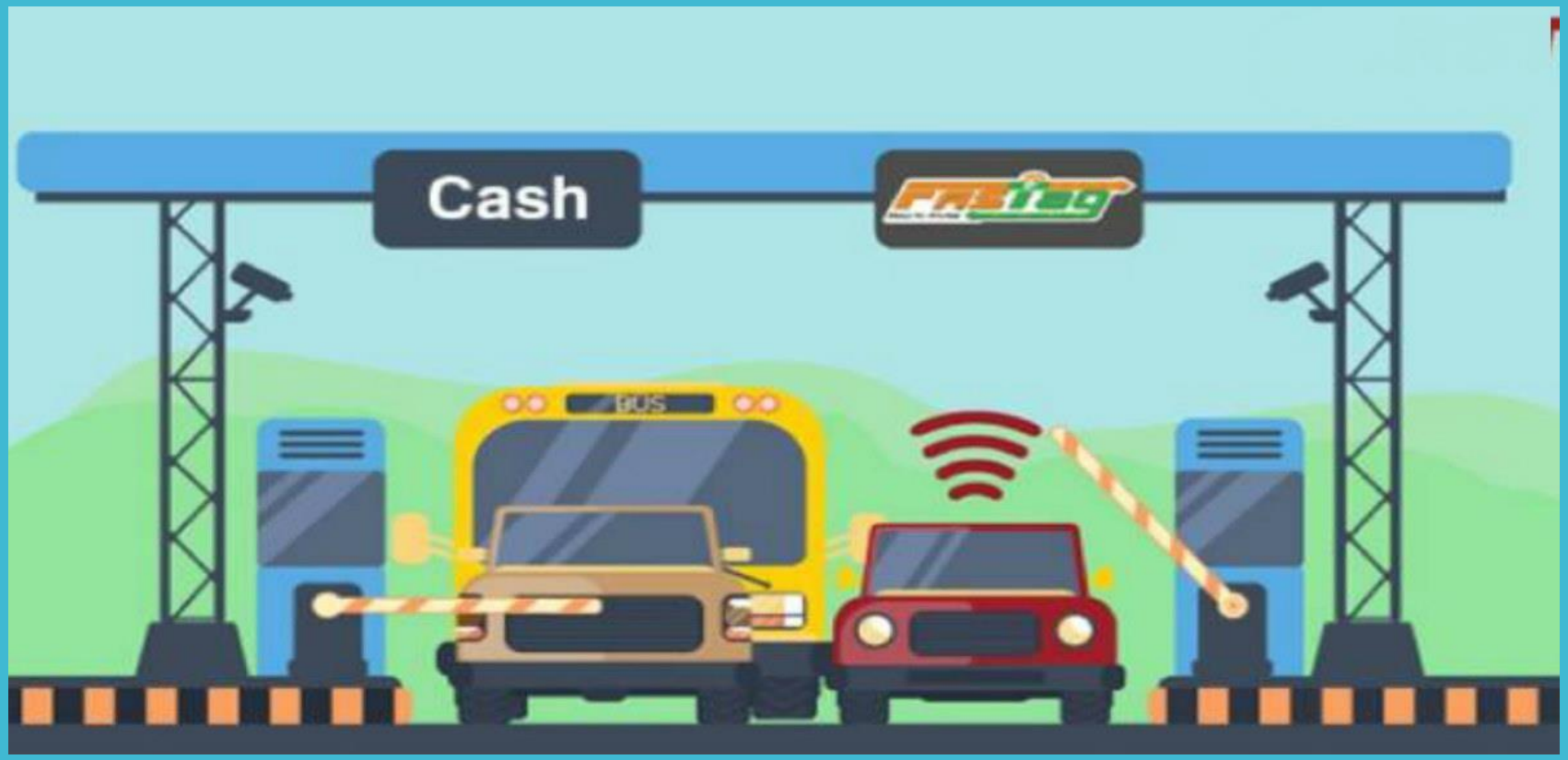
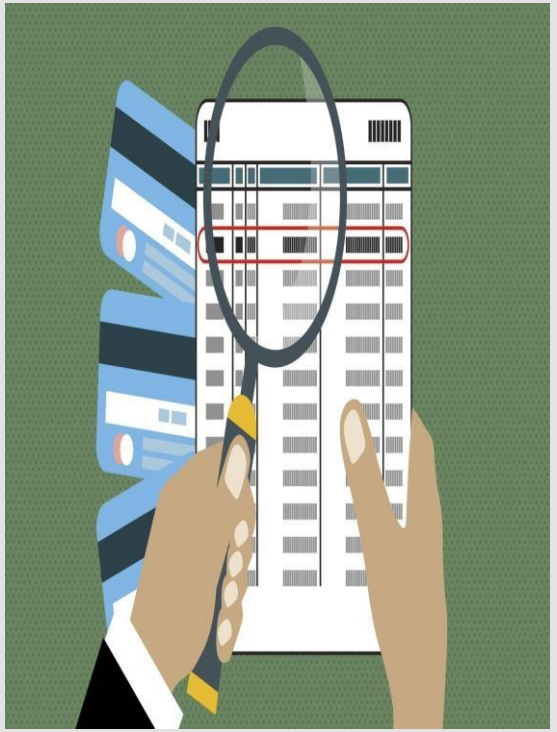
Decoding-Fastag -Fraud





A Detection Approach By Naveen!

NETC | FASTag

CONTENTS:

FRAUD DETECTION

INTRODUCTION:

1.Fastag fraud refers to fraudulent activities specifically targeted at the Fastag system, which is an electronic toll collection system used for making toll payments on highways in India.

2.This technique helps the government to get proper toll without any loss and makes effective FASTag system

3.The main goal is to develop a machine learning-based fraud detection system for Fastag transactions. By analyzing transaction details, vehicle information, location, and amounts, the system aims to accurately identify fraudulent activities, ensuring the security and integrity of Fastag transactions.

WHAT IS FASTAG?

1.FASTag is a device that employs Radio Frequency Identification (RFID) technology for making toll payments directly while the vehicle is in motion.

2.FASTag (RFID Tag) is affixed on the windscreen of the vehicle and enables a customer to make the toll payments directly from the account which is linked to FASTag.

3.FASTag offers the convenience of cashless payment along with benefits like - savings on fuel and time as the customer does not has to stop at the toll plaza. But this facility is misused by few drivers by sticking lightweight vehicles stickers which has less toll fee.

FEATURES:

Importance: The system ensures toll collection accuracy, minimizes losses, and enhances transparency in Fastag transactions.

Challenges: Overcoming data imbalances, ensuring model accuracy, and adapting to evolving fraud tactics.

Approach: Utilizing machine learning to analyze transaction data, detect patterns, and identify potential fraud, thus safeguarding Fastag transactions.

DATASET DESCRPITION:

1. Transaction ID: Unique identifier for each transaction.
2. Timestamp: Date and time of the transaction.
3. Vehicle Type: Type of vehicle involved in the transaction.
4. FastagID: Unique identifier for Fastag.
5. TollBoothID: Identifier for the toll booth.
6. Lane_Type: Type of lane used for the transaction.
7. Vehicle_Dimensions: Dimensions of the vehicle.
8. Transaction_Amount: Amount associated with the transaction.
9. Amount_paid: Amount paid for the transaction.
10. Geographical_Location: Location details of the transaction.
11. Vehicle_Speed: Speed of the vehicle during the transaction.
12. Vehicle_Plate_Number: License plate number of the vehicle.
13. Fraud_indicator: Binary indicator of fraudulent activity (target variable).

DATA CLEANING & PREPROCESSING:

Present the key features of the dataset used for Fastag fraud detection, and provide a brief description of each feature and mention the target variable (Fraud_indicator), which indicates whether a transaction is fraudulent or not.

In [2]:
```
df = pd.read_csv('FastagFraudDetection.csv')
df.head(3)
```

Out[2]:

	Transaction_ID	Timestamp	Vehicle_Type	FastagID	TollBoothID	Lane_Type	Vehicle_Dimensions	Transaction_Amount	Amount_paid	Geographical_Loca
0	1	1/6/2023 11:20	Bus	FTG-001-ABC-121	A-101	Express	Large	350	120	13.059816123454 77.77068662374
1	2	1/7/2023 14:55	Car	FTG-002-XYZ-451	B-102	Regular	Small	120	100	13.059816123454 77.77068662374
2	3	1/8/2023 18:25	Motorcycle	NaN	D-104	Regular	Small	0	0	13.059816123454 77.77068662374

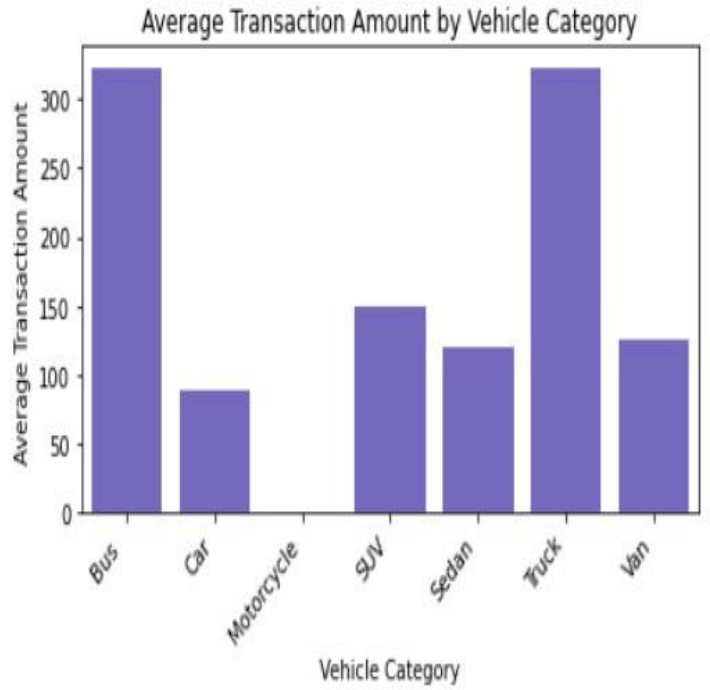
In [3]:
```
df.isnull().sum()
```

Out[3]:

```
Transaction_ID           0
Timestamp                0
Vehicle_Type             0
FastagID               549
TollBoothID              0
Lane_Type                0
Vehicle_Dimensions       0
Transaction_Amount       0
Amount_paid              0
Geographical_Location    0
Vehicle_Speed            0
Vehicle_Plate_Number     0
Fraud_indicator          0
dtype: int64
```

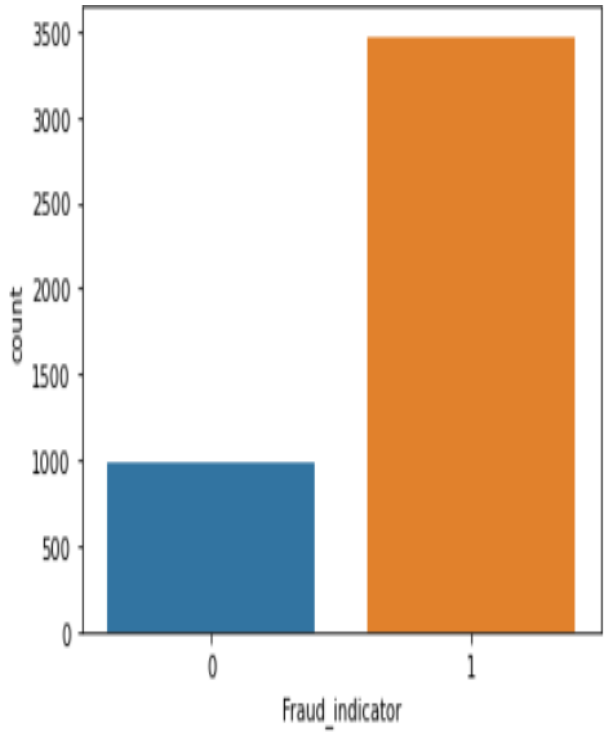
DATA EXPLORATION:

Average transaction amount by vehicle category

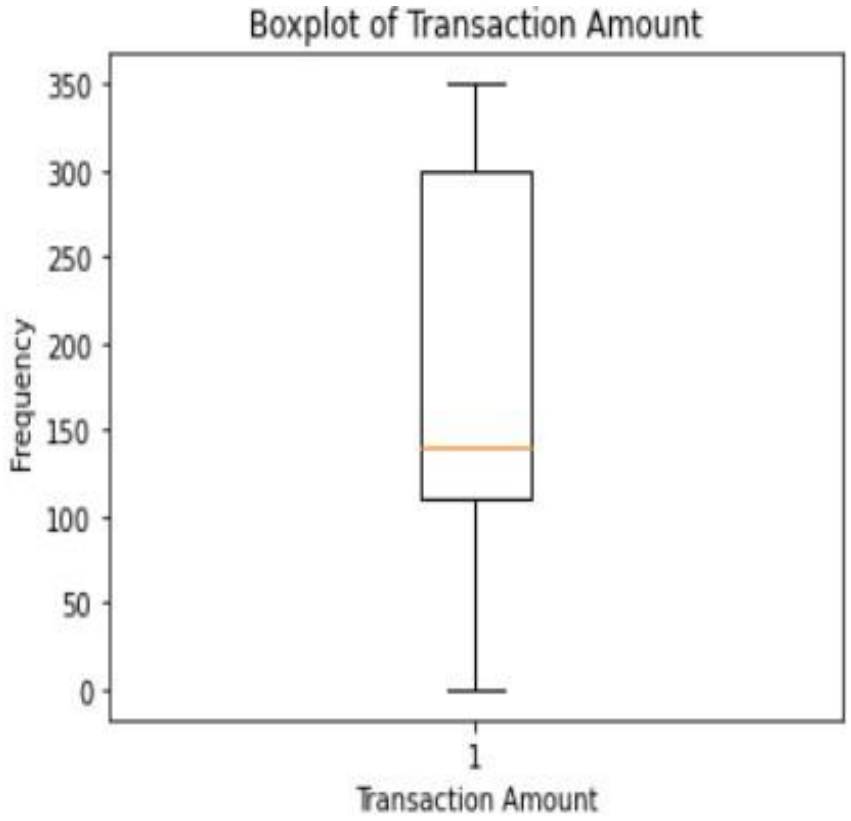


Buses and trucks are often used for commercial purposes, such as transporting goods or passengers, while cars and motorcycles are typically used for personal transportation. The higher transaction amounts for buses and trucks could indicate increased toll charges for commercial vehicles compared to personal vehicles.

Visualize the distribution of the target variable (Fraud_indicator) through histograms or pie charts. Showcase visualizations of key features to gain insights into their distributions and relationships with fraudulent transactions

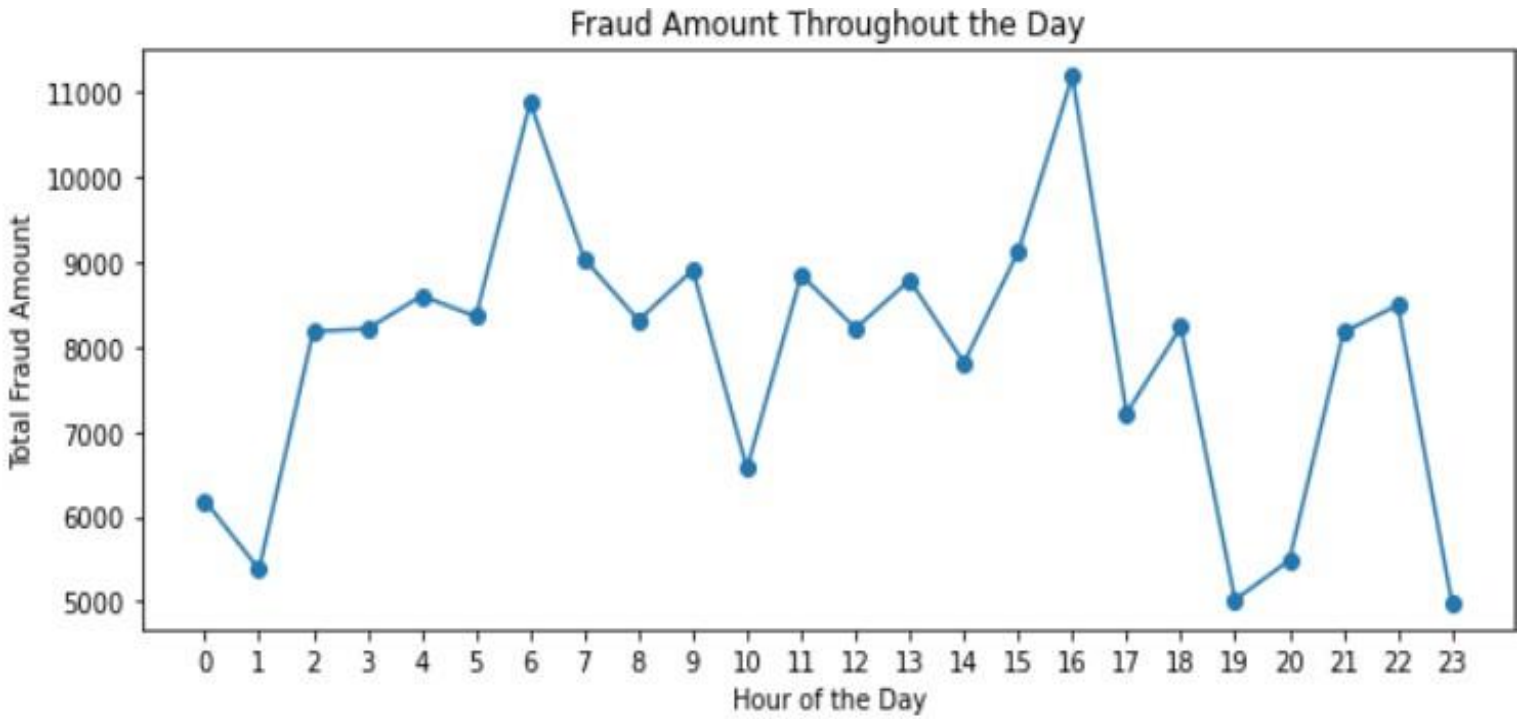


There is no Outlier in transaction amount



There is no outliers

Fraud Amount throughout the day

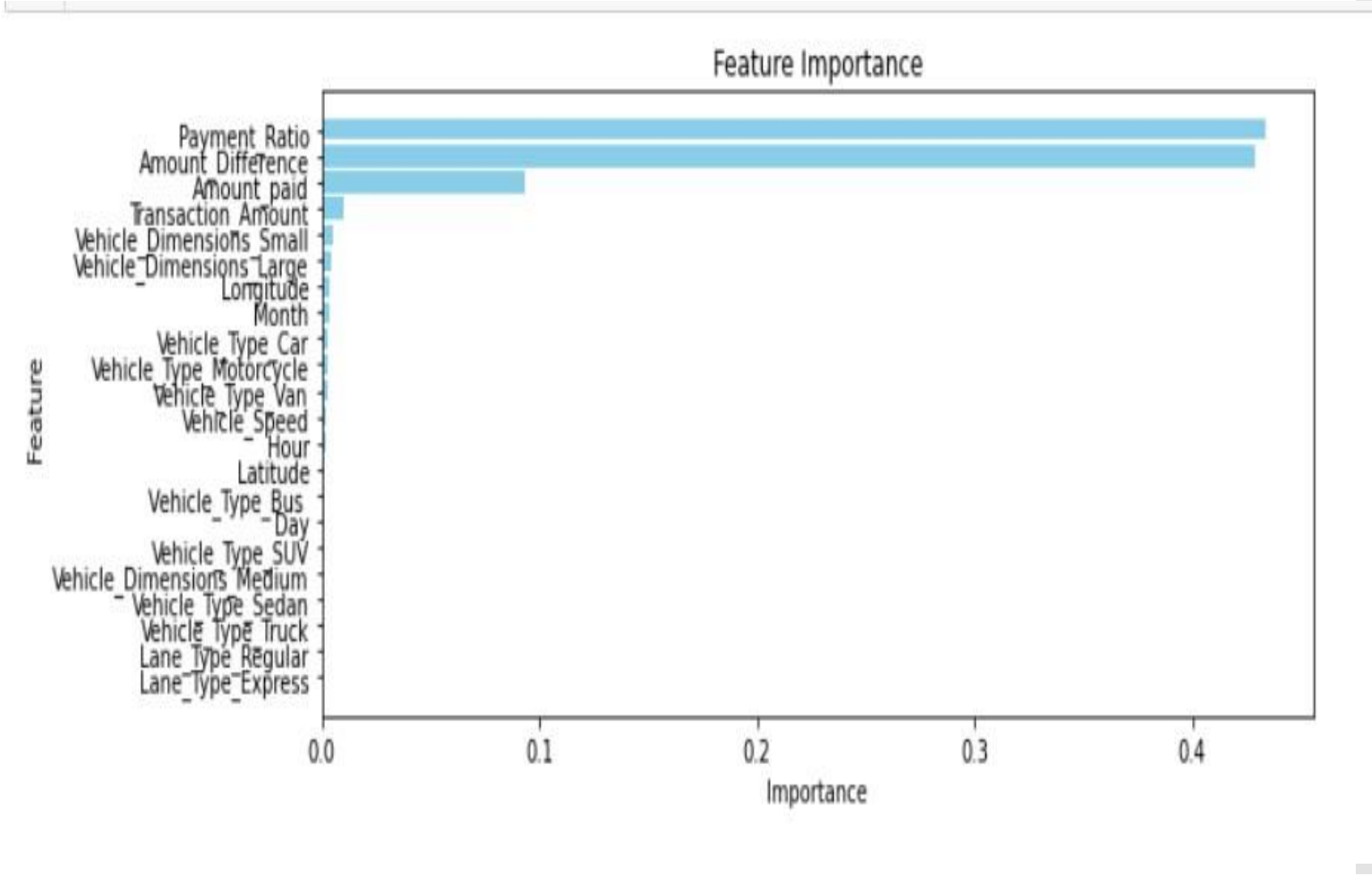


Fraudulent activity peaks around 6 AM, possibly due to the start of the day or commuting hours.

Another peak is observed around 4 PM, likely linked to the end of the workday or rush hour traffic.

FEATURE EXTRACTION:

Extracted transaction behavior features was the most informative features to the model.



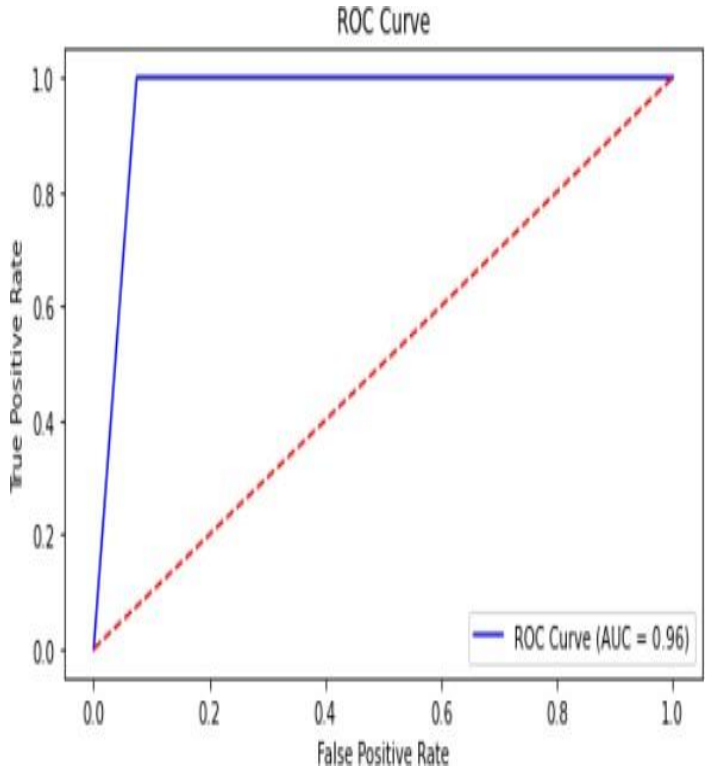
1. 92.57% : Correctly identified non-fraudulent transactions.

2.7.43% : Incorrectly classified non-fraudulent transactions as fraudulent.

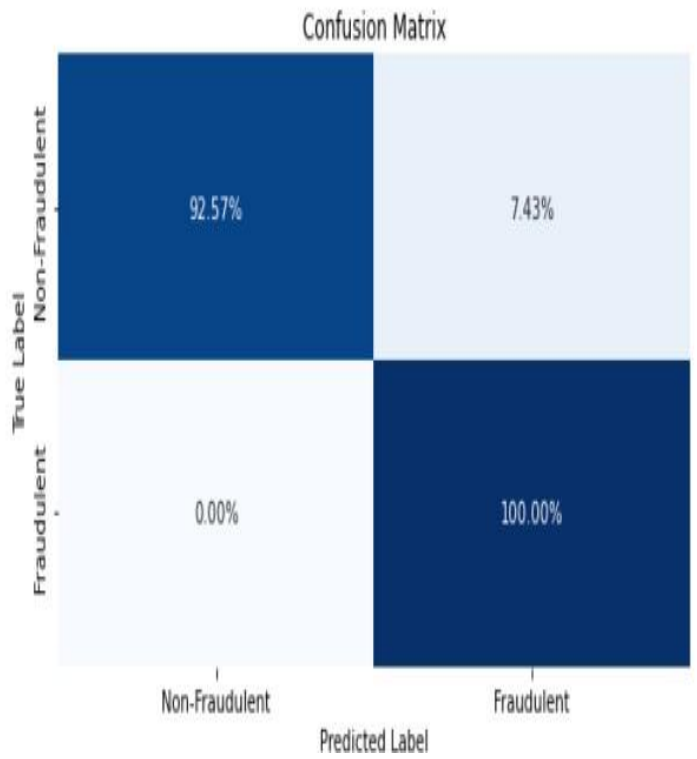
3.0.0% : No instances of falsely identifying fraudulent transactions as non-fraudulent.

4.100% : Successfully identified fraudulent transactions.

ROC Curve



Confusion Matrix



MODEL DEVEPLOMENT:

```
In [65]:
1 import joblib
2 joblib.dump(rf_classifier,'Fastag_Fraud_Detection_Model')

Out[65]: ['Fastag_Fraud_Detection_Model']

In [66]:
1 model=joblib.load('Fastag_Fraud_Detection_Model')

In [67]:
1 X.columns

Out[67]: Index(['Transaction_Amount', 'Amount_paid', 'Vehicle_Speed', 'Hour', 'Day',
       'Month', 'Amount_Difference', 'Payment_Ratio', 'Vehicle_Type_Bus ',
       'Vehicle_Type_Car', 'Vehicle_Type_Motorcycle', 'Vehicle_Type_SUV',
       'Vehicle_Type_Sedan', 'Vehicle_Type_Truck', 'Vehicle_Type_Van',
       'Lane_Type_Express', 'Lane_Type_Regular', 'Vehicle_Dimensions_Large',
       'Vehicle_Dimensions_Medium', 'Vehicle_Dimensions_Small', 'Latitude',
       'Longitude'],
      dtype='object')

In [69]:
1 model.predict([[500,245,42,12,5,3,255,0.49,0,1,1,0,0,0,1,1,0,1,0,1,13.059816,77.770687]])

Out[69]: array([0])

In [70]:
1 #Not Fraud = 1
2 #Fraud = 0
```

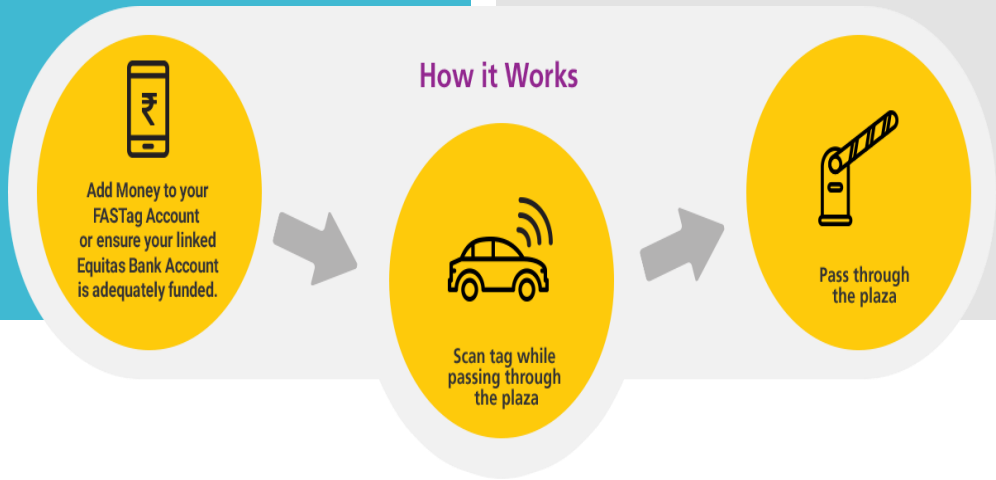
Describe the machine learning model used for Fastag fraud detection and explain its suitability for the task.

BENEFITS OF USING FASTAG:

1. Easy of Payments
2. Online Recharge
3. Non Stop Movement
4. Save Fuel and Time
5. SMS Alerts for Transactions
6. Emergency road side assistance
7. Accidental death cover RS. 100,000

APPLICATIONS:

The machine learning-based fraud detection system enhances toll collection efficiency and reduces losses by accurately identifying fraudulent Fastag transactions. It improves transparency and streamlines transaction processing. Additionally, the technology can adapt to future changes in Fastag applications, such as detecting new vehicle types and processing different types of codes through image processing techniques.



THANK YOU!!!