

Report

JPMorgan Cybersecurity Fraud Detection Report

1. Dataset Overview

The dataset consists of 200,000 transaction entries with the following 11 columns:

- **step**: The time step of the transaction.
- **type**: The type of transaction (e.g., CASH_IN, CASH_OUT, etc.).
- **amount**: The amount of money involved in the transaction.
- **nameOrig**: The origin account name.
- **oldbalanceOrig**: The starting balance of the origin account.
- **newbalanceOrig**: The balance of the origin account after the transaction.
- **nameDest**: The destination account name.
- **oldbalanceDest**: The starting balance of the destination account.
- **newbalanceDest**: The balance of the destination account after the transaction.
- **isFraud**: Indicates whether the transaction is fraudulent (1) or not (0).
- **isFlaggedFraud**: Indicates if the transaction is flagged as potential fraud (1) or not (0).

step	type	amount	nameOrig	oldbalanceOrig	newbalanceOrig	nameDest	oldbalanceDest	newbalanceDest	isFraud	isFlaggedFraud
2	1 PAYMENT	9839.64	C1231006	170136	160296.4	M1979787	0	0	0	0
3	1 PAYMENT	1864.28	C1666544	21249	19384.72	M2044282	0	0	0	0
4	1 TRANSFER	181	C1305486	181	0	C5532640	0	0	1	0
5	1 CASH_OUT	181	C8400836	181	0	C3899701	21182	0	1	0
6	1 PAYMENT	11668.14	C2048537	41554	29885.86	M1230701	0	0	0	0
7	1 PAYMENT	7817.71	C9004563	53860	46042.29	M5734872	0	0	0	0
8	1 PAYMENT	7107.77	C1549888	183195	176087.2	M4080691	0	0	0	0
9	1 PAYMENT	7861.64	C1912850	176087.2	168225.6	M6333263	0	0	0	0
10	1 PAYMENT	4024.36	C1265012	2671	0	M1176932	0	0	0	0
11	1 DEBIT	5337.77	C7124101	41720	36382.23	C1956008	41898	40348.79	0	0
12	1 DEBIT	9644.94	C1900366	4465	0	C9976083	10845	157982.1	0	0
13	1 PAYMENT	3099.97	C2491775	20771	17671.03	M2096539	0	0	0	0
14	1 PAYMENT	2560.74	C1648232	5070	2509.26	M9728652	0	0	0	0
15	1 PAYMENT	11633.76	C1716932	10127	0	M8015691	0	0	0	0
16	1 PAYMENT	4098.78	C1026483	503264	499165.2	M1635378	0	0	0	0
17	1 CASH_OUT	229133.9	C9050804	15325	0	C4764022	5083	51513.44	0	0
18	1 PAYMENT	1563.82	C7617507	450	0	M1731217	0	0	0	0
19	1 PAYMENT	1157.86	C1237762	21156	19998.14	M1877062	0	0	0	0
20	1 PAYMENT	671.64	C2033524	15123	14451.36	M4730532	0	0	0	0
21	1 TRANSFER	215310.3	C1670993	705	0	C1100439	22425	0	0	0
22	1 PAYMENT	1373.43	C2080460	13854	12480.57	M1344519	0	0	0	0
23	1 DEBIT	9302.79	C1566511	11299	1996.21	C1973538	29832	16896.7	0	0
24	1 DEBIT	1065.41	C1959239	1817	751.59	C5151329	10330	0	0	0
25	1 PAYMENT	3876.41	C5043364	67852	63975.59	M1404932	0	0	0	0
26	1 TRANSFER	311685.9	C1984094	10835	0	C9325838	6267	2719173	0	0
27	1 PAYMENT	6061.13	C1043358	443	0	M1558079	0	0	0	0
28	1 PAYMENT	9478.39	C1671590	116494	107015.6	M5848821	0	0	0	0
29	1 PAYMENT	8009.09	C1053967	10968	2958.91	M2953048	0	0	0	0
30	1 PAYMENT	8901.99	C1632497	2958.91	0	M3341971	0	0	0	0
31	1 PAYMENT	9920.52	C7648266	0	0	M1940055	0	0	0	0

Dataset Info:

- **Rows**: 200,000

- **Memory Usage:** 16.8+ MB
- **Data Types:** 3 object columns, 5 float64 columns, 3 int64 columns

```
cybersec@cybersec:~/python_projects/jpmorgan$ python3 main.py
Dataset Info:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200000 entries, 0 to 199999
Data columns (total 11 columns):
#   Column              Non-Null Count  Dtype
---  ---
0   step                200000 non-null   int64
1   type                200000 non-null   object
2   amount              200000 non-null   float64
3   nameOrig            200000 non-null   object
4   oldbalanceOrg       200000 non-null   float64
5   newbalanceOrig      200000 non-null   float64
6   nameDest            200000 non-null   object
7   oldbalanceDest      200000 non-null   float64
8   newbalanceDest      200000 non-null   float64
9   isFraud             200000 non-null   int64
10  isFlaggedFraud      200000 non-null   int64
dtypes: float64(5), int64(3), object(3)
memory usage: 16.8+ MB
None

Statistical Summary:

```

	step	amount	oldbalanceOrg	newbalanceOrig	oldbalanceDest	newbalanceDest	isFraud	isFlaggedFraud
count	200000.00000	2.000000e+05	2.000000e+05	2.000000e+05	2.000000e+05	2.000000e+05	200000.000000	200000.0
mean	10.06589	1.808112e+05	8.821957e+05	9.001938e+05	9.411592e+05	1.191866e+06	0.000735	0.0
std	2.12174	3.291800e+05	2.766264e+06	2.803759e+06	2.373010e+06	2.655236e+06	0.027101	0.0
min	1.00000	3.200000e-01	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	0.000000	0.0
25%	9.00000	1.201612e+04	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	0.000000	0.0
50%	10.00000	6.872104e+04	1.951000e+04	0.000000e+00	5.055850e+04	1.320839e+05	0.000000	0.0
75%	12.00000	2.290791e+05	1.915686e+05	2.275212e+05	7.645361e+05	1.189164e+06	0.000000	0.0
max	13.00000	1.000000e+07	3.893942e+07	3.894623e+07	3.903958e+07	3.904248e+07	1.000000	0.0

```
Statistical Summary:

```

	step	amount	oldbalanceOrg	newbalanceOrig	oldbalanceDest	newbalanceDest	isFraud	isFlaggedFraud
count	200000.00000	2.000000e+05	2.000000e+05	2.000000e+05	2.000000e+05	2.000000e+05	200000.000000	200000.0
mean	10.06589	1.808112e+05	8.821957e+05	9.001938e+05	9.411592e+05	1.191866e+06	0.000735	0.0
std	2.12174	3.291800e+05	2.766264e+06	2.803759e+06	2.373010e+06	2.655236e+06	0.027101	0.0
min	1.00000	3.200000e-01	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	0.000000	0.0
25%	9.00000	1.201612e+04	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	0.000000	0.0
50%	10.00000	6.872104e+04	1.951000e+04	0.000000e+00	5.055850e+04	1.320839e+05	0.000000	0.0
75%	12.00000	2.290791e+05	1.915686e+05	2.275212e+05	7.645361e+05	1.189164e+06	0.000000	0.0
max	13.00000	1.000000e+07	3.893942e+07	3.894623e+07	3.903958e+07	3.904248e+07	1.000000	0.0

```
Transaction Type Distribution:
type
PAYMENT    73427
CASH_OUT   66488
CASH_IN    41579
TRANSFER   16836
DEBIT       1670
Name: count, dtype: int64

Flagged fraud transactions: 0
Actual fraud transactions: 147

Transaction Volume by Type:
type
CASH_IN    7.531084e+09
CASH_OUT   1.347760e+10
DEBIT      1.514278e+07
PAYMENT    8.844203e+08
TRANSFER   1.425399e+10
Name: amount, dtype: float64
cybersec@cybersec:~/python_projects/jpmorgan$
```

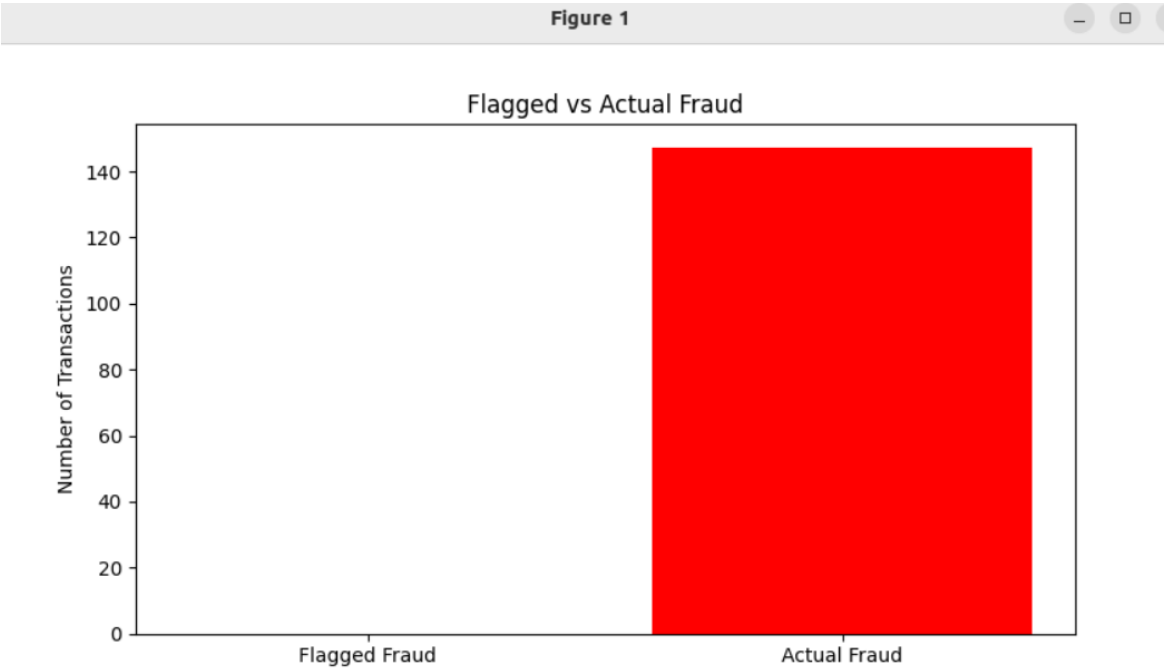
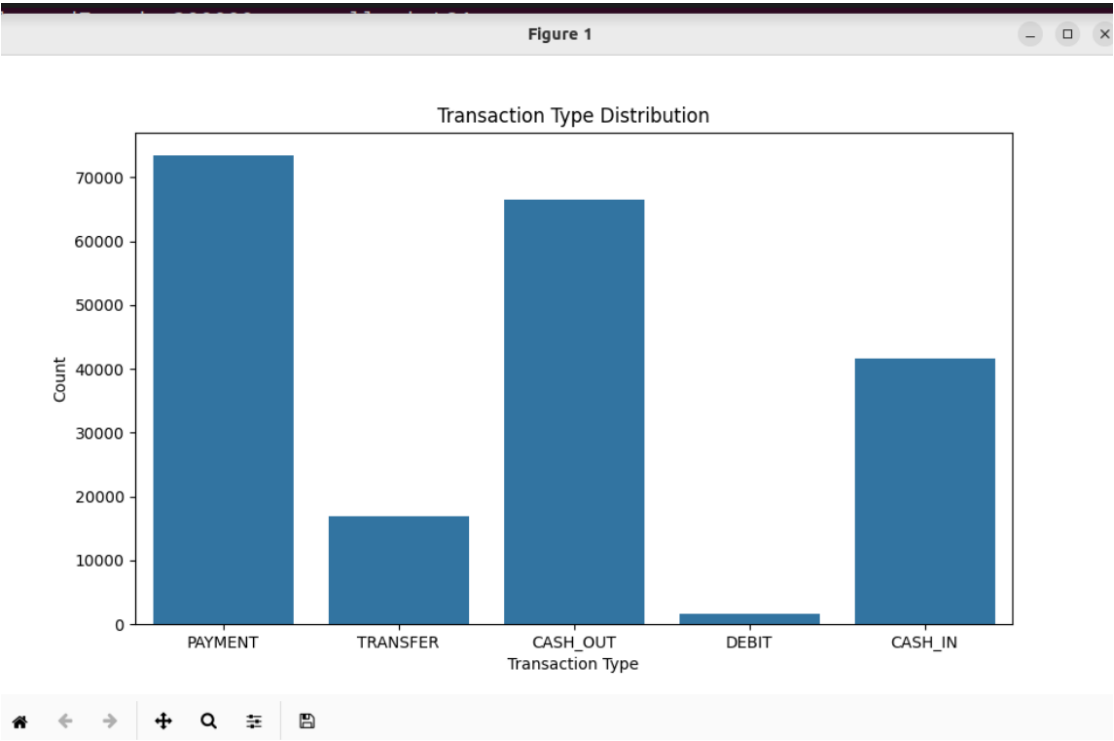
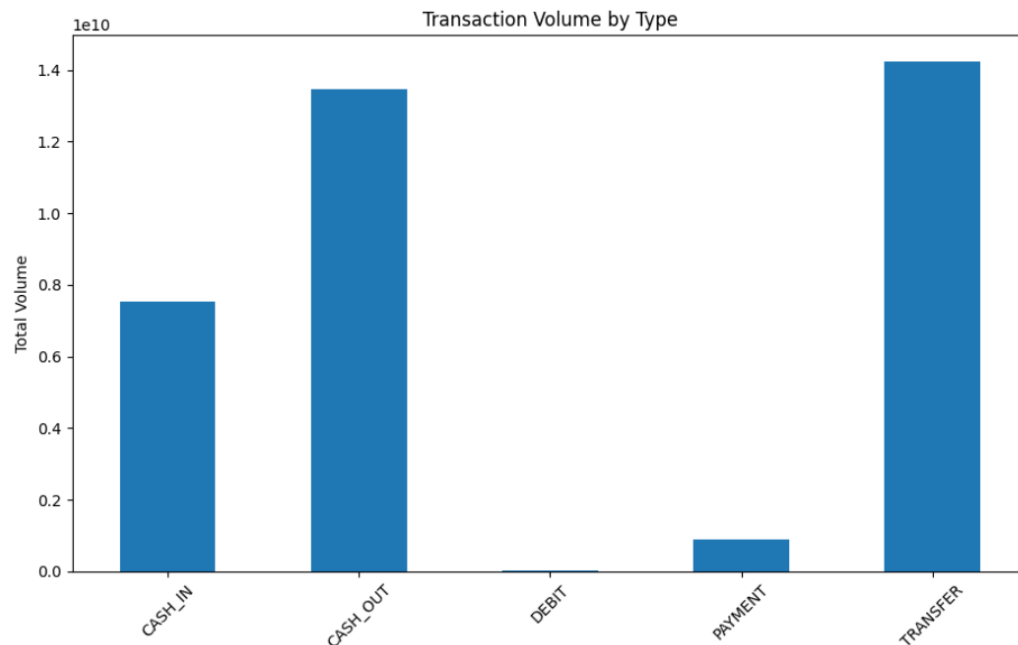


Figure 1



Statistical Summary:

- **Mean Transaction Amount:** \$180,811.20
- **Maximum Transaction Amount:** \$10,000,000
- **Fraudulent Transactions:** 147 out of 200,000
- **Flagged Fraudulent Transactions:** 0

2. Transaction Type Distribution

The dataset includes the following transaction types, distributed as follows:

- **PAYMENT:** 73,427 transactions
- **CASH_OUT:** 66,488 transactions
- **CASH_IN:** 41,579 transactions
- **TRANSFER:** 16,836 transactions
- **DEBIT:** 1,670 transactions

3. Fraud Analysis

- **Flagged Fraudulent Transactions:** 0
- **Actual Fraudulent Transactions:** 147

This suggests that although there were 147 fraudulent transactions, none of them were flagged by the system as fraudulent.

4. Transaction Volume by Type

The total transaction volume by type is as follows:

- **CASH_IN**: \$7.53 billion
- **CASH_OUT**: \$13.47 billion
- **DEBIT**: \$15.14 million
- **PAYMENT**: \$884.42 million
- **TRANSFER**: \$14.25 billion

Conclusion

This analysis reveals potential inefficiencies in the fraud detection system, as no flagged transactions were reported, despite the presence of fraudulent activity. The vast majority of transactions are concentrated in **PAYMENT**, **CASH_OUT**, and **TRANSFER** types, which should be closely monitored for further insights.

Recommendations:

1. Review and enhance fraud detection algorithms, especially for **CASH_OUT** and **TRANSFER** types.
2. Implement an improved flagging mechanism for suspicious transactions to reduce the possibility of missed fraudulent activities.
3. Monitor large-scale transactions more thoroughly, as high-volume transactions may have higher fraud risk.

This concludes the basic exploratory data analysis and initial insights from the transaction dataset. Further investigation is advised to refine the fraud detection models.