bi-test-task-2

January 7, 2024

[176]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
import plotly.express as px
%matplotlib inline
```

[ ]:
```
#DATA IMPORT
```

[7]:
```
df = pd.read_csv('sample_data.csv')
```

[ ]:
```
#DATASET INFO
```

[8]:
```
df.shape
```

[8]:
```
(10000, 8)
```

[9]:
```
df.head()
```

[9]:
```
   cl_id  successful  paid_amount        co_name     datecl  payment_method  \
0   5120           0      2000.08         Canada  2/27/2021          Mobile
1   8318           1      4446.48        Germany  1/19/2021  Bank transfers
2   9663           1      1862.80  United States   2/5/2021        E-Wallet
3   1812           0      4403.84           Iran  2/21/2021        E-Wallet
4   9726           0      4652.16        Germany  2/27/2021  Bank transfers

   mid  card_brand
0  106         JBC
1  266        Amex
2   75        Visa
3  140  MasterCard
4   52        Visa
```

[18]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 8 columns):
```

```
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   cl_id           10000 non-null  int64
 1   successful      10000 non-null  int64
 2   paid_amount     10000 non-null  float64
 3   co_name         10000 non-null  object
 4   datecl          10000 non-null  object
 5   payment_method  10000 non-null  object
 6   mid             10000 non-null  int64
 7   card_brand      10000 non-null  object
dtypes: float64(1), int64(3), object(4)
memory usage: 625.1+ KB
```

[11]:
```
df.dtypes
```

[11]:
```
cl_id              int64
successful         int64
paid_amount      float64
co_name           object
datecl            object
payment_method    object
mid                int64
card_brand        object
dtype: object
```

[ ]:
```
#SET CORRECT DATATYPES
```

[22]:
```
df['successful'] = df['successful'].astype(bool)
df['datecl'] = pd.to_datetime(df['datecl'])
```

[24]:
```
df.dtypes
```

[24]:
```
cl_id                      int64
successful                  bool
paid_amount              float64
co_name                   object
datecl            datetime64[ns]
payment_method            object
mid                        int64
card_brand                object
dtype: object
```

[128]:
```
df.head()
```

[128]:
```
   cl_id  successful  paid_amount       co_name     datecl  payment_method  \
0   5120       False      2000.08        Canada 2021-02-27          Mobile
1   8318        True      4446.48       Germany 2021-01-19  Bank transfers
```

```
2   9663        True      1862.80  United States 2021-02-05        E-Wallet
3   1812       False      4403.84           Iran 2021-02-21        E-Wallet
4   9726       False      4652.16        Germany 2021-02-27  Bank transfers

   mid  card_brand
0  106         JBC
1  266        Amex
2   75        Visa
3  140  MasterCard
4   52        Visa
```

[ ]:
```
#CHECK MISSING VALUES
```

[15]:
```
df.isna().sum()
```

[15]:
```
cl_id             0
successful        0
paid_amount       0
co_name           0
datecl            0
payment_method    0
mid               0
card_brand        0
dtype: int64
```

There are no missing values in the dataset

[ ]:
```
#CHECK DUPLICATED VALUES
```

[16]:
```
df.duplicated().sum()
```

[16]:
```
0
```

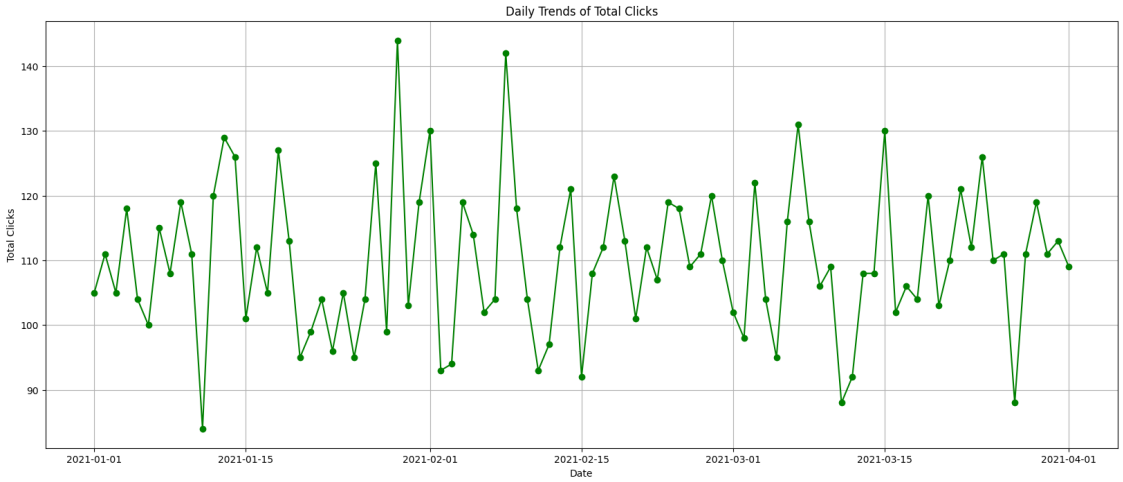
There are no dulicated values in the dataset

[ ]:
```
#QUESTION 1: Visualize daily trends of the traffic for the period: total number␣
 ↪of clicks, successful payments and total paid amount.
```

[60]:
```
clicks_by_date = df.groupby('datecl').agg({'cl_id' : 'nunique'}).reset_index()␣
 ↪#GROUP CLICKS BY DATE
clicks_by_date.head()
```

[60]:
```
       datecl  cl_id
0 2021-01-01    105
1 2021-01-02    111
2 2021-01-03    105
3 2021-01-04    118
4 2021-01-05    104
```

[87]:
```
# PlOTTING
plt.figure(figsize=(20, 8))
plt.plot(clicks_by_date['datecl'], clicks_by_date['cl_id'], marker='o', color␣
 ↪='g')
plt.title('Daily Trends of Total Clicks')
plt.xlabel('Date')
plt.ylabel('Total Clicks')
plt.grid(True)
plt.show()
```



[43]:
```
successful_df = df[df['successful']] #CREATE NEW DATAFRAME WITH SUCCESSFUL␣
 ↪PAYMENTS
successful_df.head()
```

[43]:

	cl_id	successful	paid_amount	co_name	datecl	payment_method	mid	card_brand
1	8318	True	4446.48	Germany	2021-01-19	Bank transfers	266	Amex
2	9663	True	1862.80	United States	2021-02-05	E-Wallet	75	Visa
7	7336	True	2102.56	Finland	2021-03-21	Credit cards	39	JBC
9	3729	True	1824.76	Canada	2021-01-28	Mobile	282	Visa
12	5993	True	4968.88	Finland	2021-01-31	Credit cards	185	JBC

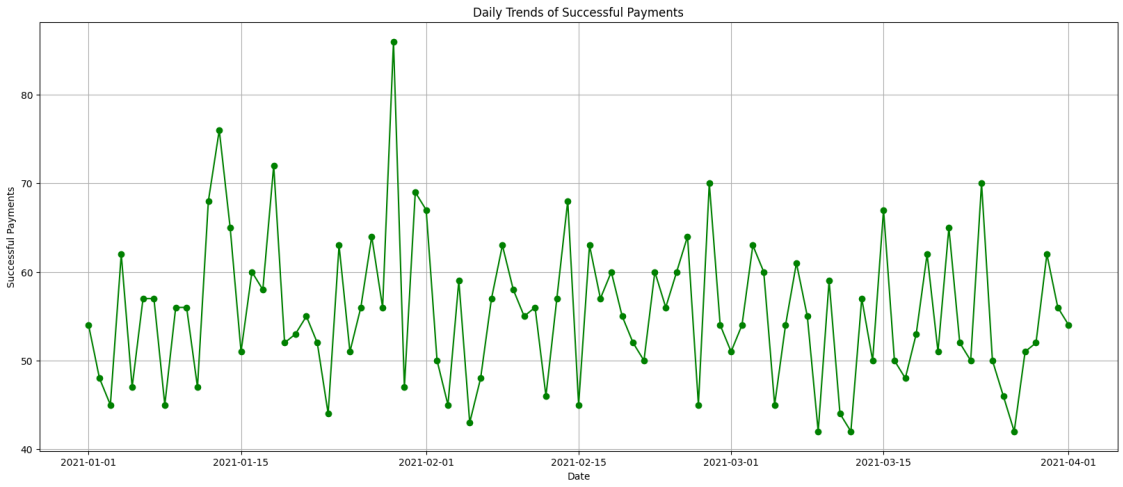
[59]:
```
successful_payments_by_date = successful_df.groupby('datecl').agg({'successful'␣
 ↪: 'count'}).reset_index() #GROUP SUCCESSFUL PAYMENTS BY DATE
```

```
successful_payments_by_date.head()
```

[59]:

	datecl	successful
0	2021-01-01	54
1	2021-01-02	48
2	2021-01-03	45
3	2021-01-04	62
4	2021-01-05	47

[89]:
```
# PLOTTING
plt.figure(figsize=(20, 8))
plt.plot(successful_payments_by_date['datecl'],␣
 ↪successful_payments_by_date['successful'], marker='o', color ='g')
plt.title('Daily Trends of Successful Payments')
plt.xlabel('Date')
plt.ylabel('Successful Payments')
plt.grid(True)
plt.show()
```

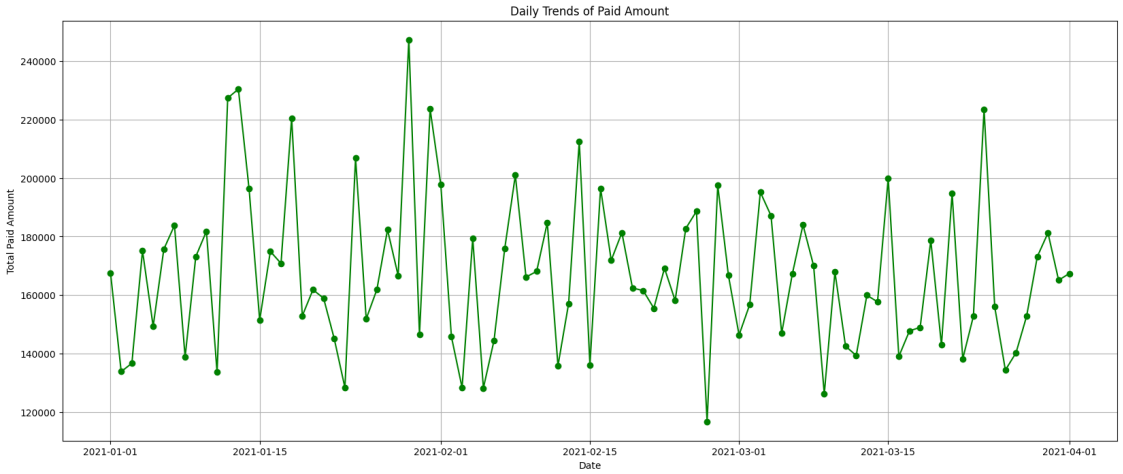


[57]:
```
paid_amount_by_date = successful_df.groupby('datecl').agg({'paid_amount' :␣
 ↪'sum'}).reset_index() #GROUP PAID AMOUNT BY DATE
paid_amount_by_date.head()
```

[57]:

	datecl	paid_amount
0	2021-01-01	167415.80
1	2021-01-02	133813.28
2	2021-01-03	136665.72
3	2021-01-04	175142.56
4	2021-01-05	149306.56

[83]:
```
# PLOTTING
plt.figure(figsize=(20, 8))
plt.plot(paid_amount_by_date['datecl'], paid_amount_by_date['paid_amount'],␣
 ↪marker='o', color ='g')
plt.title('Daily Trends of Paid Amount')
plt.xlabel('Date')
plt.ylabel('Total Paid Amount')
plt.grid(True)
plt.show()
```



[ ]:
```
#QUESTION 2: Who were the top 10 merchants in terms of paid amount? What are␣
 ↪merchants' contributions to the total paid amount overtime? Visualize their␣
 ↪daily traffic and comment on their performance.
```

[110]:
```
paid_amount_by_merchants = successful_df.groupby('mid')['paid_amount'].sum()␣
 ↪#GET TOP 10 MERCHANTS BY PAID AMOUNT
top_10_merchants = paid_amount_by_merchants.nlargest(10)
top_10_merchants
```

[110]:
```
mid
257    101363.28
216     95652.28
289     94224.72
35      83890.56
278     81417.80
73      80321.28
111     79944.08
17      79484.28
171     79434.88
54      79034.88
Name: paid_amount, dtype: float64
```

[111]:
```
filtered_df = successful_df[successful_df['mid'].isin(top_10_merchants.index)]␣
↪#CREATE NEW DATAFRAME WITH TOP 10 MERCHANTS
filtered_df.head()
```

[111]:

	cl_id	successful	paid_amount	co_name	datecl	payment_method	mid	card_brand
62	1112	True	2034.52	Turkey	2021-02-04	Credit cards	289	MasterCard
65	8001	True	2579.28	Norway	2021-01-12	Credit cards	111	MasterCard
156	3547	True	3036.48	Australia	2021-01-17	Prepaid cards	111	MasterCard
174	6118	True	3191.28	Denmark	2021-02-13	Prepaid cards	54	MasterCard
256	3118	True	2745.88	Finland	2021-02-17	Bank transfers	111	MasterCard

[112]:
```
merchant_contributions = filtered_df.groupby(['mid', 'datecl'])['paid_amount'].
↪sum().reset_index() #GROUP PAID AMOUNT BY MERCHANTS AND DATE
merchant_contributions.head()
```

[112]:

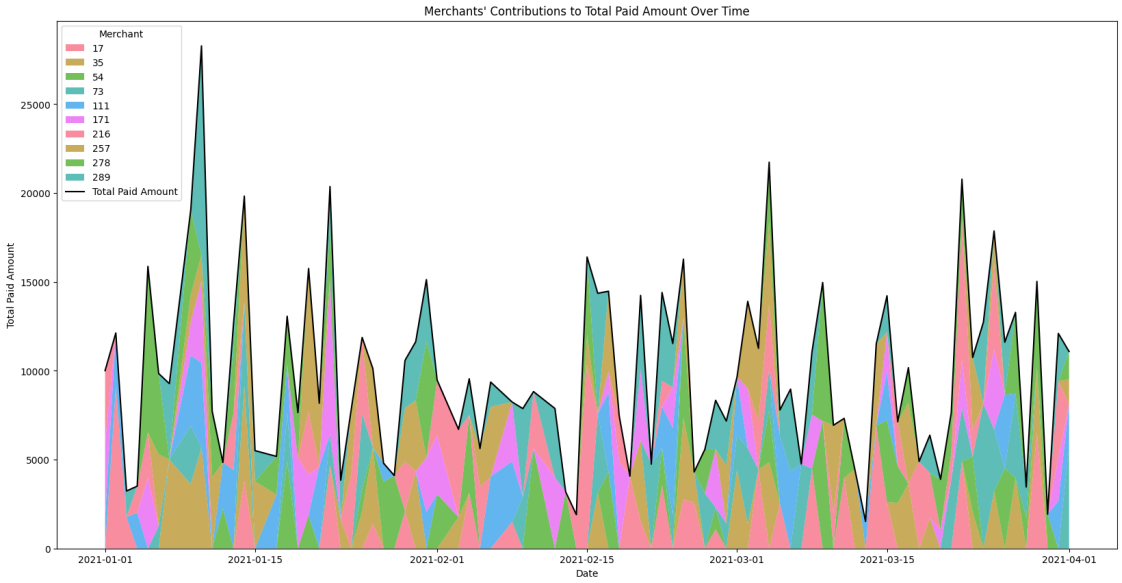
	mid	datecl	paid_amount
0	17	2021-01-02	9083.92
1	17	2021-01-03	1774.88
2	17	2021-01-14	3793.44
3	17	2021-01-22	4710.84
4	17	2021-01-26	1408.00

[123]:
```
pivot_table = merchant_contributions.pivot(index='datecl', columns='mid',␣
↪values='paid_amount').fillna(0) #PIVOT TABLE FOR PLOTTING

# PLOTTING
plt.figure(figsize=(20, 10))
plt.stackplot(pivot_table.index, pivot_table.values.T, labels=pivot_table.
↪columns, alpha=0.8)

total_paid_amount = pivot_table.sum(axis=1)
plt.plot(total_paid_amount.index, total_paid_amount, color='black',␣
↪linestyle='-', label='Total Paid Amount')


plt.title('Merchants\' Contributions to Total Paid Amount Over Time')
plt.xlabel('Date')
plt.ylabel('Total Paid Amount')
plt.legend(title='Merchant', loc='upper left')
plt.show()
```



- Among the top 10 merchants in terms of paid amount, there is noticeable diversity in their daily traffic patterns. Each merchant appears to have a unique trajectory, contributing to the overall variance in performance.
- Fluctuations in daily traffic across the top merchants may be influenced by seasonal trends, promotional events, or external factors. Analyzing these variations can provide insights into the impact of external events on merchant performance.
- While individual merchants exhibit varying patterns, identifying periods of consistent high traffic among the top 10 merchants is crucial. These high-performing periods could be associated with successful promotions, marketing campaigns, or product launches.
- The observed differences in traffic patterns suggest that a one-size-fits-all approach may not be suitable for the top 10 merchants. Tailoring marketing and promotional strategies based on each merchant's historical performance could optimize results.

[ ]:
```
#QUESTION 3: Which payment methods were being used (visualize their popularity␣
↪in terms of the number of clicks generated)?
```

[125]:
```
payment_methods = df['payment_method'].unique() #GET PAYMENT METHODS
print(f"The payment methods being used are {payment_methods}")
```

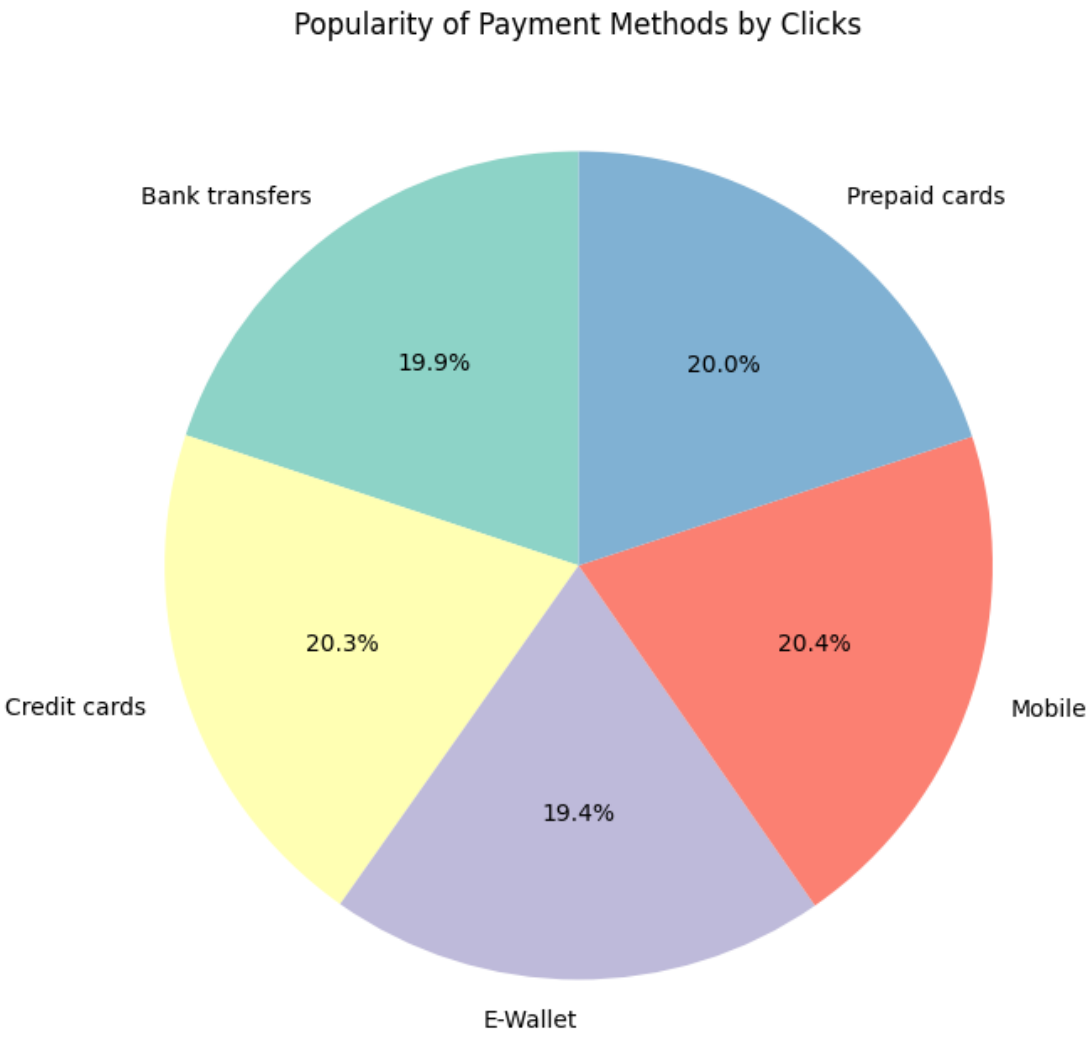
```
The payment methods being used are ['Mobile' 'Bank transfers' 'E-Wallet' 'Credit
cards' 'Prepaid cards']
```

[132]:
```
clicks_by_methods = df.groupby('payment_method').agg({'cl_id' : 'nunique'}).
↪reset_index() #GROUP CLICKS BY PAYMENT METHODS
clicks_by_methods
```

[132]:

	payment_method	cl_id
0	Bank transfers	1990
1	Credit cards	2033
2	E-Wallet	1944
3	Mobile	2037
4	Prepaid cards	1996

[134]:
```
#PLOTTING
plt.figure(figsize=(8, 8))
plt.pie(clicks_by_methods['cl_id'], labels=clicks_by_methods['payment_method'],␣
 ↪autopct='%1.1f%%', startangle=90, colors=plt.cm.Set3.colors)
plt.title('Popularity of Payment Methods by Clicks')
plt.show()
```



- The analysis of clicks by payment methods reveals a remarkably balanced distribution, with each method contributing approximately 20% to the total number of clicks.
- All payment methods, including Mobile, Bank transfers, E-Wallet, Credit cards, and Prepaid cards, exhibit an equal level of popularity, with no significant variations in click counts.
- The fact that users engage with different payment methods equally may indicate a lack of strong user preference for a particular method, showcasing a well-distributed user base.
- Given the equal popularity of payment methods, there may be an opportunity to promote specific methods or incentivize users to explore alternative payment options.

[ ]:
```
#QUESTION 4: Which countries did we process? What were the traffic and volume␣
↪(total paid amount and number of clicks) for each country? List top 10␣
↪countries with the highest average paid amount per successful payment.
```

[138]:
```
countries = df['co_name'].unique() #GET COUNTRIES NAMES
print(f"The countries being processed are {countries}")
```

```
The countries being processed are ['Canada' 'Germany' 'United States' 'Iran'
'Finland' 'Turkey'
 'Netherlands' 'Brazil' 'Switzerland' 'New Zealand' 'Australia' 'Norway'
 'United Kingdom' 'Ireland' 'France' 'Spain' 'Denmark']
```

[140]:
```
#GROUP PAID AMOUNT BY COUNTRY
paid_amount_by_country = successful_df.groupby('co_name').agg({'paid_amount':␣
↪'sum'}).sort_values(by='paid_amount', ascending=False).reset_index()
paid_amount_by_country
```

[140]:

	co_name	paid_amount
0	Norway	1010047.00
1	Denmark	986855.08
2	Australia	939779.36
3	Netherlands	926107.64
4	Iran	908760.56
5	United Kingdom	907950.36
6	Germany	907744.20
7	Switzerland	906108.56
8	Finland	898478.68
9	Turkey	894412.64
10	France	888674.76
11	United States	864295.96
12	Spain	859882.08
13	Brazil	853189.04
14	Ireland	847364.36
15	New Zealand	825658.32
16	Canada	783425.60

[141]:
```
#GROUP CLICKS BY COUNTRY
clicks_by_country = df.groupby('co_name').agg({'cl_id': 'nunique'}).
 ↪sort_values(by='cl_id', ascending=False).reset_index()
clicks_by_country
```

[141]:

	co_name	cl_id
0	Germany	637
1	Netherlands	620
2	Denmark	613
3	Norway	610
4	Australia	608
5	Iran	602
6	Spain	586
7	Switzerland	586
8	New Zealand	581
9	United Kingdom	580
10	Finland	580
11	Turkey	580
12	United States	575
13	Canada	571
14	Brazil	563
15	France	556
16	Ireland	552

[159]:
```
#GET TOP 10 COUNTRIES BY AVERAGE PAID AMOUNT
average_paid_amount = successful_df.groupby('co_name').agg({'paid_amount' :␣
 ↪'mean'})
average_paid_amount['paid_amount'] = average_paid_amount['paid_amount'].round(2)
top_10_average_paid_amount = average_paid_amount.sort_values(by='paid_amount',␣
 ↪ascending=False).head(10).reset_index()
top_10_average_paid_amount
```

[159]:

	co_name	paid_amount
0	United Kingdom	3174.65
1	Norway	3166.29
2	Iran	3091.02
3	Ireland	3070.16
4	Turkey	3063.06
5	Denmark	3045.85
6	Spain	3006.58
7	Australia	3002.49
8	Germany	2995.86
9	Finland	2994.93

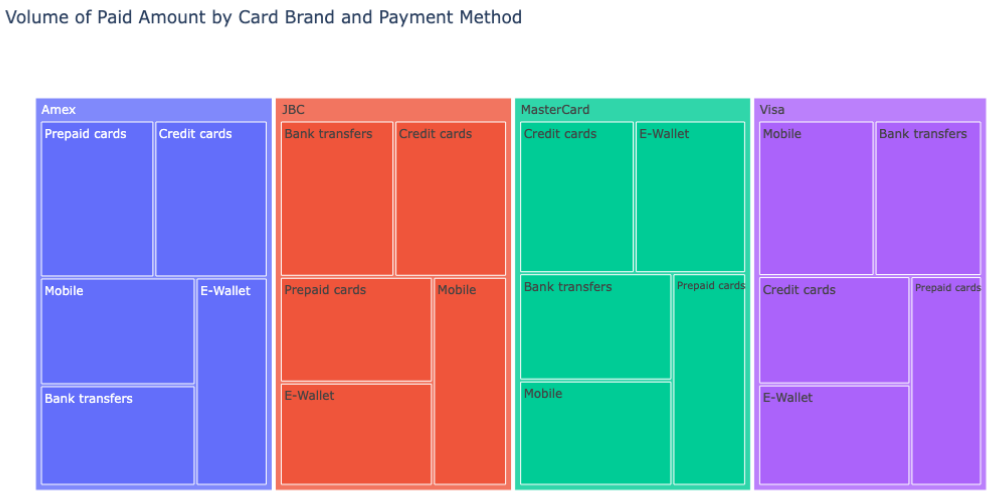
[ ]:
```
#QUESTION 5: What was the volume (total paid amount) of the card brand and␣
 ↪payment method? Visualize with Tree Map to show the proportion between␣
 ↪payment method and card brand (please visualize in 1 map).
```

[209]:
```
#GROUP PAID AMOUNT BY BRAND AND PAYMENT METHOD
volume_by_brand_method = successful_df.groupby(['card_brand',␣
 ↪'payment_method'])['paid_amount'].sum().reset_index()

#PLOTTING
fig = px.treemap(data_frame = volume_by_brand_method,
                 path=['card_brand', 'payment_method'],
                 values='paid_amount',
                 title='Volume of Paid Amount by Card Brand and Payment Method',
                )

fig.update_layout(
    width=1200,
    height=600,
)

fig.show()
```



- The chart helps identify the preferred payment methods for each card brand. A payment method that is popular for one brand may not be as prevalent for another. Understanding these preferences can inform marketing and partnership strategies.
- The varying distribution of payment methods across card brands indicates potential market segments with distinct payment preferences. Consider tailoring marketing campaigns or promotions based on these segments to maximize engagement
- For brands where a particular payment method is dominant, consider exploring strategic partnerships or collaborations with providers of that payment method to enhance the user experience and potentially attract more customers.

- Assess the competitive landscape by understanding how each card brand positions itself in terms of payment methods. Brands that offer a diverse set of payment options may appeal to a broader audience.