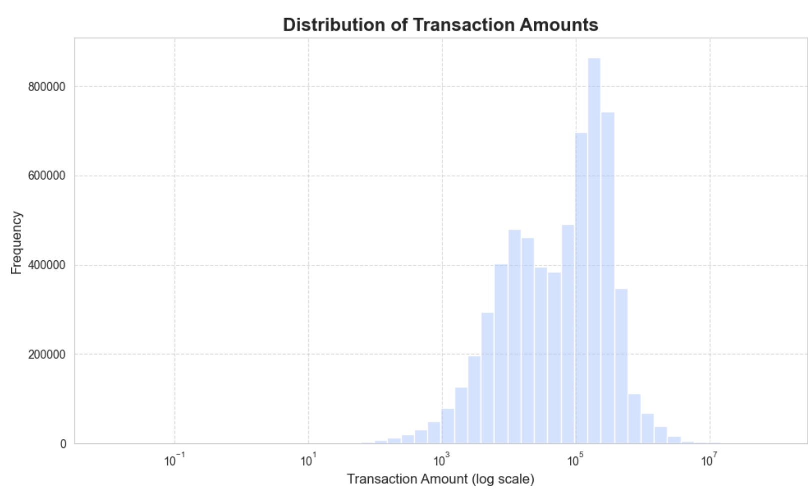
Data Collection and Preprocessing Phase

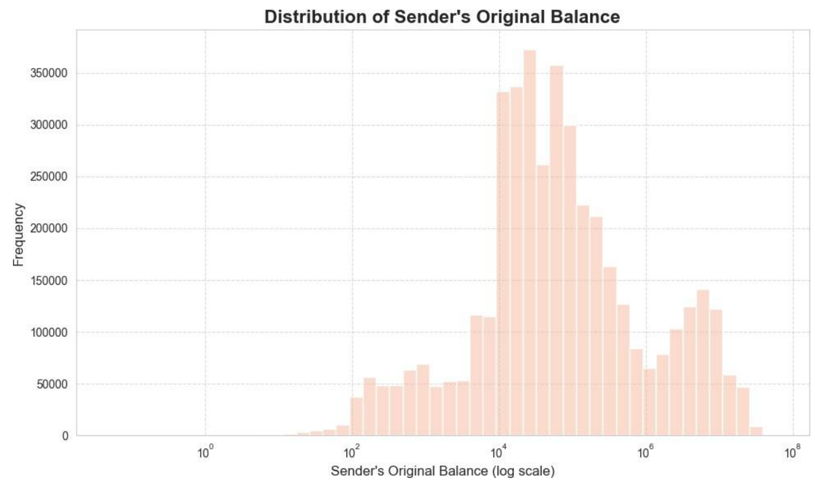
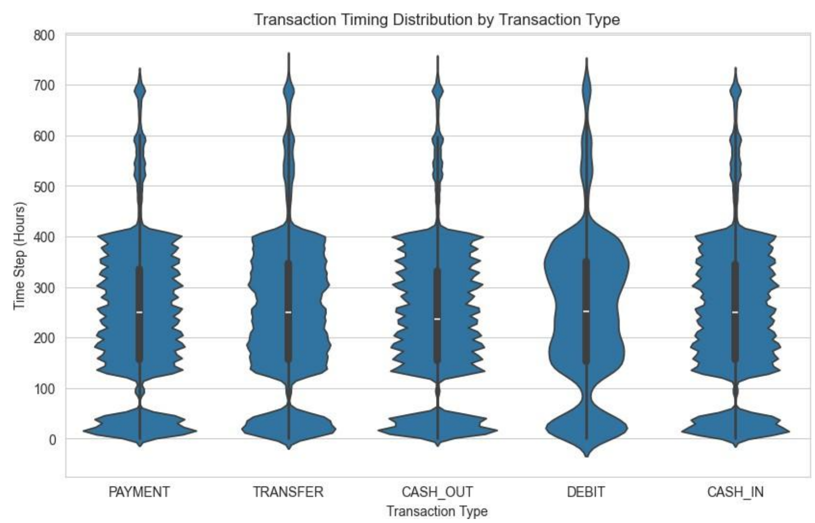
Date	19 Feb 2026
Team ID	LTVIP2026TMIDS80731
Project Title	Online Payment Fraud Detection using ML
Maximum Marks	6 Marks

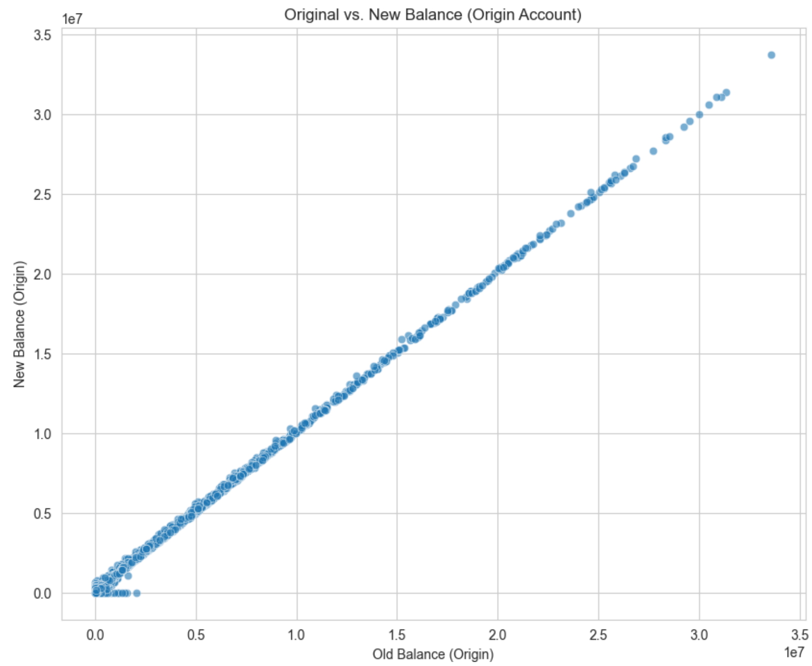
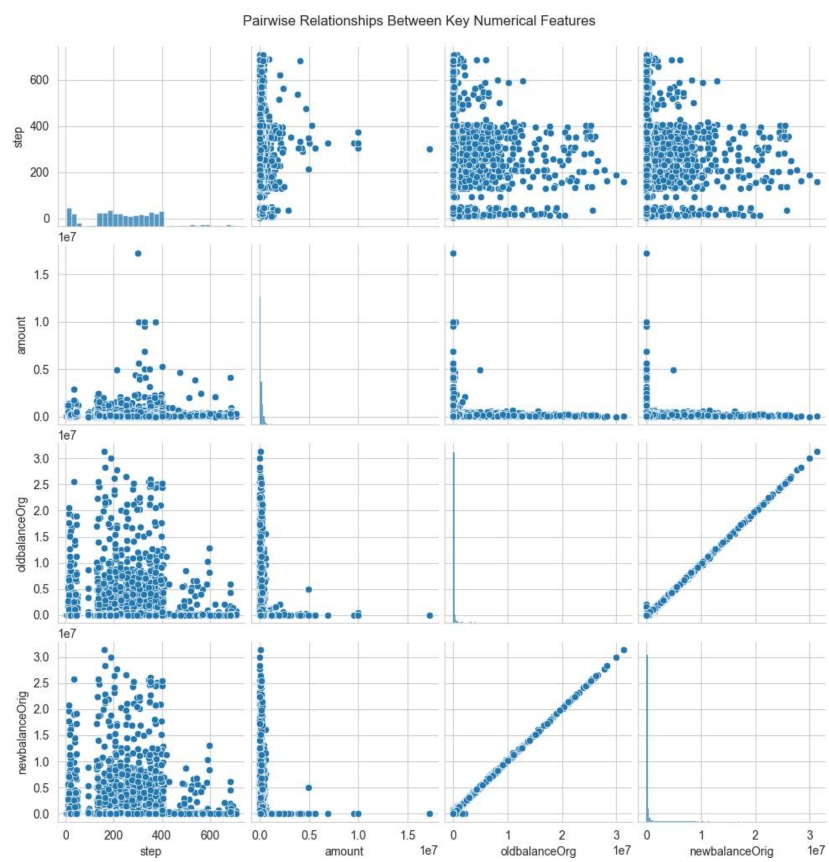
Data Exploration and Preprocessing

Identifies data sources, assesses quality issues like missing values and duplicates, and implements resolution plans to ensure accurate and reliable analysis.

<table>
<tr><th>Section</th><th>Description</th></tr>
<tr><td>Data Overview</td><td>
<table>
<tr><th></th><th>step</th><th>amount</th><th>oldbalanceOrg</th><th>newbalanceOrig</th><th>oldbalanceDest</th><th>newbalanceDest</th><th>isFraud</th><th>isFlaggedFraud</th></tr>
<tr><td>count</td><td>6.362620e+06</td><td>6.362620e+06</td><td>6.362620e+06</td><td>6.362620e+06</td><td>6.362620e+06</td><td>6.362620e+06</td><td>6.362620e+06</td><td>6.362620e+06</td></tr>
<tr><td>mean</td><td>2.433972e+02</td><td>1.798619e+05</td><td>8.338831e+05</td><td>8.551137e+05</td><td>1.100702e+06</td><td>1.224996e+06</td><td>1.290820e-03</td><td>2.514687e-06</td></tr>
<tr><td>std</td><td>1.423320e+02</td><td>6.038582e+05</td><td>2.888243e+06</td><td>2.924049e+06</td><td>3.399180e+06</td><td>3.674129e+06</td><td>3.590480e-02</td><td>1.585775e-03</td></tr>
<tr><td>min</td><td>1.000000e+00</td><td>0.000000e+00</td><td>0.000000e+00</td><td>0.000000e+00</td><td>0.000000e+00</td><td>0.000000e+00</td><td>0.000000e+00</td><td>0.000000e+00</td></tr>
<tr><td>25%</td><td>1.560000e+02</td><td>1.338957e+04</td><td>0.000000e+00</td><td>0.000000e+00</td><td>0.000000e+00</td><td>0.000000e+00</td><td>0.000000e+00</td><td>0.000000e+00</td></tr>
<tr><td>50%</td><td>2.390000e+02</td><td>7.487194e+04</td><td>1.420800e+04</td><td>0.000000e+00</td><td>1.327057e+05</td><td>2.146614e+05</td><td>0.000000e+00</td><td>0.000000e+00</td></tr>
<tr><td>75%</td><td>3.350000e+02</td><td>2.087215e+05</td><td>1.073152e+05</td><td>1.442584e+05</td><td>9.430367e+05</td><td>1.111909e+06</td><td>0.000000e+00</td><td>0.000000e+00</td></tr>
<tr><td>max</td><td>7.430000e+02</td><td>9.244552e+07</td><td>5.958504e+07</td><td>4.958504e+07</td><td>3.560159e+08</td><td>3.561793e+08</td><td>1.000000e+00</td><td>1.000000e+00</td></tr>
</table>
</td></tr>
<tr><td>Univariate Analysis</td><td>


</td></tr>
</table>

	
Bivariate Analysis	

<table>
<tr><td></td><td>
</td></tr>
<tr><td>Multivariate Analysis</td><td>
</td></tr>
<tr><td>Outliers and Anomalies</td><td>Due to the extremely wide distribution and heavy-tailed nature of financial transaction data in this dataset, traditional outlier</td></tr>
</table>

detection methods are not effective. The data spans several orders of magnitude (e.g., transaction amounts range from $0 to $92+ million), making it difficult to distinguish between legitimate large transactions and true anomalies using standard statistical methods.

Data Preprocessing Code Screenshots

Loading Data

```
#Loading Data
data=pd.read_csv("data.csv")
data_og=data.copy()
data.head()
```

	step	type	amount	nameOrig	oldbalanceOrg	newbalanceOrig	nameDest	oldbalanceDest	newbalanceDest	isFraud	isFlaggedFraud
0	1	PAYMENT	9839.64	C1231006815	170136.0	160296.36	M1979787155	0.0	0.0	0	0
1	1	PAYMENT	1864.28	C1666544295	21249.0	19384.72	M2044282225	0.0	0.0	0	0
2	1	TRANSFER	181.00	C1305486145	181.0	0.00	C553264065	0.0	0.0	1	0
3	1	CASH_OUT	181.00	C840083671	181.0	0.00	C38997010	21182.0	0.0	1	0
4	1	PAYMENT	11668.14	C2048537720	41554.0	29885.86	M1230701703	0.0	0.0	0	0

Handling Missing Data

```
#Handling Missing Data (There isnt any missing data)
data.isnull().sum()
```

```
step              0
type              0
amount            0
nameOrig          0
oldbalanceOrg     0
newbalanceOrig    0
nameDest          0
oldbalanceDest    0
newbalanceDest    0
isFraud           0
isFlaggedFraud    0
dtype: int64
```

Data Transformation

```
df_clean = data.drop(['nameOrig', 'nameDest', 'isFlaggedFraud'], axis=1)
df_clean.columns.tolist()
```

```
['step',
 'type',
 'amount',
 'oldbalanceOrg',
 'newbalanceOrig',
 'oldbalanceDest',
 'newbalanceDest',
 'isFraud']
```

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```python
df_encoded = pd.get_dummies(df_clean, columns=['type'], prefix='type')
df_encoded.head()
```

Python

amount	oldbalanceOrg	newbalanceOrig	oldbalanceDest	newbalanceDest	isFraud	type_CASH_IN	type_CASH_OUT	type_DEBIT	type_PAYMENT	type_TRANSFER
9839.64	170136.0	160296.36	0.0	0.0	0	False	False	False	True	False
1864.28	21249.0	19384.72	0.0	0.0	0	False	False	False	True	False
181.00	181.0	0.00	0.0	0.0	1	False	False	False	False	True
181.00	181.0	0.00	21182.0	0.0	1	False	True	False	False	False
11668.14	41554.0	29885.86	0.0	0.0	0	False	False	False	True	False

```python
X = df_encoded.drop('isFraud', axis=1)
y = df_encoded['isFraud']
scaler = StandardScaler()
X_scaled = scaler.fit_transform(X)
```

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<tr>
<td>Feature Engineering</td>
<td>New features such as balance changes and ratios were considered but not used in the baseline due to time/resource constraints.</td>
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<tr>
<td>Save Processed Data</td>
<td>

```python
X_scaled_df = pd.DataFrame(X_scaled, columns=X.columns)
X_scaled_df.describe()
```

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