```
import numpy as np                # For numerical computing
import pandas as pd               # For data manipulation and analysis
import matplotlib.pyplot as plt   # For data visualization
import seaborn as sns             # For enhanced data visualization
import sklearn                    # For machine learning algorithms
```

```
data=pd.read_csv("The mistral.csv")
```

```
data.head()
```

stAccountBalance	TransactionDate	TransactionTime	STATUS_	bplayer0	product_id	category_id	category_code	brand	
17819.05	2023-02-08	143207.0	1.0	Vayne	3900821.0	2.053014e+18	appliances.environment.water_heater	aqua	
2270.69	2023-02-08	141858.0	1.0	Kled	1307067.0	2.053014e+18	computers.notebook	lenovo	2
17874.44	2023-02-08	142712.0	1.0	Darius	1004237.0	2.053014e+18	electronics.smartphone	apple	9
866503.21	2023-02-08	142714.0	1.0	Singed	1480613.0	2.053014e+18	computers.desktop	pulser	8
6714.43	2023-02-08	181156.0	1.0	Urgot	28719074.0	2.053014e+18	apparel.shoes.keds	baden	

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 40051 entries, 0 to 40050
Data columns (total 16 columns):
 #   Column              Non-Null Count  Dtype  
---  ------              --------------  -----  
 0   TransactionID       40051 non-null  object 
 1   CustomerID          40051 non-null  object 
 2   CustomerDOB         39880 non-null  object 
 3   CustGender          40051 non-null  object 
 4   CustLocation        40048 non-null  object 
 5   CustAccountBalance  40003 non-null  float64
 6   TransactionDate     40050 non-null  object 
 7   TransactionTime     40050 non-null  float64
 8   STATUS_             40050 non-null  float64
 9   bplayer0            40050 non-null  object 
 10  product_id          40050 non-null  float64
 11  category_id         40050 non-null  float64
 12  category_code       40050 non-null  object 
 13  brand               40050 non-null  object 
 14  price               40050 non-null  float64
 15  PaymentMode         40050 non-null  object 
dtypes: float64(6), object(10)
memory usage: 4.9+ MB
```

```
missing_values = data.isnull().sum()
print(missing_values)
```

```
TransactionID           0
CustomerID              0
CustomerDOB           171
CustGender              0
CustLocation            3
CustAccountBalance     48
TransactionDate         1
TransactionTime         1
STATUS_                 1
bplayer0                1
product_id              1
category_id             1
category_code           1
brand                   1
price                   1
PaymentMode             1
dtype: int64
```

```
# Filling missing values for categorical variables with mode
data['CustomerDOB'].fillna(data['CustomerDOB'].mode()[0], inplace=True)
data['CustLocation'].fillna(data['CustLocation'].mode()[0], inplace=True)
data['brand'].fillna(data['brand'].mode()[0], inplace=True)
data['PaymentMode'].fillna(data['PaymentMode'].mode()[0], inplace=True)

# Filling missing values for numerical variables with median
data['CustAccountBalance'].fillna(data['CustAccountBalance'].median(), inplace=True)
data['price'].fillna(data['price'].median(), inplace=True)

# Drop rows with missing values in TransactionDate and TransactionTime columns
data.dropna(subset=['TransactionDate', 'TransactionTime'], inplace=True)
```

```
data.isnull().sum()
```

```
TransactionID         0
CustomerID            0
CustomerDOB           0
CustGender            0
CustLocation          0
CustAccountBalance    0
TransactionDate       0
TransactionTime       0
STATUS_               0
bplayer0              0
product_id            0
category_id           0
category_code         0
brand                 0
price                 0
PaymentMode           0
dtype: int64
```

```
# Convert CustAccountBalance column from float to int
data['CustAccountBalance'] = data['CustAccountBalance'].astype(int)
data['price']= data['price'].astype(int)
```

```
data.tail(5)
```

	TransactionID	CustomerID	CustomerDOB	CustGender	CustLocation	CustAccountBalance	TransactionDate	TransactionTime	STATU
40045	T40046	C6118785	23/10/90	Female	MUMBAI	286	2023-09-27	201545.0	
40046	T40047	C7426331	29/5/85	Male	KARNAL	42498	2023-09-27	195424.0	
40047	T40048	C1829935	29/1/81	Female	JHAJJAR	27614	2023-09-27	195427.0	
40048	T40049	C5319624	10/2/93	Female	RAJKOT	7327	2023-09-27	215724.0	
40049	T40050	C3320566	21/12/91	Male	SRIPERUMBUDUR	18426	2023-09-22	134203.0	

```
# Splitting CustomerDOB column into year, month, and day columns
data[[ 'DOB_Day','DOB_Month','DOB_Year',]] = data['CustomerDOB'].str.split('/', expand=True)

# Convert the data type of the newly created columns to integer
data['DOB_Year'] = data['DOB_Year'].astype(int)
data['DOB_Month'] = data['DOB_Month'].astype(int)
data['DOB_Day'] = data['DOB_Day'].astype(int)

# Drop the original CustomerDOB column
data.drop(columns=['CustomerDOB'], inplace=True)
```

```
data . head()
```

	TransactionID	CustomerID	CustGender	CustLocation	CustAccountBalance	TransactionDate	TransactionTime	STATUS_	bplayer0	produc
0	T1	C5841053	Male	JAMSHEDPUR	17819	2023-02-08	143207.0	1.0	Vayne	39008
1	T2	C2142763	Female	JHAJJAR	2270	2023-02-08	141858.0	1.0	Kled	13070
2	T3	C4417068	Female	MUMBAI	17874	2023-02-08	142712.0	1.0	Darius	10042
3	T4	C5342380	Female	MUMBAI	866503	2023-02-08	142714.0	1.0	Singed	14806
4	T5	C9031234	Male	NAVI MUMBAI	6714	2023-02-08	181156.0	1.0	Urgot	287190

```
bplayer0_details = data['bplayer0'].value_counts()
print(bplayer0_details)
```

```
Sett           2124
Garen          1838
Darius         1691
Mordekaiser    1648
Urgot          1598
               ...
Elise             3
Braum             2
Evelynn           1
Nami              1
Sona              1
Name: bplayer0, Length: 154, dtype: int64
```

```
# Drop the bplayer0 column from the dataset
data.drop(columns=['bplayer0'], inplace=True)
```

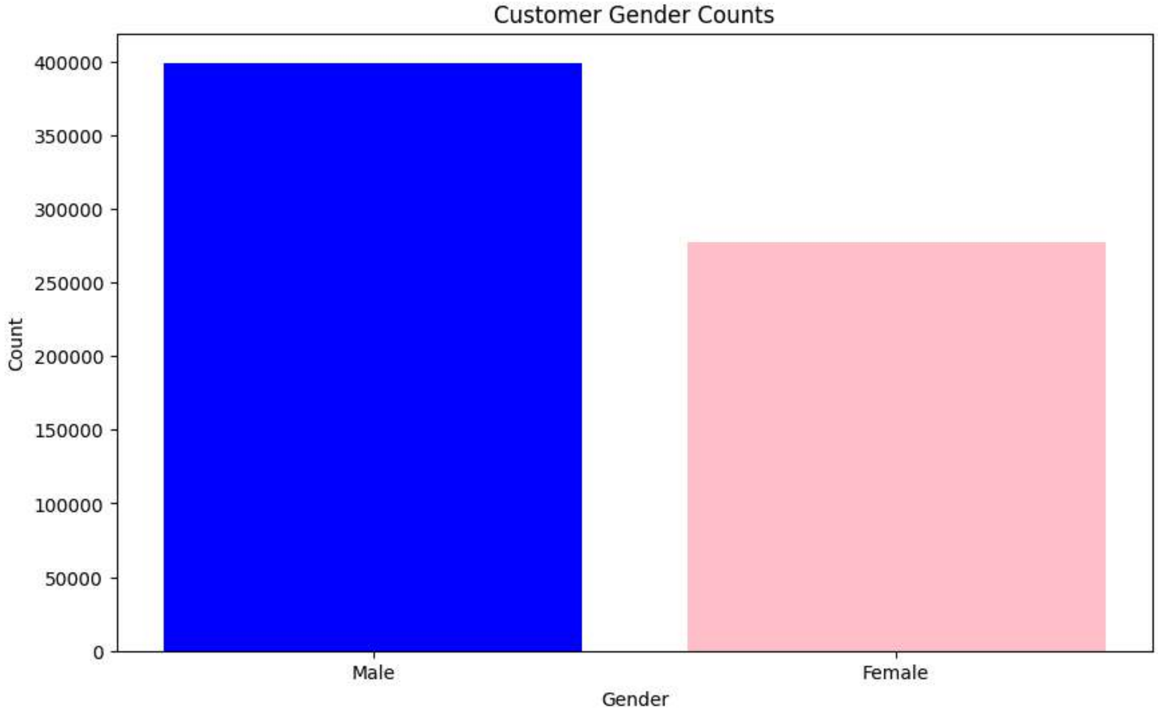
```
data.describe()
```

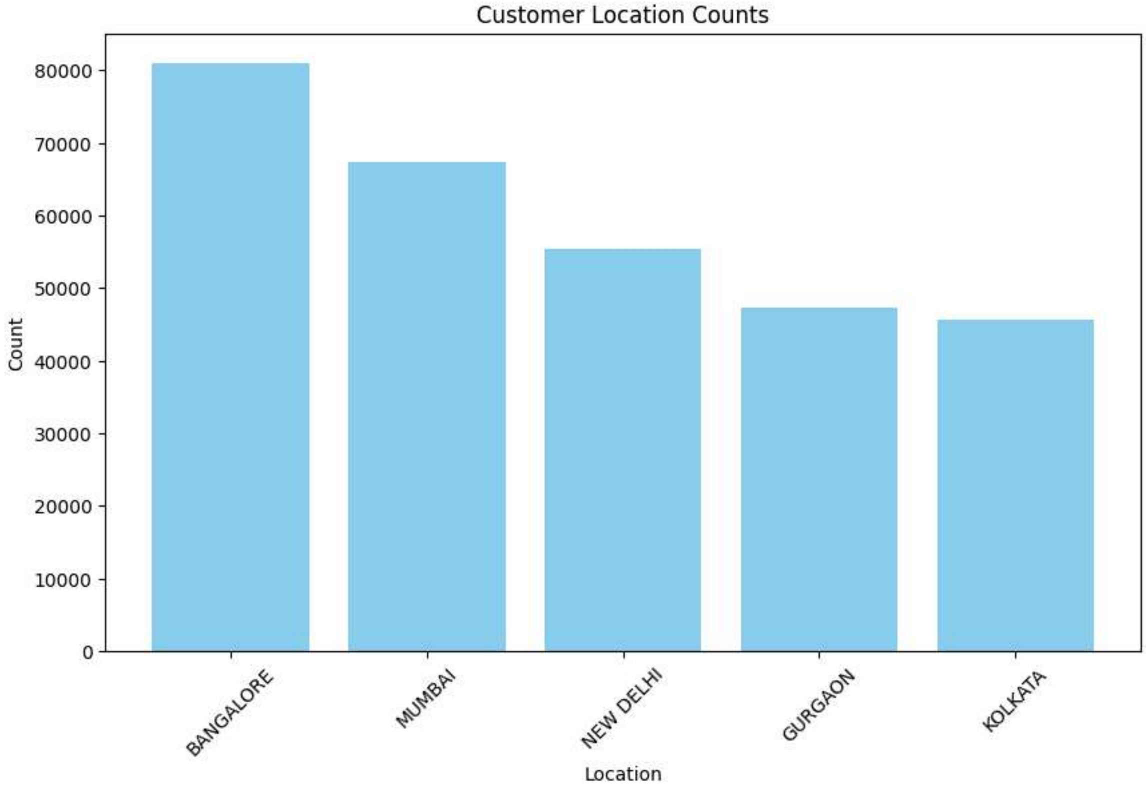
	CustAccountBalance	TransactionTime	STATUS_	product_id	category_id	price	DOB_Day	DOB_Month	DOB_Year
count	4.005000e+04	40050.000000	40050.0	4.005000e+04	4.005000e+04	40050.000000	40050.000000	40050.000000	40050.000000
mean	1.180848e+05	172170.529114	1.0	5.363302e+06	2.055217e+18	31636.790662	14.023346	6.161099	84.994207
std	6.544220e+05	42543.399636	0.0	8.030879e+06	1.369242e+16	35698.183155	9.332191	3.550756	9.327266
min	0.000000e+00	2.000000	1.0	1.001588e+06	2.053014e+18	79.000000	1.000000	1.000000	0.000000
25%	5.496500e+03	145548.500000	1.0	1.004839e+06	2.053014e+18	8977.000000	5.000000	3.000000	82.000000
50%	1.910300e+04	184353.000000	1.0	1.700380e+06	2.053014e+18	17779.000000	14.000000	6.000000	87.000000
75%	6.443900e+04	203129.000000	1.0	5.100797e+06	2.053014e+18	41080.000000	22.000000	9.000000	91.000000
max	5.099967e+07	235951.000000	1.0	5.290004e+07	2.172371e+18	231666.000000	31.000000	12.000000	99.000000

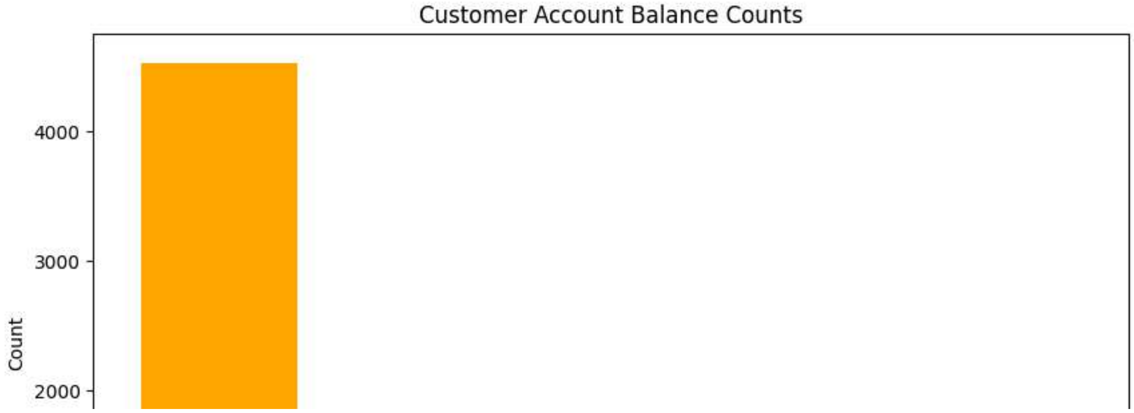
```
# Value counts for each column



cust_gender_counts = data['CustGender'].value_counts()
cust_location_counts = data['CustLocation'].value_counts()
cust_balance_counts = data['CustAccountBalance'].value_counts()
transaction_date_counts = data['TransactionDate'].value_counts()

status_counts = data['STATUS_'].value_counts()


category_code_counts = data['category_code'].value_counts()
brand_counts = data['brand'].value_counts()
price_counts = data['price'].value_counts()
payment_mode_counts = data['PaymentMode'].value_counts()

# Display value counts


print("\nCustGender value counts:\n", cust_gender_counts)
print("\nCustLocation value counts:\n", cust_location_counts)
print("\nCustAccountBalance value counts:\n", cust_balance_counts)
print("\nTransactionDate value counts:\n", transaction_date_counts)

print("\nSTATUS_ value counts:\n", status_counts)

print("\ncategory_code value counts:\n", category_code_counts)
print("\nbrand value counts:\n", brand_counts)
print("\nprice value counts:\n", price_counts)
print("\nPaymentMode value counts:\n", payment_mode_counts)
```

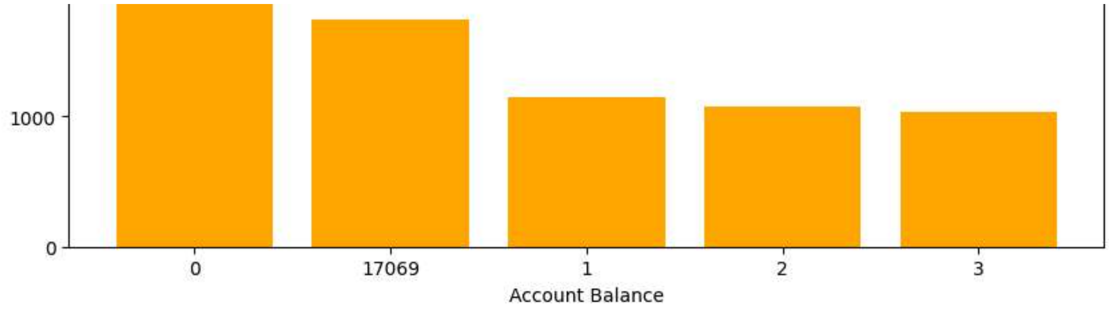
```
2023-08-17        9
2023-10-16        3
Name: TransactionDate, dtype: int64

STATUS_ value counts:
 1.0    40050
Name: STATUS_, dtype: int64

category_code value counts:
 electronics.smartphone          17324
computers.notebook               1750
electronics.clocks               1743
electronics.audio.headphone      1505
electronics.video.tv             1299
                                 ...
appliances.environment.fan          2
apparel.skirt                       1
country_yard.furniture.bench        1
sport.tennis                        1
apparel.shorts                      1
Name: category_code, Length: 120, dtype: int64

brand value counts:
 samsung        7422
apple          6009
xiaomi         4035
huawei         1742
lg              621
               ...
helvi             1
aeg               1
specialized       1
numark            1
biostar           1
Name: brand, Length: 740, dtype: int64

price value counts:
 87801     841
11768     755
25817     392
127393    361
22928     343
         ...
43319       1
4716        1
65070       1
73669       1
86409       1
Name: price, Length: 3811, dtype: int64

PaymentMode value counts:
 Online Payment      18247
Credit Card          6862
Cash on Delivery     6448
Debit Card           3641
Cash                 2669
Bank Transfer        2183
Name: PaymentMode, dtype: int64
```

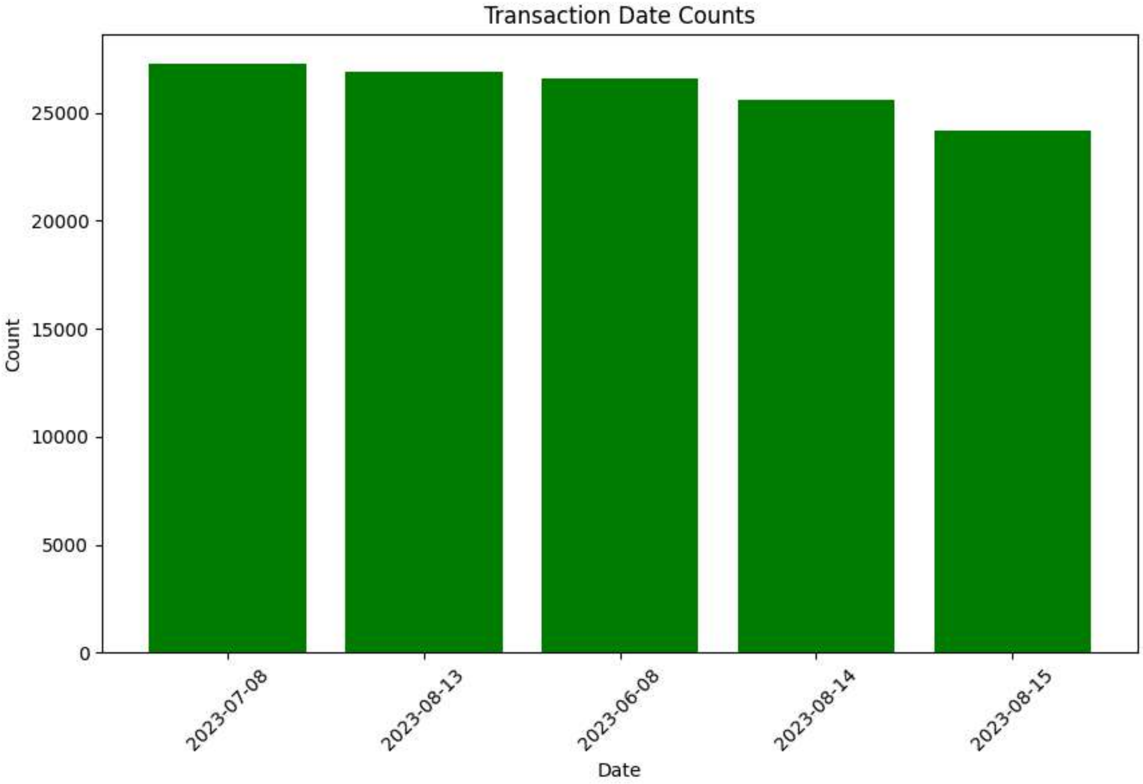
```
import matplotlib.pyplot as plt

# CustGender Counts
cust_gender_counts = {'Male': 399191, 'Female': 277484}
plt.figure(figsize=(10, 6))
plt.bar(cust_gender_counts.keys(), cust_gender_counts.values(), color=['blue', 'pink'])
plt.title('Customer Gender Counts')
plt.xlabel('Gender')
plt.ylabel('Count')
plt.show()

# CustLocation Counts
cust_location_counts = {'BANGALORE': 81032, 'MUMBAI': 67442, 'NEW DELHI': 55424, 'GURGAON': 47263, 'KOLKATA': 45562}
plt.figure(figsize=(10, 6))
plt.bar(cust_location_counts.keys(), cust_location_counts.values(), color='skyblue')
plt.title('Customer Location Counts')
plt.xlabel('Location')
plt.ylabel('Count')
plt.xticks(rotation=45)
plt.show()

# CustAccountBalance Counts
cust_balance_counts = {'0': 4525, '17069': 1750, '1': 1149, '2': 1072, '3': 1033}
plt.figure(figsize=(10, 6))
plt.bar(cust_balance_counts.keys(), cust_balance_counts.values(), color='orange')
plt.title('Customer Account Balance Counts')
plt.xlabel('Account Balance')
plt.ylabel('Count')
plt.show()

# TransactionDate Counts
transaction_date_counts = {'2023-07-08': 27256, '2023-08-13': 26916, '2023-06-08': 26578, '2023-08-14': 25594, '2023-08-15': 24165}
plt.figure(figsize=(10, 6))
plt.bar(transaction_date_counts.keys(), transaction_date_counts.values(), color='green')
plt.title('Transaction Date Counts')
plt.xlabel('Date')
plt.ylabel('Count')
plt.xticks(rotation=45)
plt.show()

# CategoryCode Counts
category_code_counts = {'electronics.smartphone': 294001, 'electronics.clocks': 31559, 'computers.notebook': 30903,
                        'electronics.audio.headphone': 28160, 'electronics.video.tv': 23865}
plt.figure(figsize=(10, 6))
plt.bar(category_code_counts.keys(), category_code_counts.values(), color='purple')
plt.title('Category Code Counts')
plt.xlabel('Category Code')
plt.ylabel('Count')
plt.xticks(rotation=45)
plt.show()

# Brand Counts
brand_counts = {'samsung': 126017, 'apple': 109761, 'xiaomi': 64033, 'huawei': 29844, 'lg': 10876}
plt.figure(figsize=(10, 6))
plt.bar(brand_counts.keys(), brand_counts.values(), color='brown')
plt.title('Brand Counts')
plt.xlabel('Brand')
plt.ylabel('Count')
plt.xticks(rotation=45)
plt.show()

# Price Counts
price_counts = {'87800': 8261, '87801': 7443, '11762': 6833, '127393': 6539, '14573': 4943}
plt.figure(figsize=(10, 6))
plt.bar(price_counts.keys(), price_counts.values(), color='red')
plt.title('Price Counts')
plt.xlabel('Price')
plt.ylabel('Count')
plt.show()

# PaymentMode Counts
payment_mode_counts = {'Online Payment': 307604, 'Credit Card': 115980, 'Cash on Delivery': 107868,
                       'Debit Card': 62220, 'Cash': 44858}
plt.figure(figsize=(10, 6))
plt.bar(payment_mode_counts.keys(), payment_mode_counts.values(), color='gray')
plt.title('Payment Mode Counts')
plt.xlabel('Payment Mode')
plt.ylabel('Count')
plt.xticks(rotation=45)
plt.show()
```

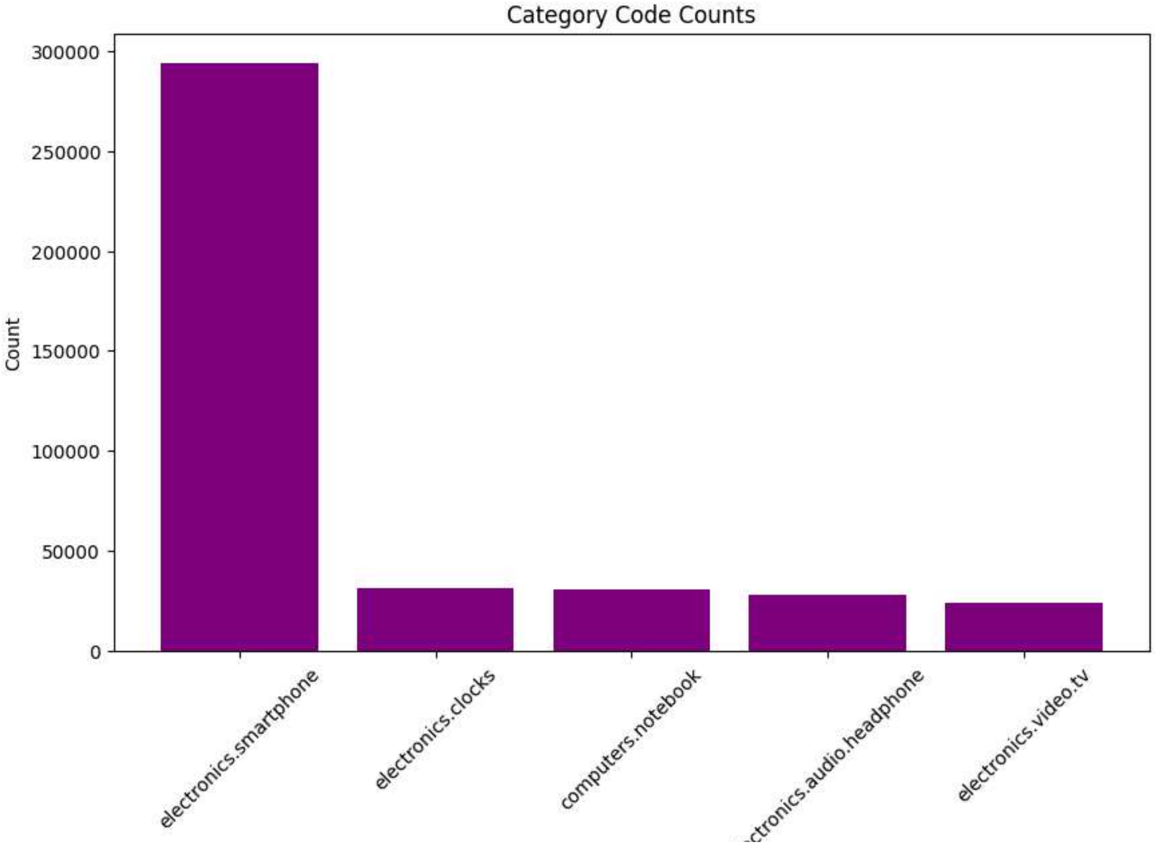

Customer Gender Counts
Count
400000
350000
300000
250000
200000
150000
100000
50000
0
Male
Female
Gender

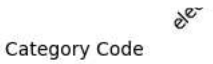

Customer Location Counts
Count
80000
70000
60000
50000
40000
30000
20000
10000
0
BANGALORE
MUMBAI
NEW DELHI
GURGAON
KOLKATA
Location

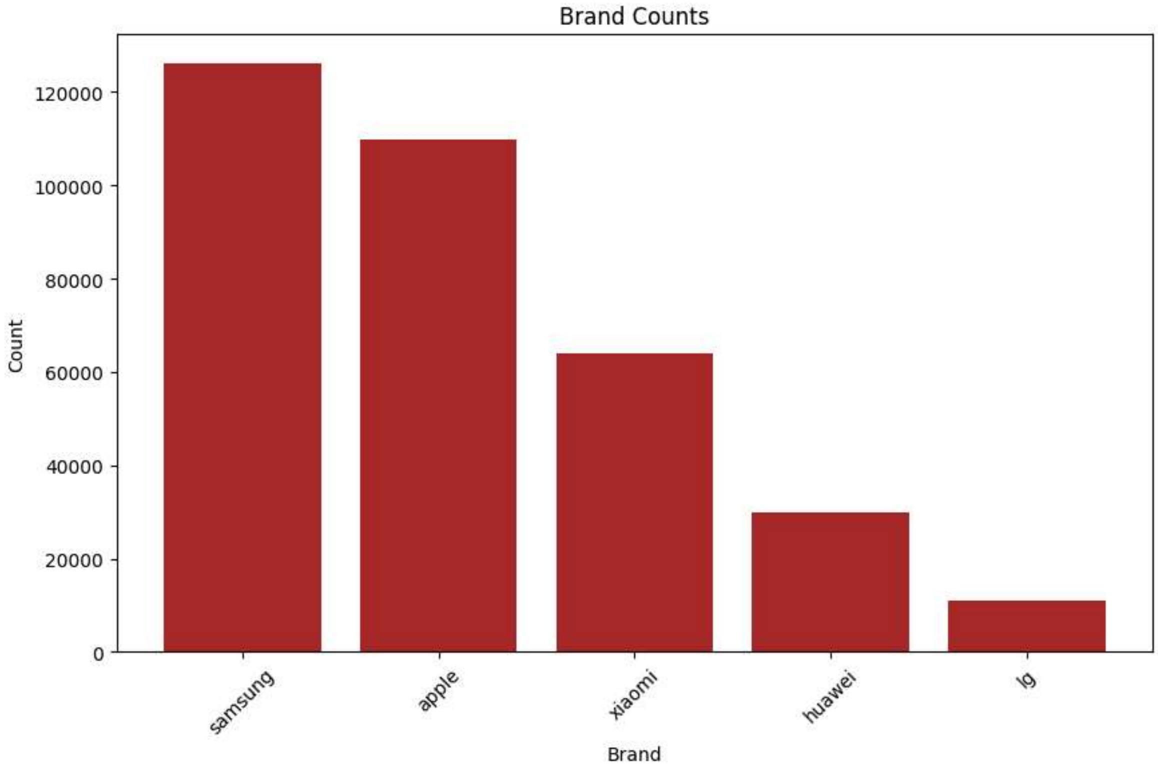

Customer Account Balance Counts
Count
4000
3000
2000

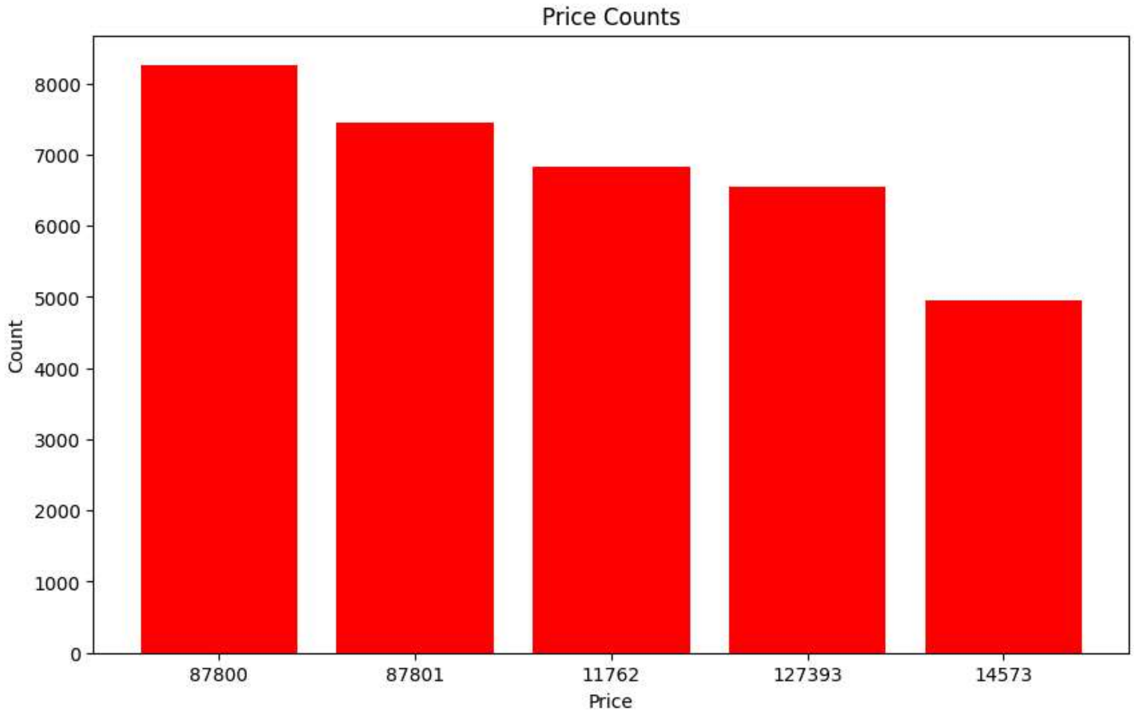

1000
0
0
17069
1
2
3
Account Balance

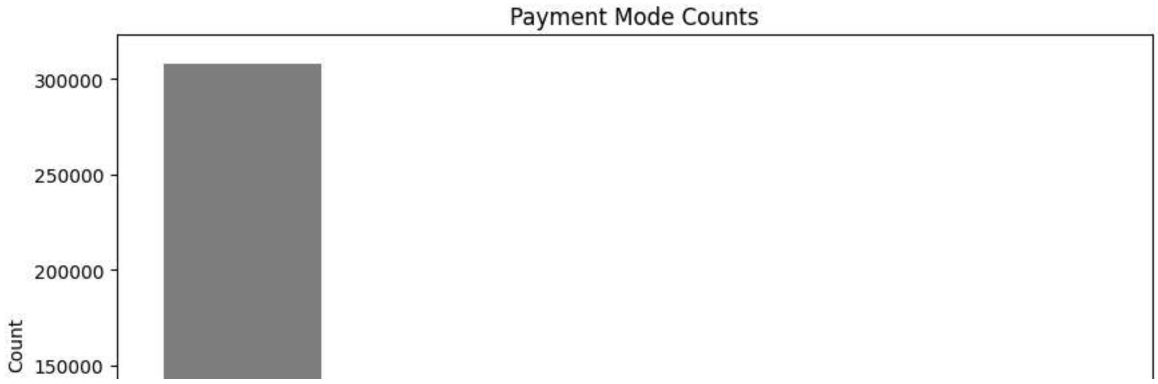

Transaction Date Counts
Count
25000
20000
15000
10000
5000
0
2023-07-08
2023-08-13
2023-06-08
2023-08-14
2023-08-15
Date


Category Code Counts
Count
300000
250000
200000
150000
100000
50000
0
electronics.smartphone
electronics.clocks
computers.notebook
ctronics.audio.headphone
electronics.video.tv


ele
Category Code


Brand Counts
Count
0
20000
40000
60000
80000
100000
120000
samsung
apple
xiaomi
huawei
lg
Brand


Price Counts
Count
0
1000
2000
3000
4000
5000
6000
7000
8000
87800
87801
11762
127393
14573
Price


Payment Mode Counts
Count
150000
200000
250000
300000