```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

Importing Libraries

```
import numpy as np
import random
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sn
import re
%matplotlib inline
```

Loading Data

```
df = pd.read_csv('/content/drive/MyDrive/Research/Datathon/DATATHON-UPDATED.txt', sep = '|')
```

Data Columns

```
df.columns
```

```
Index(['acct_id', 'VINTAGE_YEAR', 'STATE', 'GENERATION', 'AGE', 'FICO',
       'MONTHLY_INCOME', 'PRODUCT_SEGMENT', 'PARTNERBUSINESSKEY',
       'PARTNER_NAME', 'CREDIT_LIMIT', 'TRANSACTIONPOSTDT', 'TRANSACTIONAMT',
       'MERCHANTDESC', 'MCC', 'MCC_DESCRIPTION', 'SPENDCATEGORYNM', 'ENTRYNBR',
       'ME_BALANCE'],
      dtype='object')
```

Total Transactions

```
len(df)
```

```
3555741
```

Total Unique Customers

```
len(pd.unique(df['acct_id']))
```

```
50000
```

Missing values

```
df.isna().sum().sum()
```

```
7968
```

Missing value for each column

```
for i in df.columns:
  print(i,end=' : ')
  print(df[i].isna().sum())
```

```
acct_id : 0
VINTAGE_YEAR : 0
STATE : 1968
GENERATION : 0
AGE : 0
FICO : 0
MONTHLY_INCOME : 0
PRODUCT_SEGMENT : 0
PARTNERBUSINESSKEY : 0
PARTNER_NAME : 0
```

```
CREDIT_LIMIT : 0
TRANSACTIONPOSTDT : 0
TRANSACTIONAMT : 0
MERCHANTDESC : 1092
MCC : 0
MCC_DESCRIPTION : 4908
SPENDCATEGORYNM : 0
ENTRYNBR : 0
ME_BALANCE : 0
```

```
for x in range(1,50):
    print(x, end=' ')
    print(x-2-(2*(int((x-2)/7))),end='),(')
```

```
1 -1),(2 0),(3 1),(4 2),(5 3),(6 4),(7 5),(8 6),(9 5),(10 6),(11 7),(12 8),(13 9),(14 10),(15 11),(16 10),(17 11),(18 12),(19 13),(20 14
```

Feature Engineering

New Columns Date, Month, Days

```
df['date'] = pd.to_datetime(df['TRANSACTIONPOSTDT'])
month_day_count={1:0,2:31,3:59,4:90,5:120,6:151,7:181}
df['buy_month'] = df['date'].apply(lambda date:date.month)
df['time_series'] = df['date'].apply(lambda date:(date.day+month_day_count[date.month]))
df['buy_weekday'] = df['date'].apply(lambda date:date.day_name())
```

```
df['time_series'] = df['time_series'].apply(lambda x: x-2-(2*(int((x-2)/7))))
```

Merchant Name Extraction

```
df['Merchant_Name'] = df['MERCHANTDESC'].apply(lambda x: re.sub(r'[*|&|^|%|.|?|$|#|1|2|4|5|8|0]'," ",str(x)))
df['Merchant_Name'] = df['Merchant_Name'].apply(lambda x: str(x).strip().upper())
df['Merchant_Name'] = df['Merchant_Name'].apply(lambda x: x if (x[:3]=='THE' or x[:2]=='IN') else re.split(' ',str(x))[0] )
df['Merchant_Name'] = df['Merchant_Name'].apply(lambda x: 'AMAZON' if (x=='AMZN'  ) else x)
df['Merchant_Name'] = df['Merchant_Name'].apply(lambda x: 'WALMART' if (x=='WAL-MART' or x=='WM') else x)
df['Merchant_Name'] = df['Merchant_Name'].apply(lambda x: 'SAMSCLUB' if (x=='SAMS') else x)
```

```
mil=df[df['GENERATION']=='4. Millennials']
Gen_Z=df[df['GENERATION']=='5. Gen Z']
Boomers=df[df['GENERATION']=='2. Boomers']
```

```
both=df[(df['GENERATION']=='5. Gen Z')|(df['GENERATION']=='4. Millennials')]
```

Spend Category Name

```
pd.unique(Gen_Z['AGE'])
```

```
array([26, 24, 25, 23, 22, 21, 20])
```

Length

```
len(pd.unique(df['SPENDCATEGORYNM']))
```

```
23
```

```
pd.unique(df['MCC_DESCRIPTION'])
```

```
       'OMNI HOTEL ', 'MIRAGE HOTEL AND CASINO ', 'EMIRATES AIRLINES ',
       'HYATT PLACE', 'SHANGRI-LA INTERNATIONAL', 'AVIANCA', 'ANA HOTELS',
       'ELEC RAZOR STORES/SALE/SERV', 'MOTOR HOME DEALERS',
       'SILVER LEGACY HOTEL AND CASINO', 'CONTRACTORS - CONCRETE',
       'LOEWS HOTEL', 'EXCALIBUR HOTEL AND CASINO', 'AUTO PAINT SHOPS',
       'TENT AND AWNING SHOPS', "HARRAH'S HOTELS AND CASINOS",
       "CAESAR'S HOTEL AND CASINO", 'AUSTRIAN AIR',
       'VIRGIN RIVER HOTEL AND CASINO',
       'AIRPORTS, AIRPORT TERMINALS/FLYING FIELDS',
       'MONTE CARLO HOTEL AND CASINO', 'MILLENNIUM HOTELS',
       'CHINA AIRLINES', 'EUROP CAR', 'SNOWMOBILE DEALERS',
       'MICROTEL INNS & SUITES', 'COSMOPOLITAN OF LAS VEGAS',
       'RIO SUITES', 'MAINSTAY SUITES', 'SN BRUSSELS AIRLINES',
       'WILDERNESS HOTEL & RESORT', 'INTRA-GOVERNMENT PURCHASES',
       'IBERIA', 'ARIA', 'AIR MAROC', 'MOBILE HOME DEALERS',
       'STENOGRAPHIC SERVICES', 'PREMIER TRAVEL INNS',
       'SECURITY BROKERS/DEALERS', 'SMUGGLERS NOTCH RESORT',
       'RADISSON BLU', 'RAILROADS-FREIGHT', 'AIR-INDIA',
       'ROYAL KONA RESORT', 'PAYLESS CAR RENTAL', 'PARIS LAS VEGAS HOTEL',
       'INTER-CONTINENTAL', 'GOLDEN NUGGET', 'CARIBBEAN AIRLINES',
       'CLUB MED', 'ROSEN HOTELS AND RESORTS', 'LUXOR HOTEL AND CASINO',
       'EMBASSY HOTELS', 'TREASURE ISLAND HOTEL & CASINO',
       'RADISSON HOTEL', 'FONTAINEBLEAU RESORTS',
       'ECONOMY INNS OF AMERICA', 'THUNDERBIRD/RED LION',
       'SCANDIC HOTELS', 'AIR FRANCE', "BALLY'S HOTEL AND CASINO",
       'AEROFLOT', 'BAHAMASAIR', 'VENETIAN RESORT HOTEL CASINO',
       'ANTIQUE REPRODUCTION STORES', 'WALDORF', 'LA QUINTA RESORT',
       'FURRIERS AND FUR SHOPS', 'EASYJET', 'WIZZ AIRLINES',
       'TROPICANA RESORT & CASINO', 'NEW YORK-NEW YORK HOTEL+CASINO',
       'GAYLORD PALMS', 'CROSSLAND', 'SWISSOTEL', 'PAKISTAN',
       'VIRGIN ATLANTIC', 'BEAU RIVAGE HOTEL AND CASINO',
       'OUTBOUND TELEMARKETING MERCHNT', 'DIRECT MKTG-TRAVEL RELATED ARR',
       'MERIDIEN', 'SOFITEL HOTELS', 'FAIRFIELD HOTEL',
       'STRATOSPHERE HOTEL AND CASINO', 'FOUR SEASONS', 'MIDEASTAIR',
       'QATAR AIRWAYS', 'EGYPTAIR', 'OSTEOPATHS', 'HOTELES EL PRESIDENTE',
       'PAL AIR', 'NOVOTEL', 'GULF AIR (BAHRAIN)', 'LAN AIR',
       'HILTON CONRAD', 'KOREAN AIR', 'HARVEY/BRISTOL HOTELS',
       'TACA INTERNATIONAL', 'TAP AIR', 'HILTON INTERNATIONAL',
       'SAUDIA AIR', 'SHILO INN', 'AFFILIATED AUTO RENTAL',
       'BUDGET HOST INNS', 'DIRECT SELL/DOOR-TO-DOOR', 'WYNN LAS VEGAS',
       'CANOPY HOTELS', 'ALITALIA', 'SANDMAN HOTELS', 'LXR',
       'PEPPERMILL HOTEL CASINO', 'PARK INNS INTERNATIONAL',
       'THE PALACE HOTEL', "SAM'S TOWN HOTEL AND CASINO",
       'BILTMORE HOTEL & SUITES', "SHONEY'S INN", 'ROYAL HOTELS', 'SAS',
       'HOTELES MELIA', 'GRAND SIERRA RESORT', 'ETIHADAIR',
       'WINDWARD ISLAND', 'AUTOMOBILE SUPPLY STORES', 'ST. REGIS HOTEL',
       'ALA MOANA HOTEL', 'CATHAYPACAIR', 'SWISS INTERNATIONAL AIRLINES',
       'OXFORD SUITES', "WHISKEY PETE'S HOTEL & CASINO", 'SANDMAN INN',
       'AZUL AIR', 'CARLTON HOTELS', 'CITY LODGE HOTELS', 'STEIGENBERGER',
       'CHATEAU ELAN WINERY AND RESORT', 'PULLMAN INTERNATIONAL HOTELS',
       'FREMONT HOTEL AND CASINO'], dtype=object)
```

```
len(pd.unique(df['MCC_DESCRIPTION']))
```

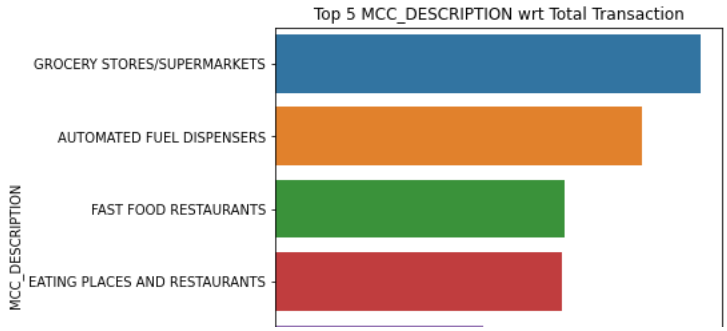
```
506
```

State

```
pd.unique(df['STATE'])
```

```
array(['AZ', 'NY', 'FL', 'TX', 'KY', 'MA', 'MI', 'CA', 'NE', 'SC', 'DC',
       'NC', 'NJ', 'VA', 'OK', 'NV', 'IA', 'MN', 'IL', 'SD', 'LA', 'NM',
       'MO', 'WA', 'MS', 'WV', 'MD', 'OH', 'TN', 'WI', 'IN', 'CO', 'GA',
       'AL', 'ID', 'HI', 'UT', 'KS', 'ND', 'PA', 'AR', 'MT', 'CT', 'NH',
       'OR', 'VT', 'ME', 'RI', 'DE', 'WY', nan, 'GU', 'PR', 'AK', 'AE',
       'TEX', 'VI', 'AP'], dtype=object)
```

```
x=df['MCC_DESCRIPTION'].value_counts()[:6].rename_axis('MCC_DESCRIPTION').reset_index(name='Total')
plt.figure(figsize = (6,6))
sn.barplot(x="Total", y="MCC_DESCRIPTION", data=x,label="MCC_DESCRIPTION").set(title='Top 5 MCC_DESCRIPTION wrt Total Transaction',xlabel="Am
plt.savefig("/content/drive/MyDrive/Research/Datathon/Figure/Top 5 MCC_DESCRIPTION wrt Total Transaction.png")
```




```
len(pd.unique(df['STATE']))
```

```
58
```

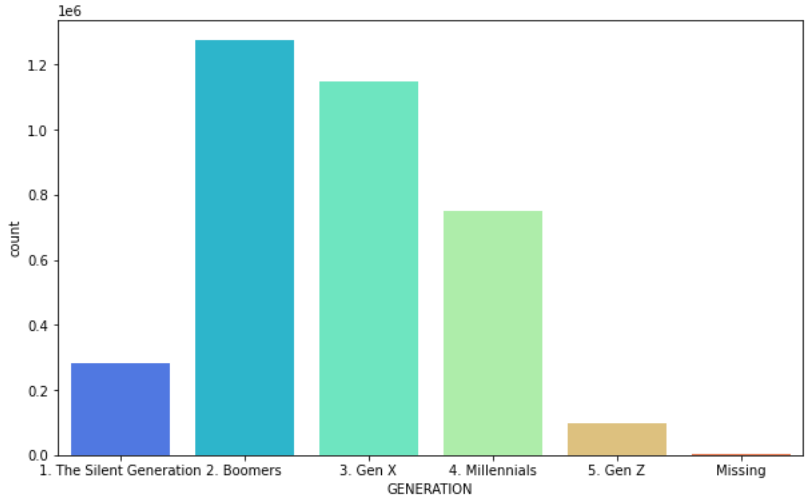
Generation

```
pd.unique(df['GENERATION'])
```

```
array(['1. The Silent Generation', '2. Boomers', '3. Gen X',
       '4. Millennials', '5. Gen Z', 'Missing'], dtype=object)
```

```
plt.figure(figsize = (10,6))
sn.countplot(x='GENERATION', data = df,  palette = 'rainbow')
```

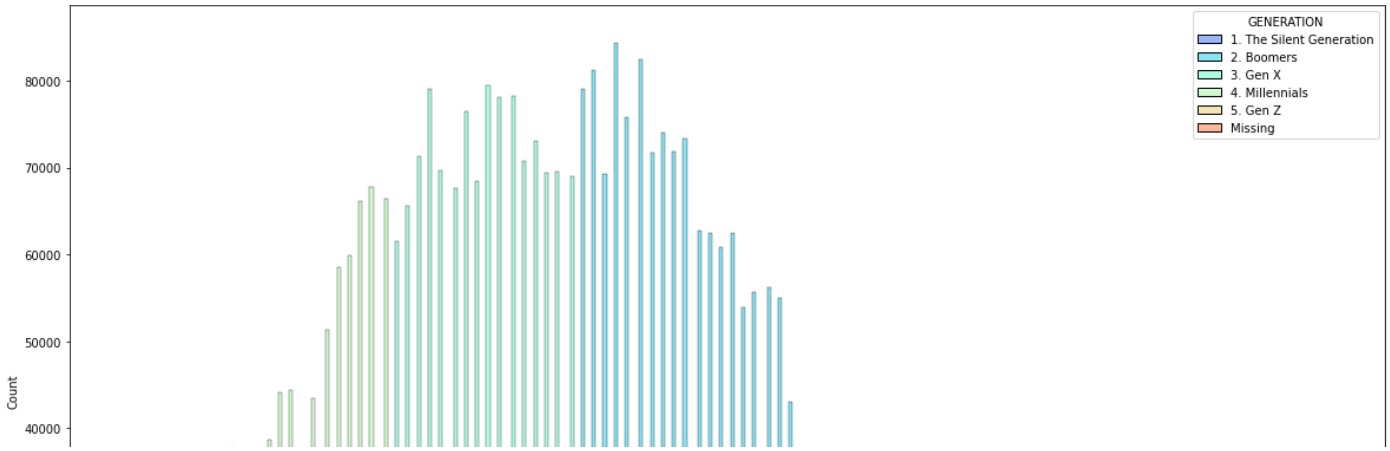
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f1826ec4f50>
```



AGE

```
plt.figure(figsize = (20,12))
sn.histplot(x='AGE', data = df, hue='GENERATION', palette = 'rainbow')
```

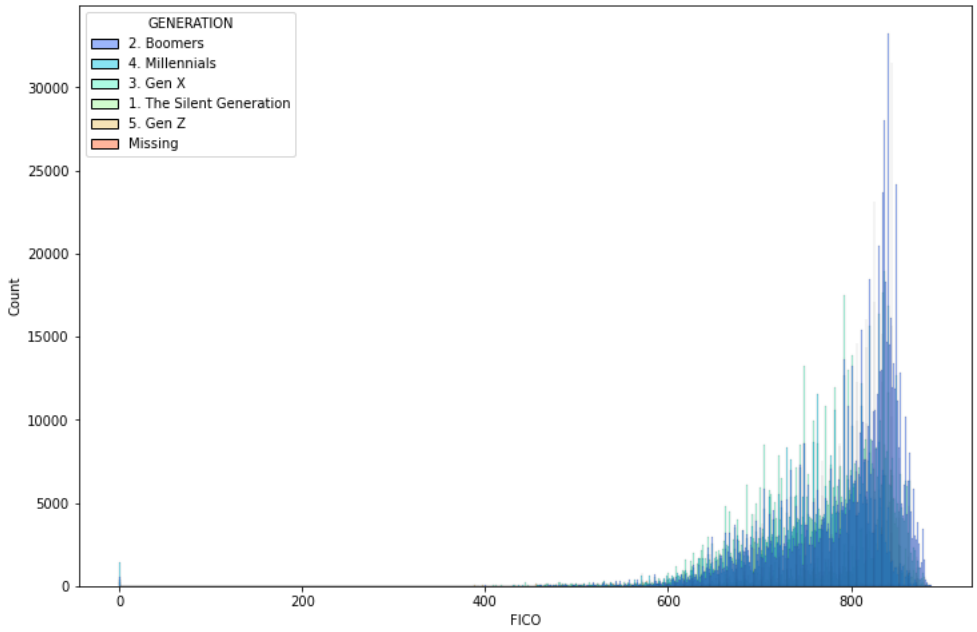
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fbb3f8c1350>
```



FICO

```
plt.figure(figsize = (12,8))
sn.histplot(x='FICO', data = df, hue='GENERATION', palette = 'rainbow')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fbfedf11490>
```



GEN_Z FICO

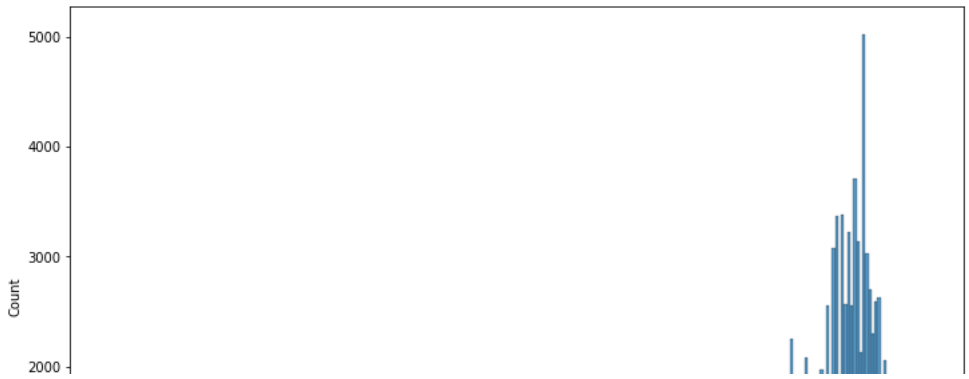
```
Gen_Z=df[df['GENERATION']=='5. Gen Z']
```

```
len(Gen_Z)
```

```
99588
```

```
plt.figure(figsize = (12,8))
sn.histplot(x='FICO', data = Gen_Z,  palette = 'rainbow')
```

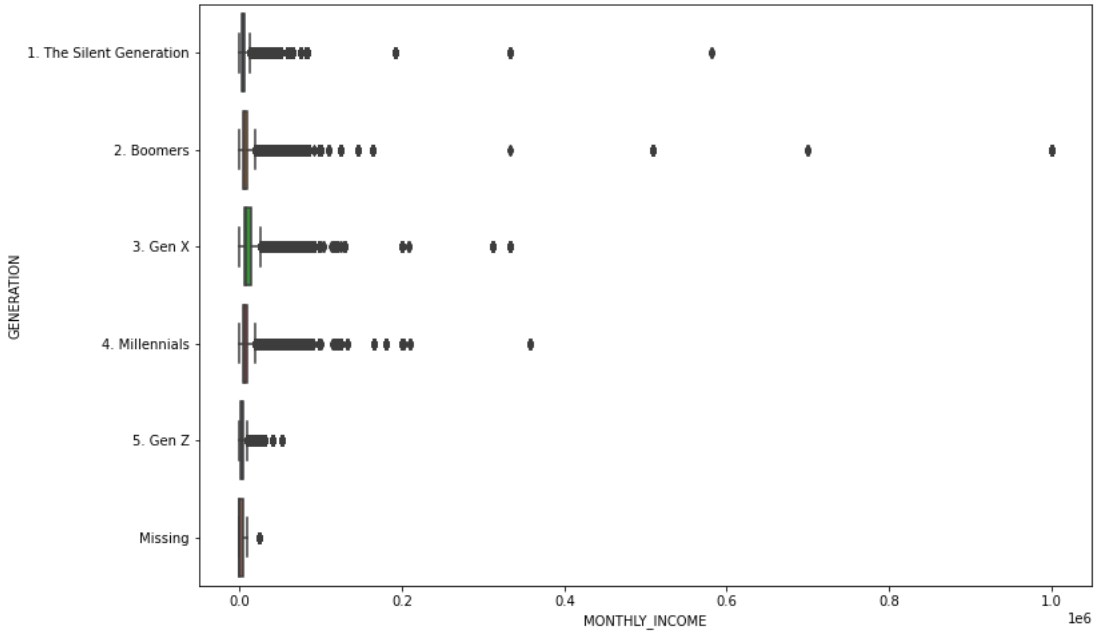
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fbb3d953d10>
```



Monthly_Income

```
plt.figure(figsize = (12,8))
sn.boxplot(x='MONTHLY_INCOME', data = df, y='GENERATION')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fbb3cfe8290>
```

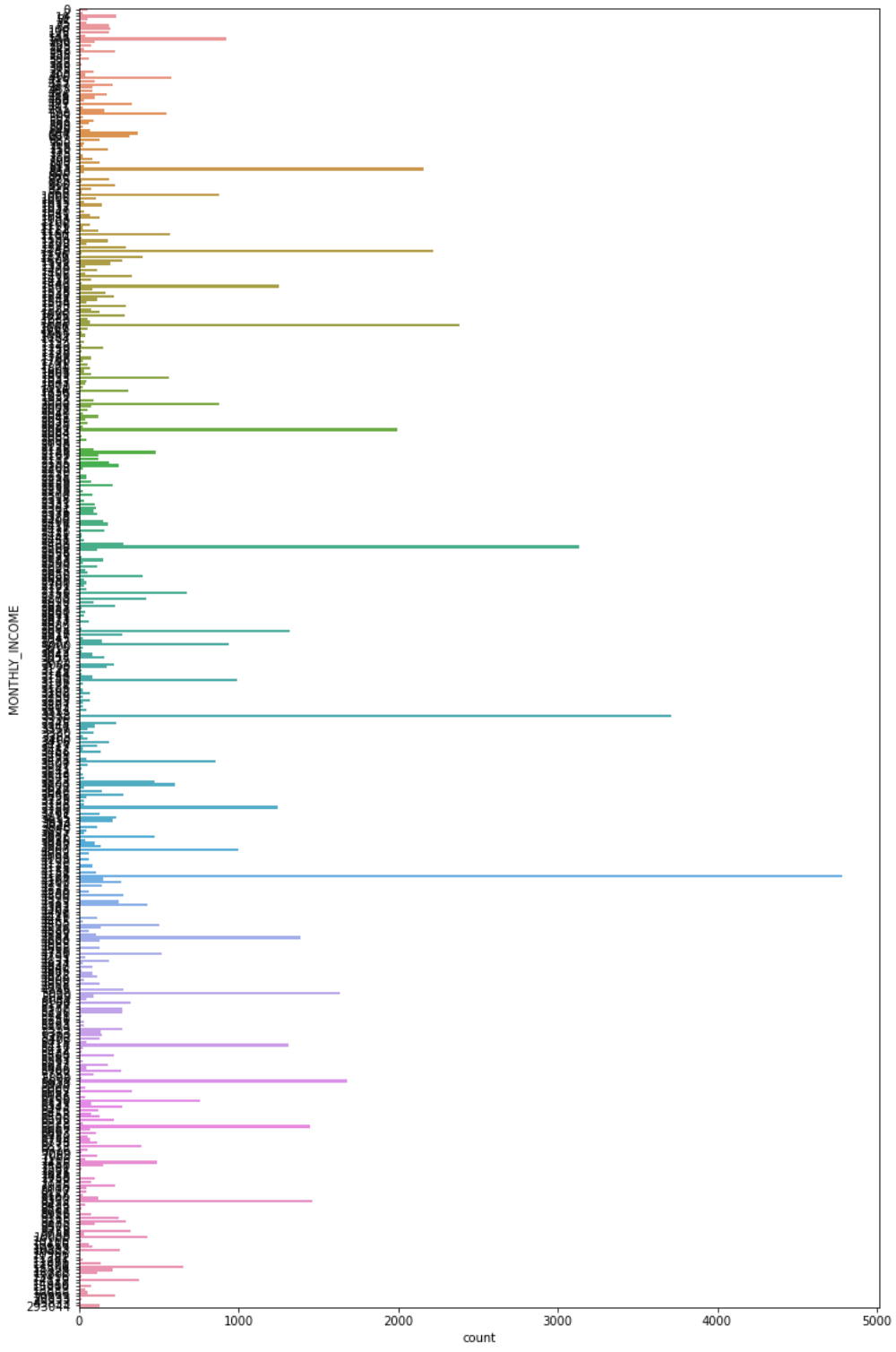



```
plt.figure(figsize = (12,8))
sn.boxplot(x='MONTHLY_INCOME', data = Gen_Z)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fbb3d071890>
```

```
plt.figure(figsize = (12,20))
sn.countplot(y='MONTHLY_INCOME', data = Gen_Z)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fbfa01eb0d0>
```



SPEND CATEGORY Name

```
pd.unique(df['SPENDCATEGORYNM'])
```

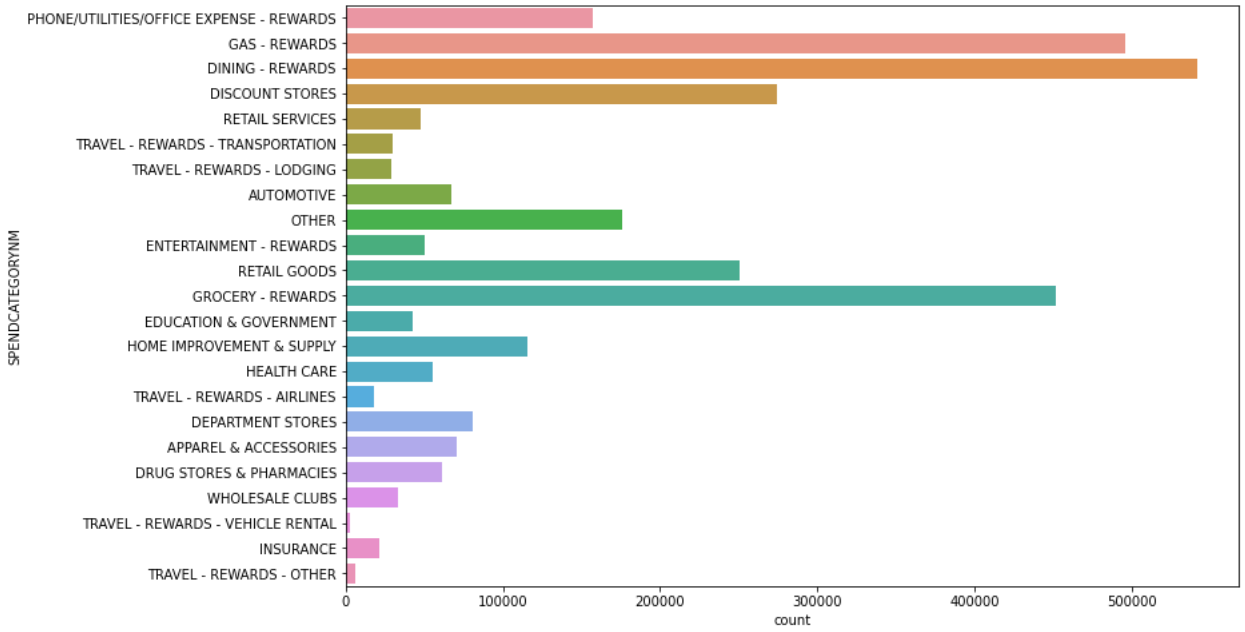
```
array(['PHONE/UTILITIES/OFFICE EXPENSE - REWARDS', 'GAS - REWARDS',
       'DINING - REWARDS', 'DISCOUNT STORES', 'RETAIL SERVICES',
       'TRAVEL - REWARDS - TRANSPORTATION', 'TRAVEL - REWARDS - LODGING',
```

```
'AUTOMOTIVE', 'OTHER', 'ENTERTAINMENT - REWARDS', 'RETAIL GOODS',
'GROCERY - REWARDS', 'EDUCATION & GOVERNMENT',
'HOME IMPROVEMENT & SUPPLY', 'HEALTH CARE',
'TRAVEL - REWARDS - AIRLINES', 'DEPARTMENT STORES',
'APPAREL & ACCESSORIES', 'DRUG STORES & PHARMACIES',
'WHOLESALE CLUBS', 'TRAVEL - REWARDS - VEHICLE RENTAL',
'INSURANCE', 'TRAVEL - REWARDS - OTHER'], dtype=object)
```

For ALL

```
plt.figure(figsize = (12,8))
sn.countplot(y='SPENDCATEGORYNM', data = df)
```

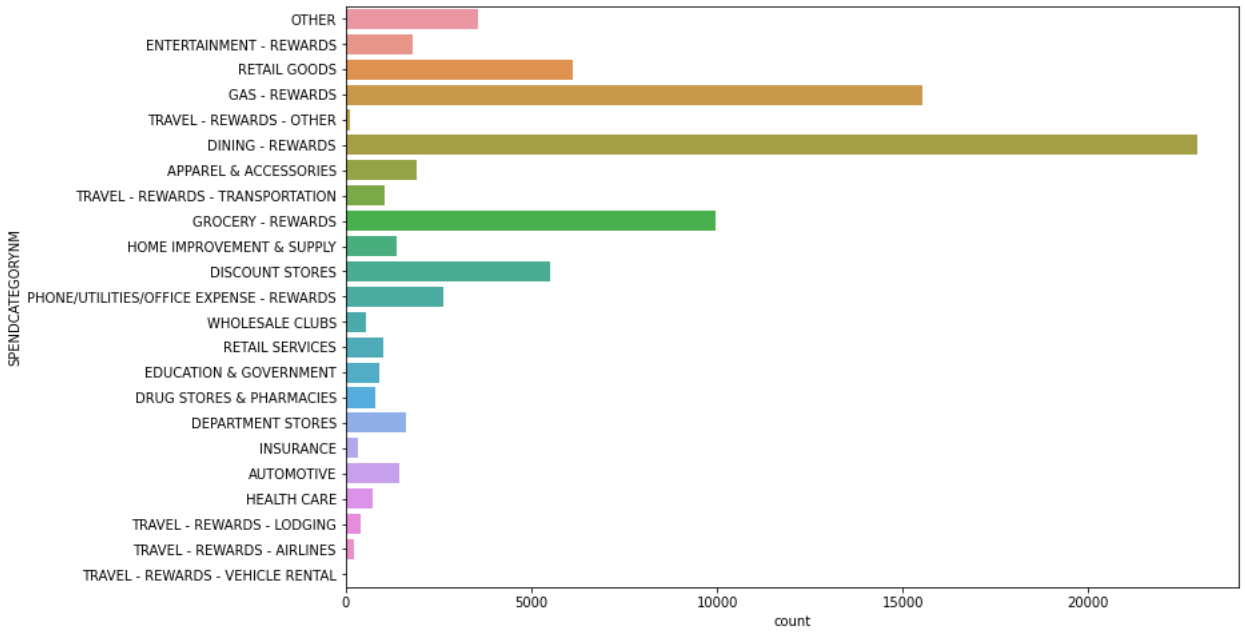
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fbfa28c4c10>
```



Gen_z

```
plt.figure(figsize = (12,8))
sn.countplot(y='SPENDCATEGORYNM', data = Gen_Z)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fbf94afbd50>
```



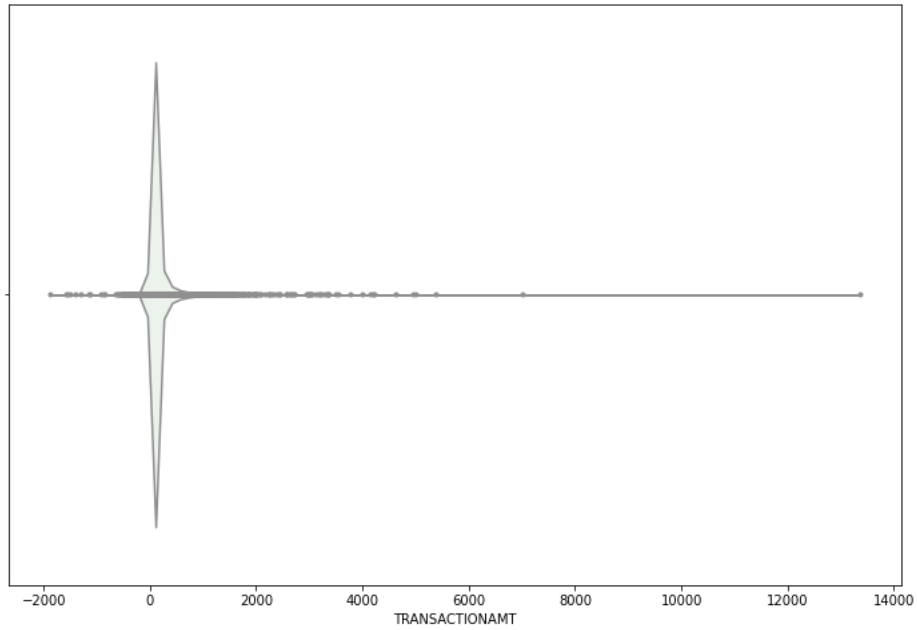
Spend Amount

```
Gen_Z['TRANSACTIONAMT'].describe()
```

```
count    80461.000000
mean        46.087254
std        138.685144
min      -1871.720000
25%          8.960000
50%         19.980000
75%         45.540000
max      13355.910000
Name: TRANSACTIONAMT, dtype: float64
```

```
plt.figure(figsize = (12,8))
sn.violinplot(data=Gen_Z,x='TRANSACTIONAMT', palette="light:g", inner="points", orient="h")
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fab2282ccd0>
```



ME_BALANCE

```
Gen_Z['ME_BALANCE'].describe()
```

```
count    80461.000000
mean      1099.261547
std       1488.314599
min      -1375.940000
25%        219.430000
50%        604.500000
75%       1385.280000
max      13891.910000
Name: ME_BALANCE, dtype: float64
```

```
plt.figure(figsize = (12,8))
sn.violinplot(data=Gen_Z,x='ME_BALANCE', palette="light:g", inner="points", orient="h")
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fab1c954710>
```

Gen_Z

```
Gen_Z=df[df['GENERATION']=='5. Gen Z']
```

'2. Boomers'

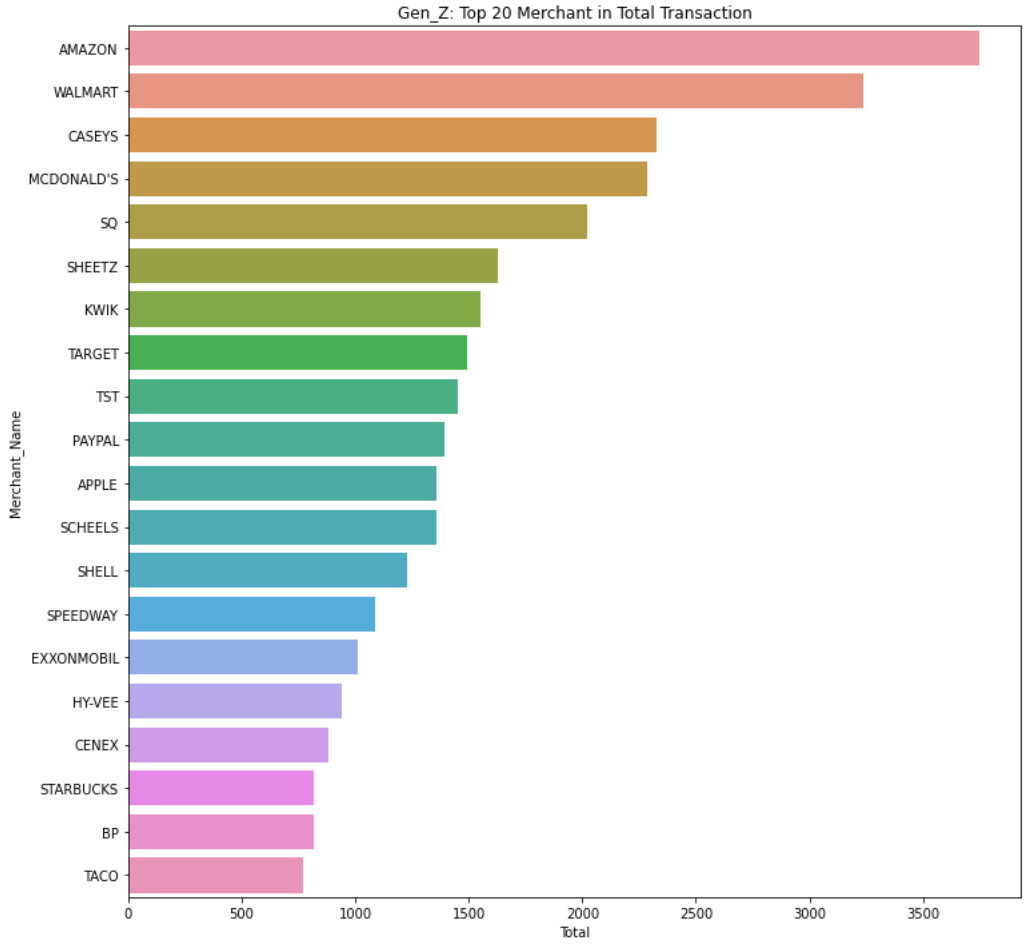
```
Boomers=df[df['GENERATION']=='2. Boomers']
```

```
x=Gen_Z['MCC_DESCRIPTION'].value_counts()[:20].rename_axis('MCC_DESCRIPTION').reset_index(name='Total')
plt.figure(figsize = (12,12))
sn.barplot(x="Total", y="MCC_DESCRIPTION", data=x,label="MCC_DESCRIPTION").set(title='Gen_Z: Top 20 MCC_DESCRIPTION wrt Total Transaction')
plt.savefig("/content/drive/MyDrive/Research/Datathon/Figure/Gen_Z Top 20 Top 20 MCC_DESCRIPTION wrt Total Transaction.png")
```

Top 20 Merchant wrt to Total transaction by Gen_Z

```
x=Gen_Z['Merchant_Name'].value_counts()[:20].rename_axis('Merchant_Name').reset_index(name='Total')
plt.figure(figsize = (12,12))
sn.barplot(x="Total", y="Merchant_Name", data=x,label="Merchant_Name").set(title='Gen_Z: Top 20 Merchant in Total Transaction')
#plt.savefig("/content/drive/MyDrive/Research/Datathon/Figure/Gen_Z Top 20 Merchant in Total Spent.png")
```

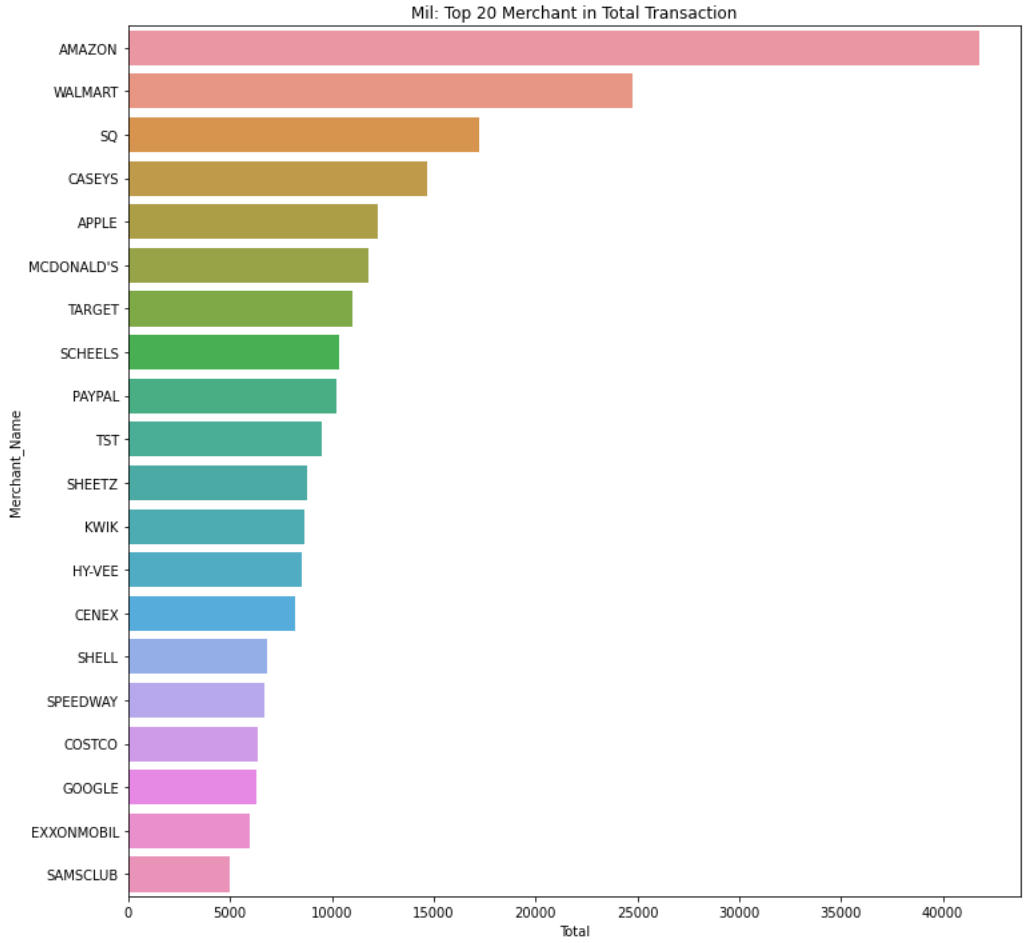
```
[Text(0.5, 1.0, 'Gen_Z: Top 20 Merchant in Total Transaction')]
```



MIL

```
x=mil['Merchant_Name'].value_counts()[:20].rename_axis('Merchant_Name').reset_index(name='Total')
plt.figure(figsize = (12,12))
sn.barplot(x="Total", y="Merchant_Name", data=x,label="Merchant_Name").set(title='Mil: Top 20 Merchant in Total Transaction')
#plt.savefig("/content/drive/MyDrive/Research/Datathon/Figure/Gen_Z Top 20 Merchant in Total Spent.png")
```

```
[Text(0.5, 1.0, 'Mil: Top 20 Merchant in Total Transaction')]
```




```
'SCHOOLS - DEFAULT''COMPUTERS/PERIPHERALS/SOFTWARE''RECREATION SERVICES''TOURIST ATTRACTIONS AND XHBT''STATIONERY STORES',
```

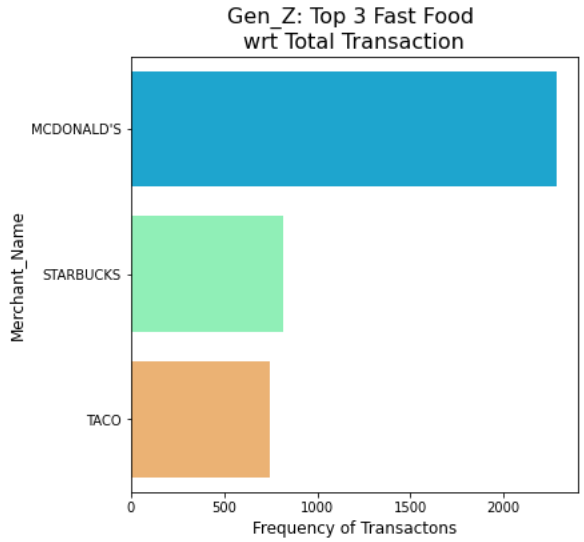
```
df['MCC_DESCRIPTION'].unique()
```

```
'INTER-CONTINENTAL ', 'GOLDEN NUGGET ', 'CARIBBEAN AIRLINES ',
'CLUB MED', 'ROSEN HOTELS AND RESORTS', 'LUXOR HOTEL AND CASINO',
'EMBASSY HOTELS', 'TREASURE ISLAND HOTEL & CASINO',
'RADISSON HOTEL', 'FONTAINEBLEAU RESORTS',
'ECONOMY INNS OF AMERICA', 'THUNDERBIRD/RED LION',
'SCANDIC HOTELS', 'AIR FRANCE', "BALLY'S HOTEL AND CASINO",
'AEROFLOT', 'BAHAMASAIR', 'VENETIAN RESORT HOTEL CASINO',
'ANTIQUE REPRODUCTION STORES', 'WALDORF', 'LA QUINTA RESORT',
'FURRIERS AND FUR SHOPS', 'EASYJET', 'WIZZ AIRLINES',
'TROPICANA RESORT & CASINO', 'NEW YORK-NEW YORK HOTEL+CASINO',
'GAYLORD PALMS', 'CROSSLAND', 'SWISSOTEL', 'PAKISTAN',
'VIRGIN ATLANTIC', 'BEAU RIVAGE HOTEL AND CASINO',
'OUTBOUND TELEMARKETING MERCHNT', 'DIRECT MKTG-TRAVEL RELATED ARR',
'MERIDIEN', 'SOFITEL HOTELS', 'FAIRFIELD HOTEL',
'STRATOSPHERE HOTEL AND CASINO', 'FOUR SEASONS', 'MIDEASTAIR',
'QATAR AIRWAYS', 'EGYPTAIR', 'OSTEOPATHS', 'HOTELES EL PRESIDENTE',
'PAL AIR', 'NOVOTEL', 'GULF AIR (BAHRAIN)', 'LAN AIR',
'HILTON CONRAD', 'KOREAN AIR', 'HARVEY/BRISTOL HOTELS',
'TACA INTERNATIONAL', 'TAP AIR', 'HILTON INTERNATIONAL',
'SAUDIA AIR', 'SHILO INN', 'AFFILIATED AUTO RENTAL',
'BUDGET HOST INNS', 'DIRECT SELL/DOOR-TO-DOOR', 'WYNN LAS VEGAS',
'CANOPY HOTELS', 'ALITALIA', 'SANDMAN HOTELS', 'LXR',
'PEPPERMILL HOTEL CASINO', 'PARK INNS INTERNATIONAL',
'THE PALACE HOTEL', "SAM'S TOWN HOTEL AND CASINO",
'BILTMORE HOTEL & SUITES', "SHONEY'S INN", 'ROYAL HOTELS', 'SAS',
'HOTELES MELIA', 'GRAND SIERRA RESORT', 'ETIHADAIR',
'WINDWARD ISLAND', 'AUTOMOBILE SUPPLY STORES', 'ST. REGIS HOTEL',
'ALA MOANA HOTEL', 'CATHAYPACAIR', 'SWISS INTERNATIONAL AIRLINES',
'OXFORD SUITES', "WHISKEY PETE'S HOTEL & CASINO", 'SANDMAN INN',
'AZUL AIR', 'CARLTON HOTELS', 'CITY LODGE HOTELS', 'STEIGENBERGER',
'CHATEAU ELAN WINERY AND RESORT', 'PULLMAN INTERNATIONAL HOTELS',
'FREMONT HOTEL AND CASINO'], dtype=object)
```

MCC_Description

```
x=data['Merchant_Name'].value_counts()[:3].rename_axis('Merchant_Name').reset_index(name='Total')
fig=plt.figure(figsize = (6,6))
plt.title('Gen_Z: Top 3 Fast Food \nwrt Total Transaction', fontsize=16)
plt.xlabel('xlabel', fontsize=12)
plt.ylabel('ylabel', fontsize=12)
sn.barplot(x="Total", y="Merchant_Name", data=x,label="Merchant_Name", palette='rainbow').set(ylabel="Merchant_Name",xlabel="Frequency of Trai
#plt.savefig("/content/drive/MyDrive/Research/Datathon/Figure/Gen_Z Top 20 Top 20 MCC_DESCRIPTION wrt Total Transaction.png")
```

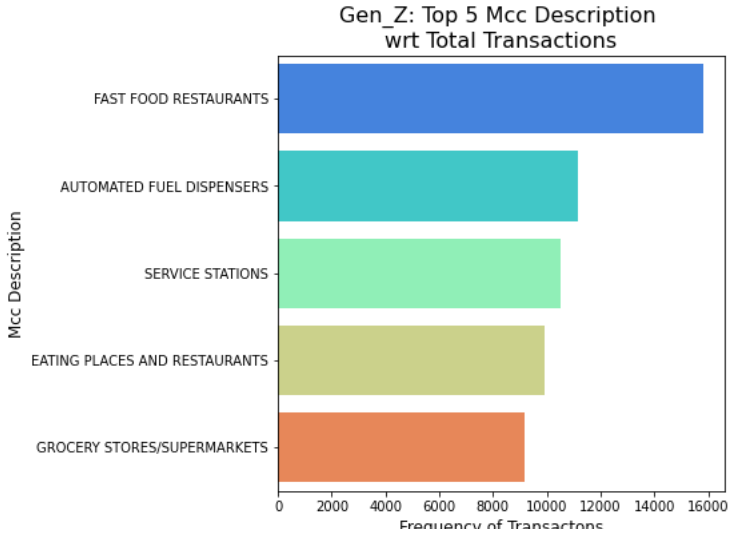
```
[Text(0, 0.5, 'Merchant_Name'), Text(0.5, 0, 'Frequency of Transactons')]
```



MIL

```
x=Gen_Z['MCC_DESCRIPTION'].value_counts()[:5].rename_axis('MCC_DESCRIPTION').reset_index(name='Total')
fig=plt.figure(figsize = (6,6))
plt.title('Gen_Z: Top 5 Mcc Description \nwrt Total Transactions', fontsize=16)
plt.xlabel('xlabel', fontsize=12)
plt.ylabel('ylabel', fontsize=12)
sn.barplot(x="Total", y="MCC_DESCRIPTION", data=x,label="Mcc Description", palette='rainbow').set(ylabel="Mcc Description",xlabel="Frequency
#plt.savefig("/content/drive/MyDrive/Research/Datathon/Figure/Gen_Z Top 20 Top 20 MCC_DESCRIPTION wrt Total Transaction.png")
```

```
[Text(0, 0.5, 'Mcc Description'), Text(0.5, 0, 'Frequency of Transactons')]
```

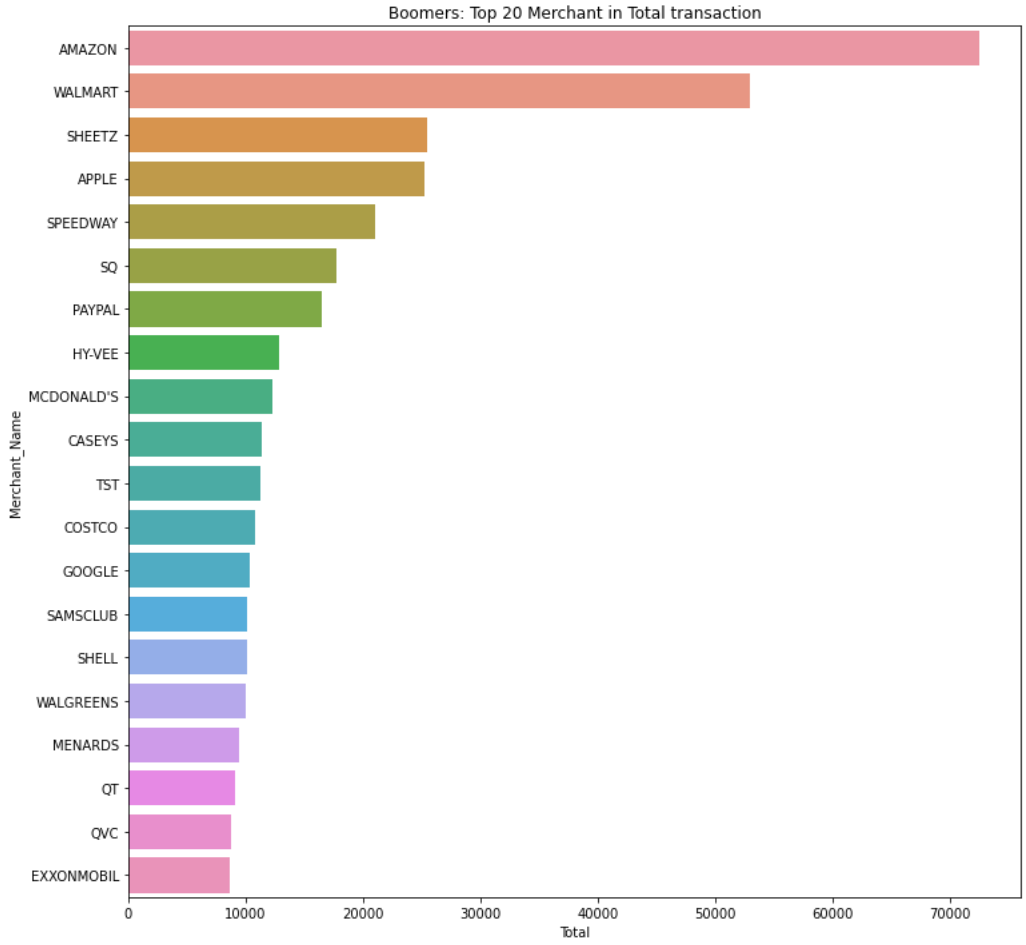



```
x['MCC_DESCRIPTION'].unique()
```

```
array(['FAST FOOD RESTAURANTS', 'AUTOMATED FUEL DISPENSERS',
       'SERVICE STATIONS', 'EATING PLACES AND RESTAURANTS',
       'GROCERY STORES/SUPERMARKETS'], dtype=object)
```

TOP 20 Merchant wrt total transaction for Boomers

```
x=Boomers['Merchant_Name'].value_counts()[:20].rename_axis('Merchant_Name').reset_index(name='Total')
plt.figure(figsize = (12,12))
sn.barplot(x="Total", y="Merchant_Name", data=x,label="Merchant_Name").set(title='Boomers: Top 20 Merchant in Total transaction')
plt.savefig("/content/drive/MyDrive/Research/Datathon/Figure/Boomers Top 20 Merchant in Total transaction.png")
```



Top 20 Merchant wrt total spending Gen_Z

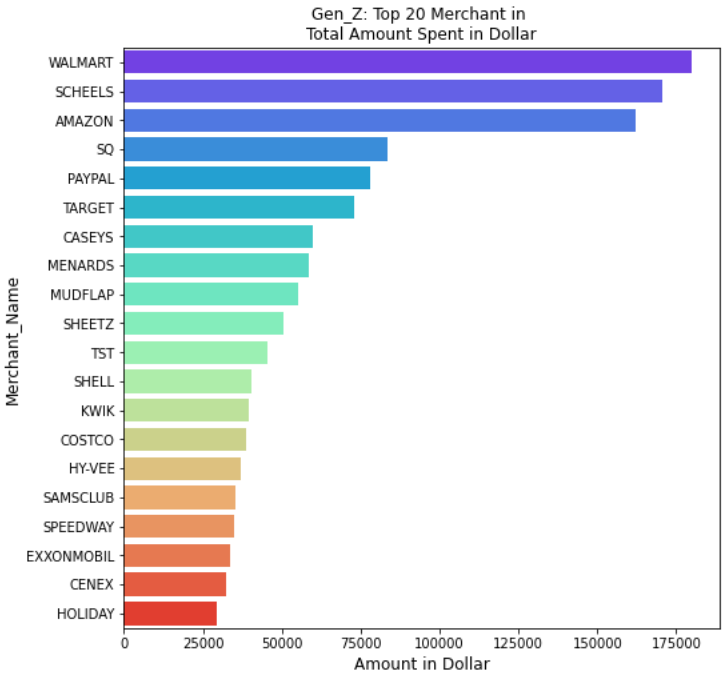
```
x=Gen_Z['Merchant_Name'].value_counts().rename_axis('Merchant_Name').reset_index(name='Total_Transactions')
avg_transaction = pd.DataFrame(Gen_Z.groupby('Merchant_Name')['TRANSACTIONAMT'].mean())
total_transaction = pd.DataFrame(Gen_Z.groupby('Merchant_Name')['TRANSACTIONAMT'].sum())
unique_customer = pd.DataFrame(Gen_Z.groupby('Merchant_Name')['acct_id'].nunique())
merchant_avg=pd.merge(x, avg_transaction, on = 'Merchant_Name')
merchant_all=pd.merge(merchant_avg, total_transaction, on = 'Merchant_Name')
merchant_all=pd.merge(merchant_all, unique_customer, on = 'Merchant_Name')
merchant_all_min_trans_30=merchant_all[merchant_all['Total_Transactions']>30]
merchant_all_min_trans_30=merchant_all_min_trans_30.rename(columns={"TRANSACTIONAMT_x": "AVG", "TRANSACTIONAMT_y": "SUM"})


Gen_Z_Top_merchant=merchant_all_min_trans_30.nlargest(n=20, columns=['SUM'])
```

```
fig=plt.figure(figsize = (8,8))
plt.title('Gen_Z: Top 5 Mcc Description wrt Total Transaction', fontsize=16)
plt.xlabel('xlabel', fontsize=12)
plt.ylabel('ylabel', fontsize=12)
sn.barplot(x="SUM", y="Merchant_Name", data=Gen_Z_Top_merchant,label="Merchant_Name", palette='rainbow').set(title='Gen_Z: Top 20 Merchant in

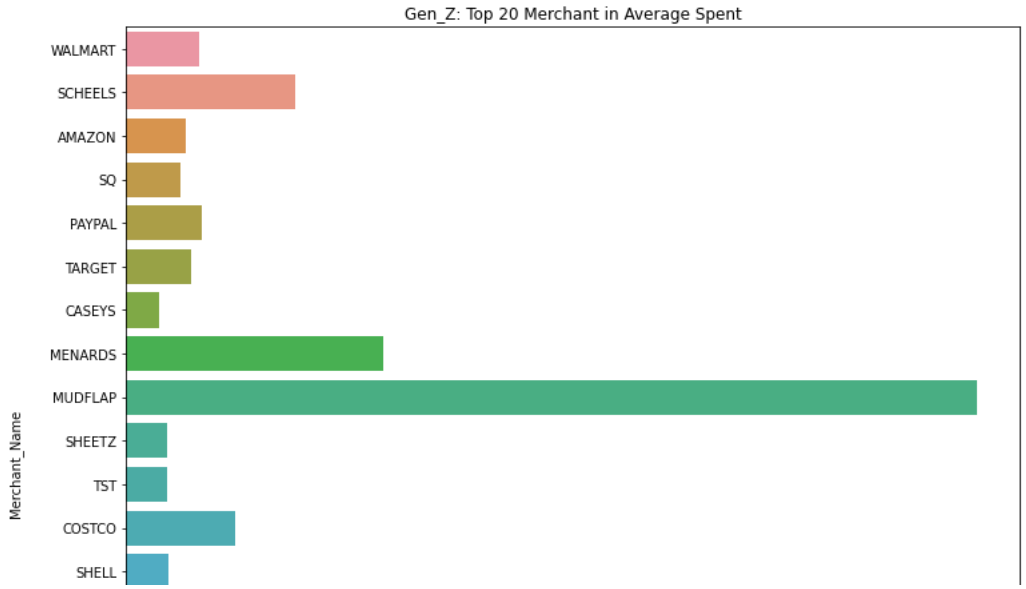
#plt.savefig("/content/drive/MyDrive/Research/Datathon/Figure/Gen_Z Top 20 Merchant in Total Spent.png")
```

```
[Text(0.5, 0, 'Amount in Dollar'),
 Text(0.5, 1.0, 'Gen_Z: Top 20 Merchant in \nTotal Amount Spent in Dollar')]
```



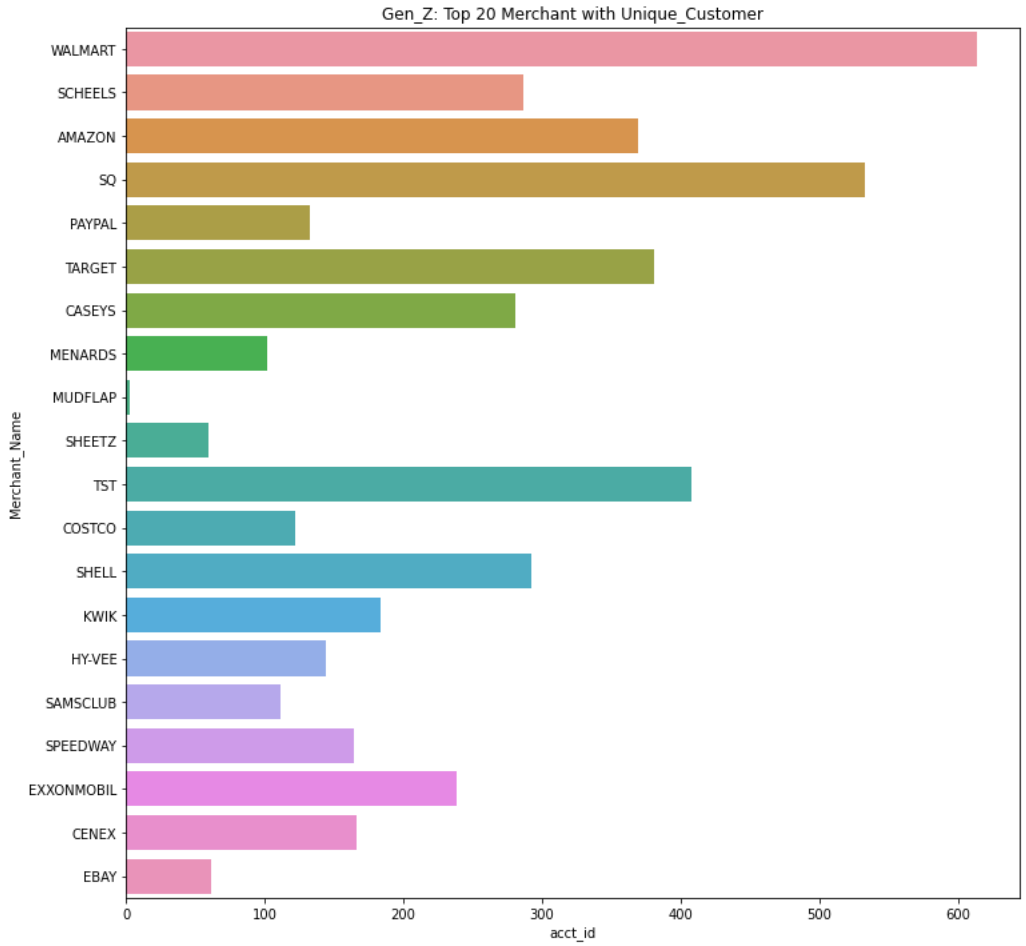

```
plt.figure(figsize = (12,12))
sn.barplot(x="AVG", y="Merchant_Name", data=Gen_Z_Top_merchant,label="Merchant_Name").set(title='Gen_Z: Top 20 Merchant in Average Spent')

plt.savefig("/content/drive/MyDrive/Research/Datathon/Figure/Gen_Z Top 20 Merchant in Average Spent.png")
```




```
plt.figure(figsize = (12,12))
sn.barplot(x="acct_id", y="Merchant_Name", data=Gen_Z_Top_merchant,label="Merchant_Name").set(title='Gen_Z: Top 20 Merchant with Unique_Custor

plt.savefig("/content/drive/MyDrive/Research/Datathon/Figure/Gen_Z Top 20 Merchant with Unique_Customer.png")
```



MIL

```
x=Boomers['Merchant_Name'].value_counts().rename_axis('Merchant_Name').reset_index(name='Total_Transactions')
avg_transaction = pd.DataFrame(Boomers.groupby('Merchant_Name')['TRANSACTIONAMT'].mean())
total_transaction = pd.DataFrame(Boomers.groupby('Merchant_Name')['TRANSACTIONAMT'].sum())
unique_customer = pd.DataFrame(Boomers.groupby('Merchant_Name')['acct_id'].nunique())
merchant_avg=pd.merge(x, avg_transaction, on = 'Merchant_Name')
merchant_all=pd.merge(merchant_avg, total_transaction, on = 'Merchant_Name')
```

```
merchant_all=pd.merge(merchant_all, unique_customer, on = 'Merchant_Name')
merchant_all_min_trans_30=merchant_all[merchant_all['Total_Transactions']>30]
merchant_all_min_trans_30=merchant_all_min_trans_30.rename(columns={"TRANSACTIONAMT_x": "AVG", "TRANSACTIONAMT_y": "SUM"})
merchant_all_min_trans_30.head(4)
```

Double-click (or enter) to edit

```
Gen_Z.columns
```

```
Index(['acct_id', 'VINTAGE_YEAR', 'STATE', 'GENERATION', 'AGE', 'FICO',
       'MONTHLY_INCOME', 'PRODUCT_SEGMENT', 'PARTNERBUSINESSKEY',
       'PARTNER_NAME', 'CREDIT_LIMIT', 'TRANSACTIONPOSTDT', 'TRANSACTIONAMT',
       'MERCHANTDESC', 'MCC', 'MCC_DESCRIPTION', 'SPENDCATEGORYNM', 'ENTRYNBR',
       'ME_BALANCE', 'date', 'buy_month', 'time_series', 'buy_weekday',
       'Merchant_Name'],
      dtype='object')
```

```
Gen_Z[Gen_Z['Merchant_Name']=='APPLE']['SPENDCATEGORYNM'].unique()
```

```
array(['RETAIL GOODS', 'OTHER', 'AUTOMOTIVE', 'GROCERY - REWARDS',
       'TRAVEL - REWARDS - OTHER'], dtype=object)
```

```
Gen_Z[Gen_Z['Merchant_Name']=='APPLE']['MCC_DESCRIPTION'].unique()
```

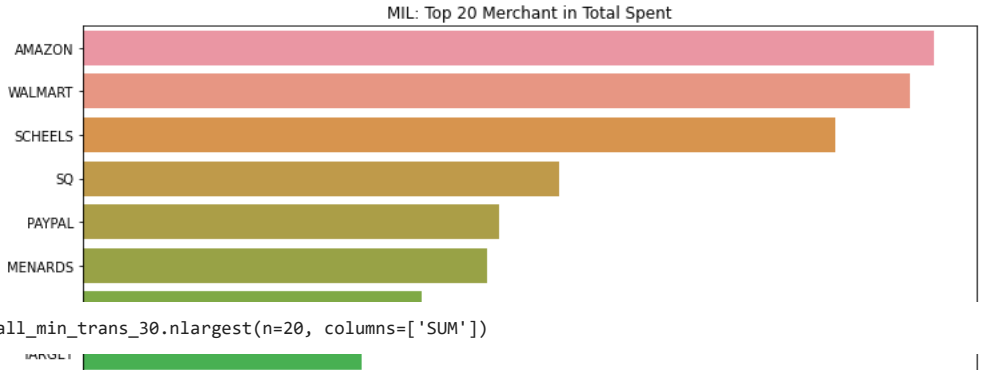
```
array(['LARGE DIGITAL GOODS MERCHANT', 'RECORD STORES',
       'DIGITAL GOODS BOOKSMOVIEMUSIC', 'ELECTRONIC SALES',
       'CIGAR STORES/STANDS', 'CAR & TRUCK DEALERS/NEW/USED',
       'GROCERY STORES/SUPERMARKETS', 'MISC FOOD STORES - DEFAULT',
       'TRAVEL AGENCIES'], dtype=object)
```

Top 20 Merchant by Boomers

```
x=mil['Merchant_Name'].value_counts().rename_axis('Merchant_Name').reset_index(name='Total_Transactions')
avg_transaction = pd.DataFrame(mil.groupby('Merchant_Name')['TRANSACTIONAMT'].mean())
total_transaction = pd.DataFrame(mil.groupby('Merchant_Name')['TRANSACTIONAMT'].sum())
unique_customer = pd.DataFrame(mil.groupby('Merchant_Name')['acct_id'].nunique())
merchant_avg=pd.merge(x, avg_transaction, on = 'Merchant_Name')
merchant_all=pd.merge(merchant_avg, total_transaction, on = 'Merchant_Name')
merchant_all=pd.merge(merchant_all, unique_customer, on = 'Merchant_Name')
merchant_all_min_trans_30=merchant_all[merchant_all['Total_Transactions']>30]
merchant_all_min_trans_30=merchant_all_min_trans_30.rename(columns={"TRANSACTIONAMT_x": "AVG", "TRANSACTIONAMT_y": "SUM"})
merchant_all_min_trans_30.head(4)
Boomers_Top_merchant=merchant_all_min_trans_30.nlargest(n=20, columns=['SUM'])
plt.figure(figsize = (12,12))
sn.barplot(x="SUM", y="Merchant_Name", data=Boomers_Top_merchant,label="Merchant_Name").set(title='MIL: Top 20 Merchant in Total Spent')

#plt.savefig("/content/drive/MyDrive/Research/Datathon/Figure/Boomers Top 20 Merchant in Total Spent.png")
```

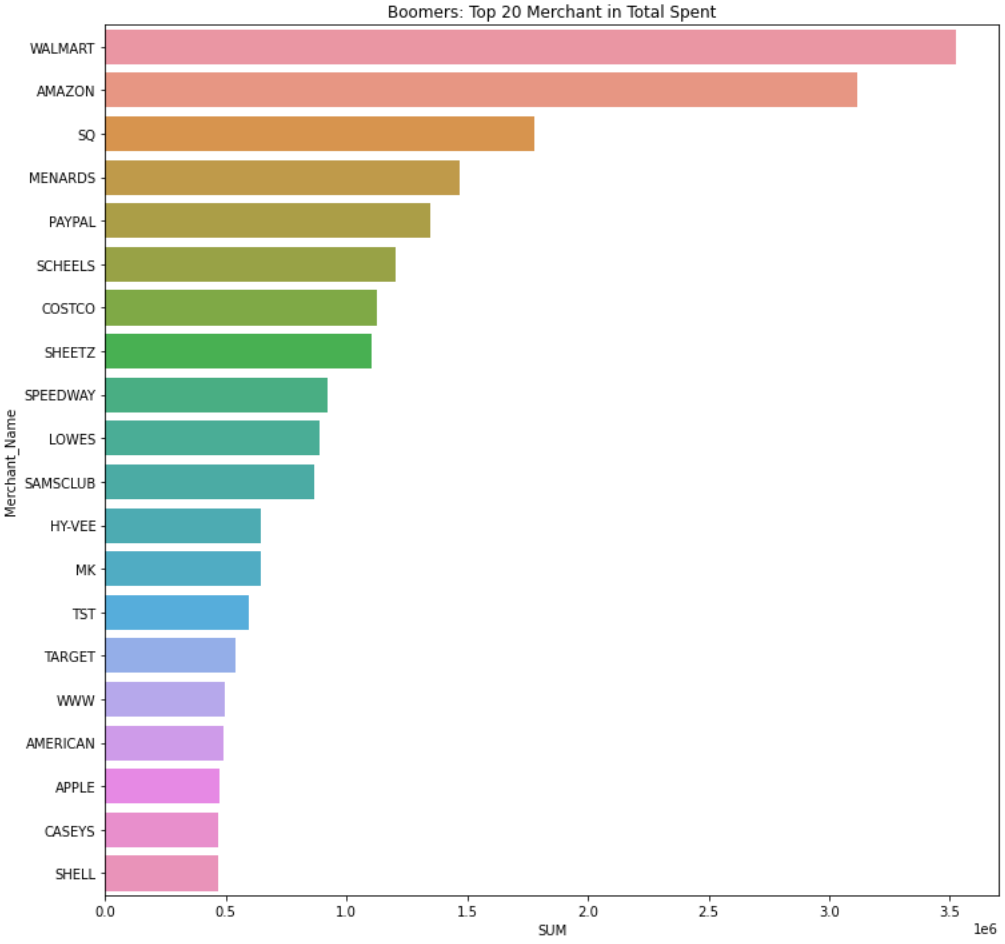
```
[Text(0.5, 1.0, 'MIL: Top 20 Merchant in Total Spent')]
```




```
Boomers_Top_merchant=merchant_all_min_trans_30.nlargest(n=20, columns=['SUM'])
```

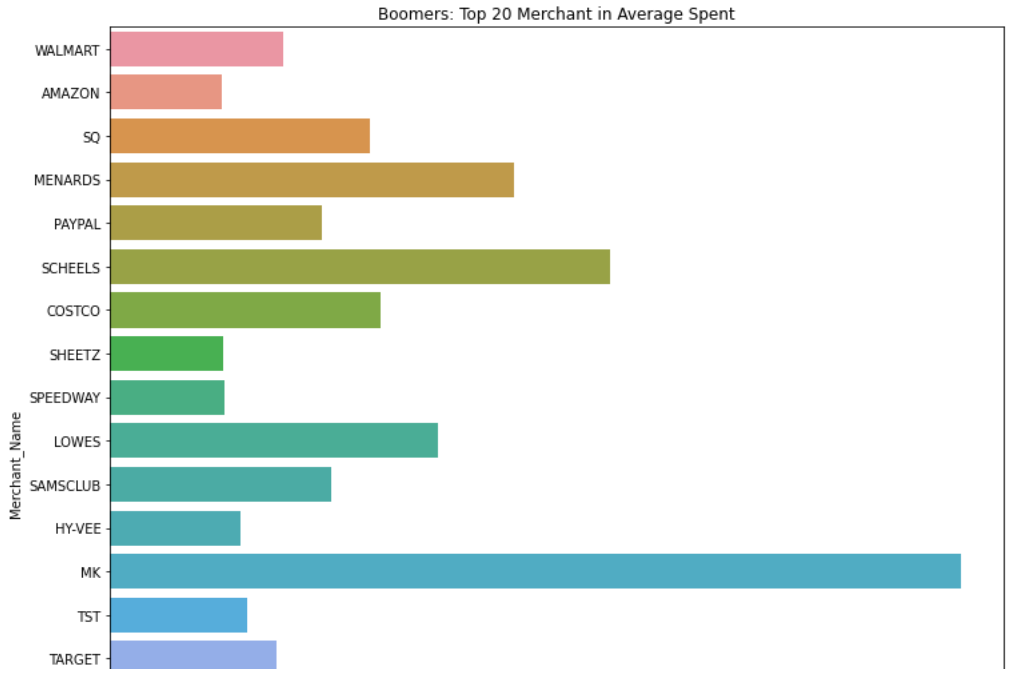
```
plt.figure(figsize = (12,12))
sn.barplot(x="SUM", y="Merchant_Name", data=Boomers_Top_merchant,label="Merchant_Name").set(title='Boomers: Top 20 Merchant in Total Spent')

plt.savefig("/content/drive/MyDrive/Research/Datathon/Figure/Boomers Top 20 Merchant in Total Spent.png")
```



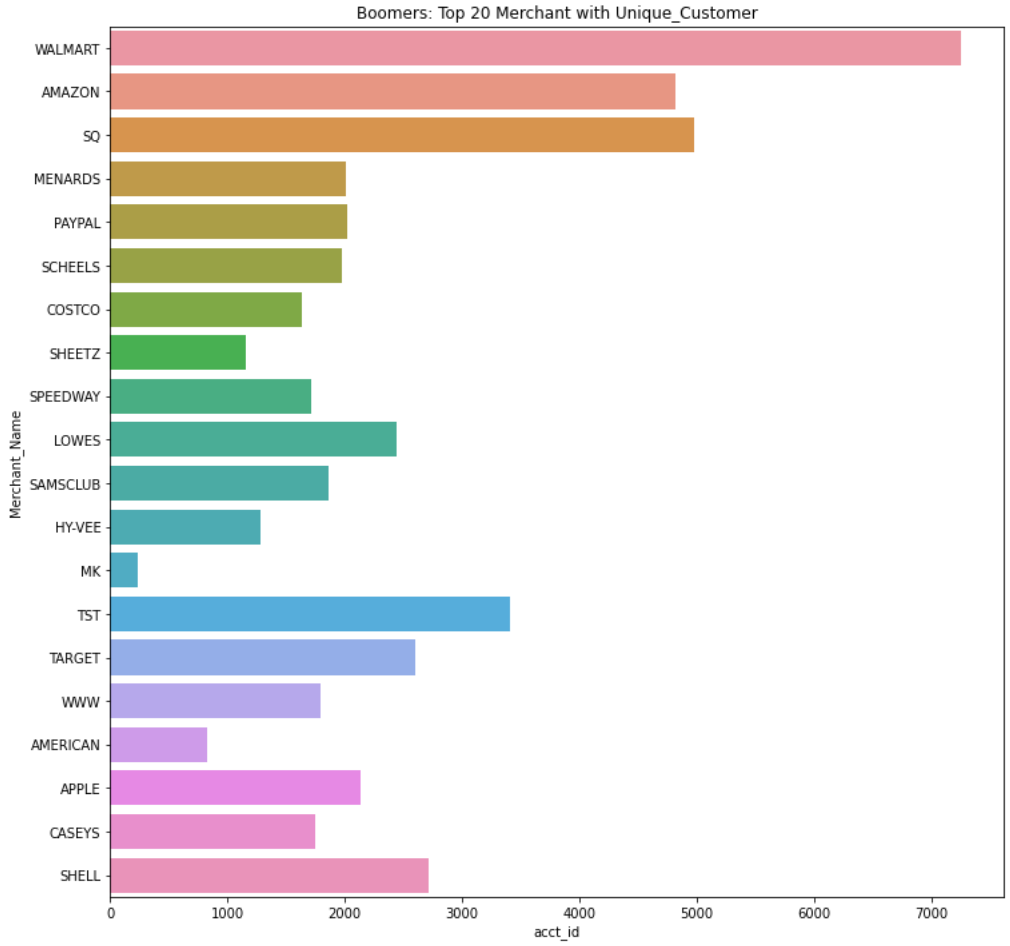

```
plt.figure(figsize = (12,12))
sn.barplot(x="AVG", y="Merchant_Name", data=Boomers_Top_merchant,label="Merchant_Name").set(title='Boomers: Top 20 Merchant in Average Spent'

plt.savefig("/content/drive/MyDrive/Research/Datathon/Figure/Boomers Top 20 Merchant in Total Spent.png")
```




```
plt.figure(figsize = (12,12))
sn.barplot(x="acct_id", y="Merchant_Name", data=Boomers_Top_merchant,label="Merchant_Name").set(title='Boomers: Top 20 Merchant with Unique_Cu
```

```
[Text(0.5, 1.0, 'Boomers: Top 20 Merchant with Unique_Customer')]
```



Top 5 merchant of each category on Total Spending

```
category=pd.unique(Gen_Z['SPENDCATEGORYNM'])
for item in category:
  data=Gen_Z[Gen_Z['SPENDCATEGORYNM']==item]
```

```
total_transaction = pd.DataFrame(data.groupby('Merchant_Name')['TRANSACTIONAMT'].sum())
x=total_transaction.nlargest(n=3, columns=['TRANSACTIONAMT']).reset_index('Merchant_Name')
plt.figure(figsize = (6,6))
titl='Gen_Z: Top 3 Merchant for \nCategory: '+item
des="/content/drive/MyDrive/Research/Datathon/Figure/Gen_Z "+item[:4]+" Top 3 Merchant for Category "+item[:4]+".png"
sn.barplot(x="TRANSACTIONAMT", y="Merchant_Name", data=x,label="Merchant", palette='rainbow').set(title=titl,xlabel='Total amount in Dollar
plt.savefig(des)

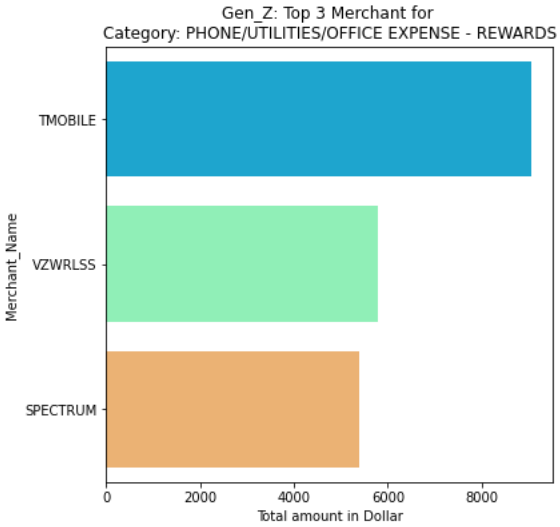
# data=Boomers[Boomers['SPENDCATEGORYNM']==item]
# total_transaction = pd.DataFrame(data.groupby('Merchant_Name')['TRANSACTIONAMT'].sum())
# x=total_transaction.nlargest(n=4, columns=['TRANSACTIONAMT']).reset_index('Merchant_Name')
# plt.figure(figsize = (6,6))
# titl='Boomers: Top 4 Merchant for Category: '+item
# des="/content/drive/MyDrive/Research/Datathon/Figure/Boomers "+item[:4]+" Top 4 Merchant for Category.png"
# sn.barplot(x="TRANSACTIONAMT", y="Merchant_Name", data=x,label="Merchant").set(title=titl)
# plt.savefig(des)

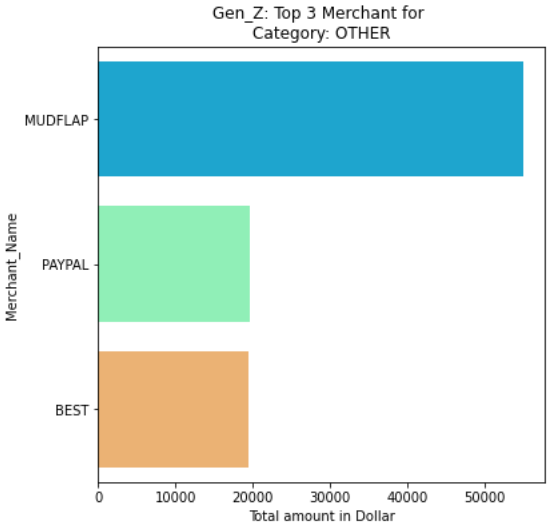
# data=mil[mil['SPENDCATEGORYNM']==item]
# total_transaction = pd.DataFrame(data.groupby('Merchant_Name')['TRANSACTIONAMT'].sum())
# x=total_transaction.nlargest(n=4, columns=['TRANSACTIONAMT']).reset_index('Merchant_Name')
# plt.figure(figsize = (6,6))
# titl='MIL: Top 4 Merchant for Category: '+item
# des="/content/drive/MyDrive/Research/Datathon/Figure/Boomers "+item[:4]+" Top 4 Merchant for Category.png"
# sn.barplot(x="TRANSACTIONAMT", y="Merchant_Name", data=x,label="Merchant").set(title=titl)
# #plt.savefig(des)
```

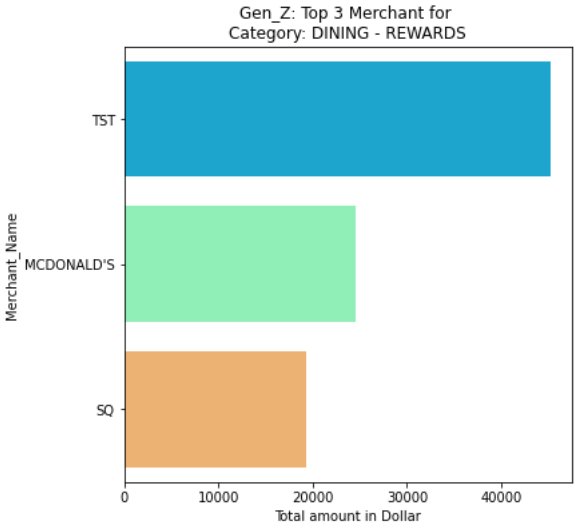
```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:6: RuntimeWarning: More than 20 figures have been opened. Figures create

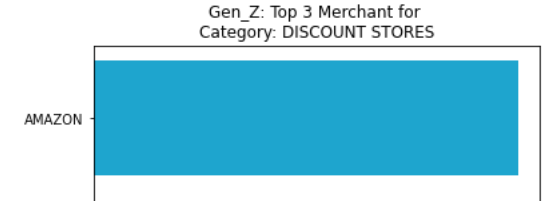
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:6: RuntimeWarning: More than 20 figures have been opened. Figures create

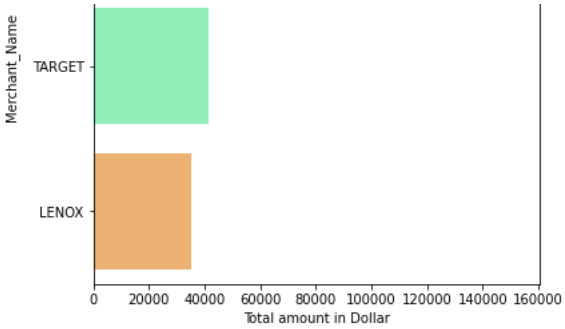
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:6: RuntimeWarning: More than 20 figures have been opened. Figures create
```



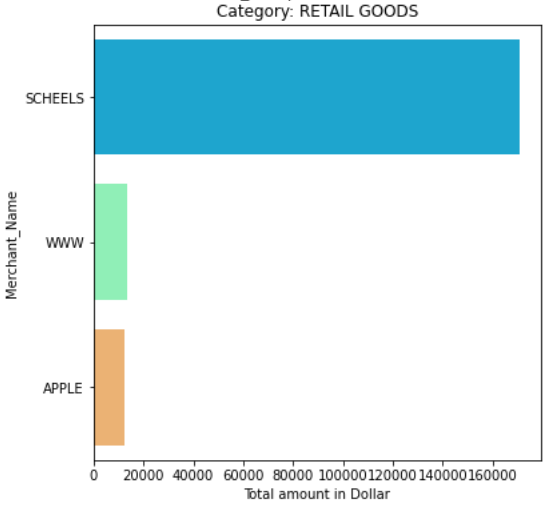




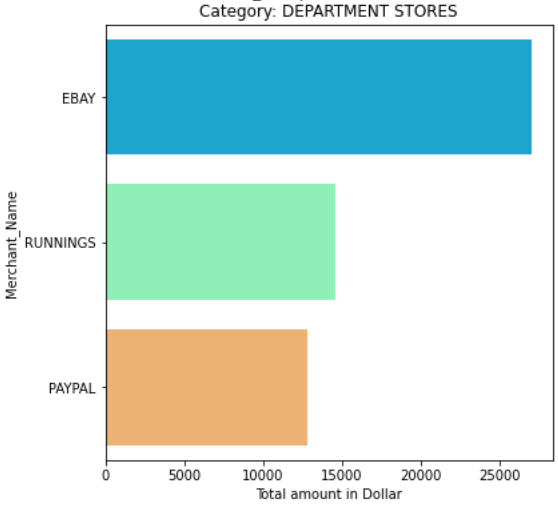




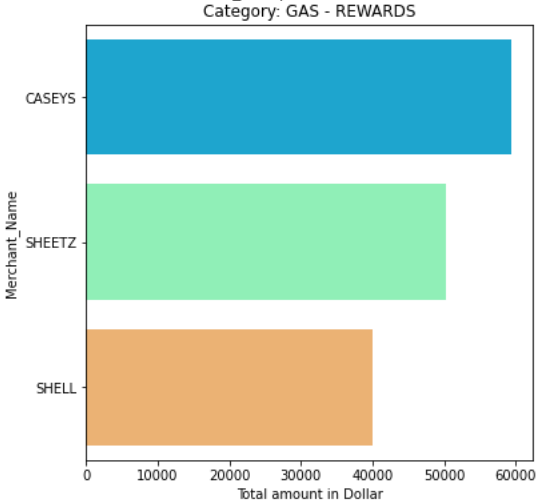
Gen_Z: Top 3 Merchant for
Category: RETAIL GOODS



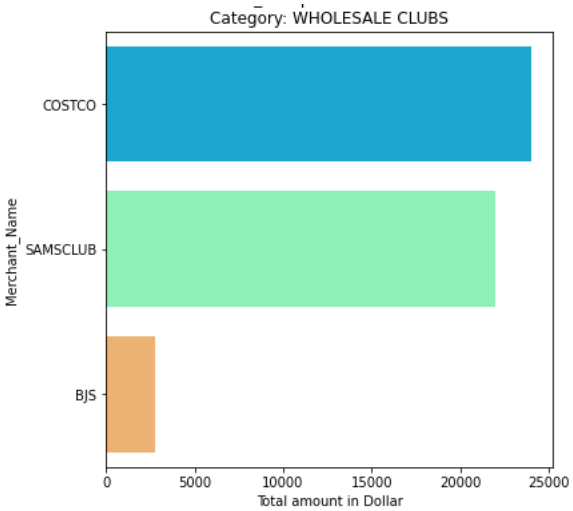
Gen_Z: Top 3 Merchant for
Category: DEPARTMENT STORES

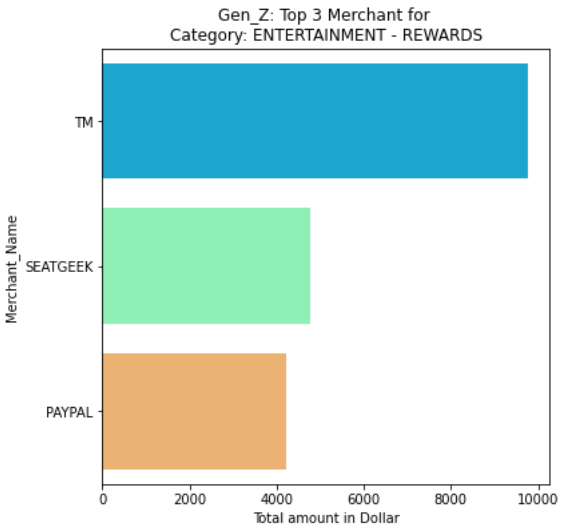


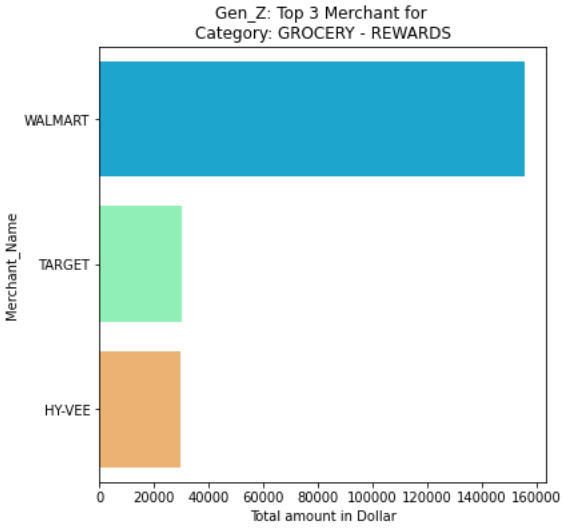
Gen_Z: Top 3 Merchant for
Category: GAS - REWARDS

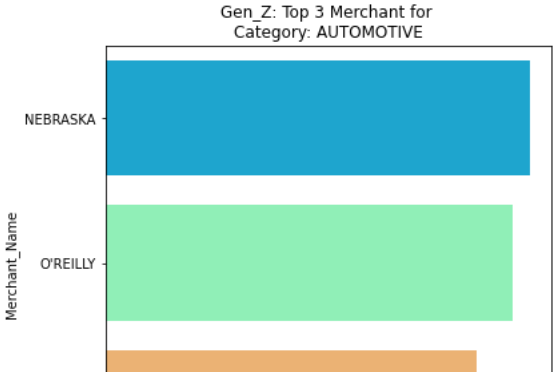


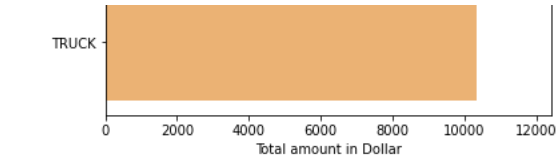
Gen_Z: Top 3 Merchant for

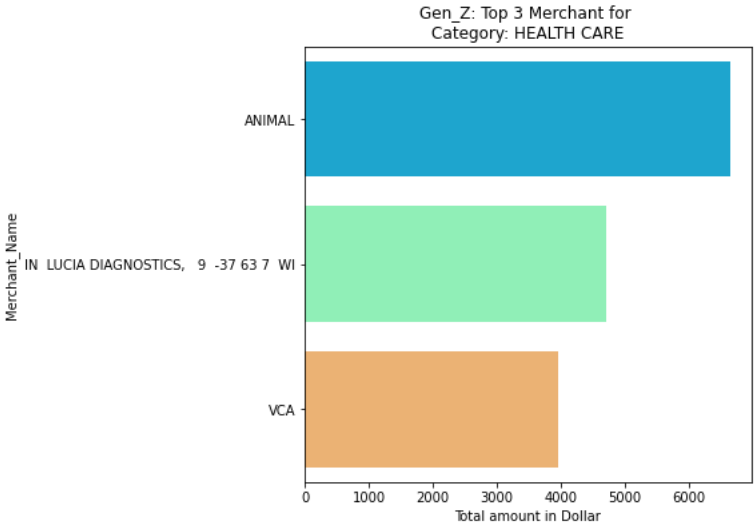

Category: WHOLESALE CLUBS
COSTCO
SAMSCLUB
BJS
Merchant_Name
0
5000
10000
15000
20000
25000
Total amount in Dollar

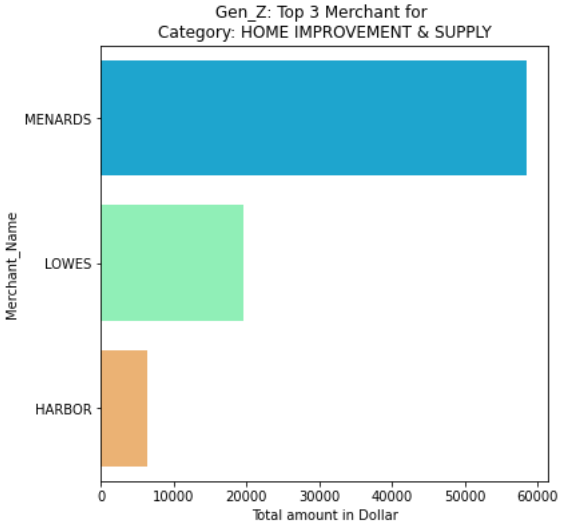

Gen_Z: Top 3 Merchant for
Category: ENTERTAINMENT - REWARDS
TM
SEATGEEK
PAYPAL
Merchant_Name
0
2000
4000
6000
8000
10000
Total amount in Dollar

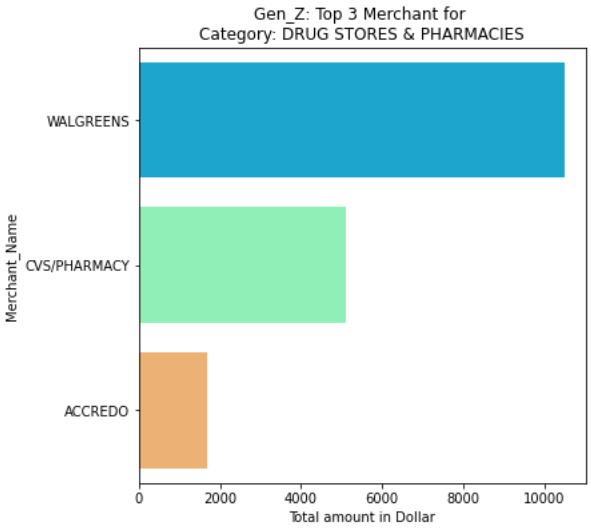

Gen_Z: Top 3 Merchant for
Category: GROCERY - REWARDS
WALMART
TARGET
HY-VEE
Merchant_Name
0
20000
40000
60000
80000
100000
120000
140000
160000
Total amount in Dollar

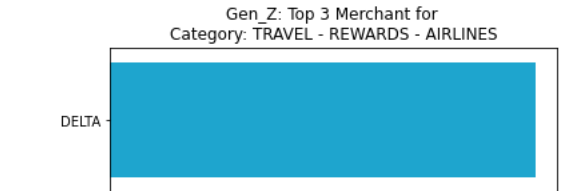

Gen_Z: Top 3 Merchant for
Category: AUTOMOTIVE
NEBRASKA
O'REILLY
Merchant_Name

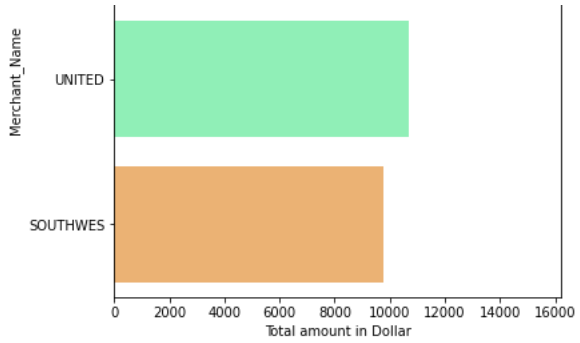

TRUCK
0
2000
4000
6000
8000
10000
12000
Total amount in Dollar

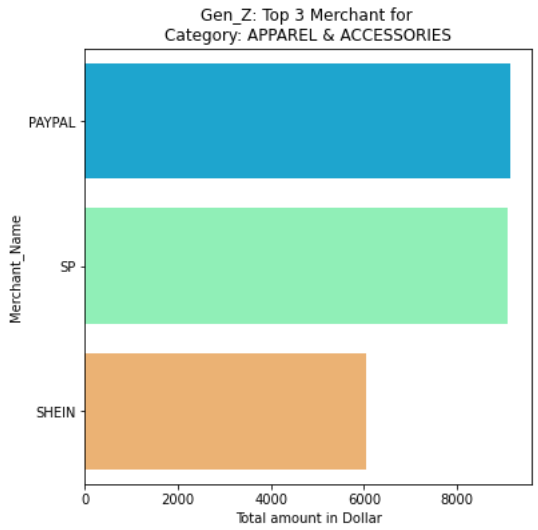

Gen_Z: Top 3 Merchant for
Category: HEALTH CARE
ANIMAL
IN LUCIA DIAGNOSTICS, 9 -37 63 7 WI
VCA
Merchant_Name
0
1000
2000
3000
4000
5000
6000
Total amount in Dollar

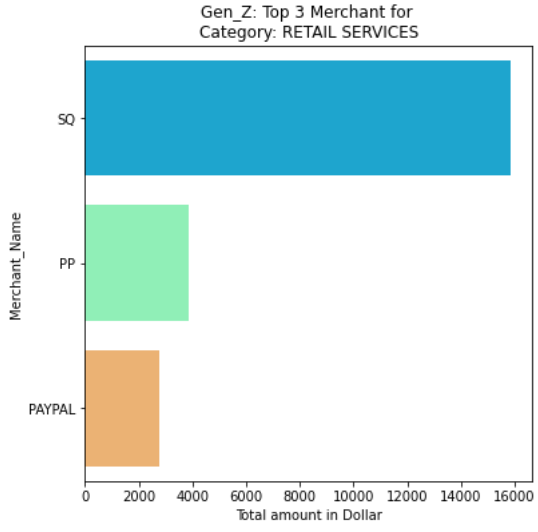

Gen_Z: Top 3 Merchant for
Category: HOME IMPROVEMENT & SUPPLY
MENARDS
LOWES
HARBOR
Merchant_Name
0
10000
20000
30000
40000
50000
60000
Total amount in Dollar

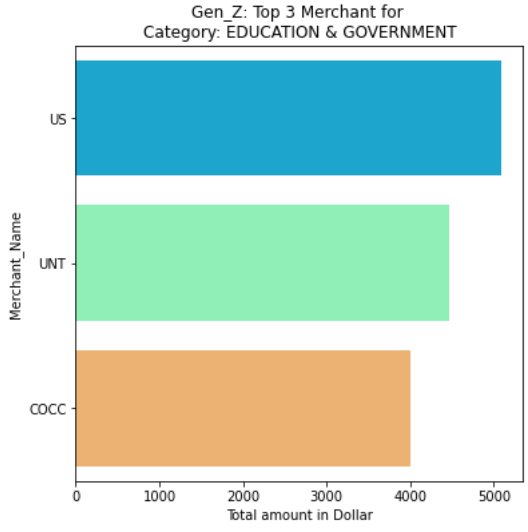

Gen_Z: Top 3 Merchant for
Category: DRUG STORES & PHARMACIES
WALGREENS
CVS/PHARMACY
ACCREDO
Merchant_Name
0
2000
4000
6000
8000
10000
Total amount in Dollar

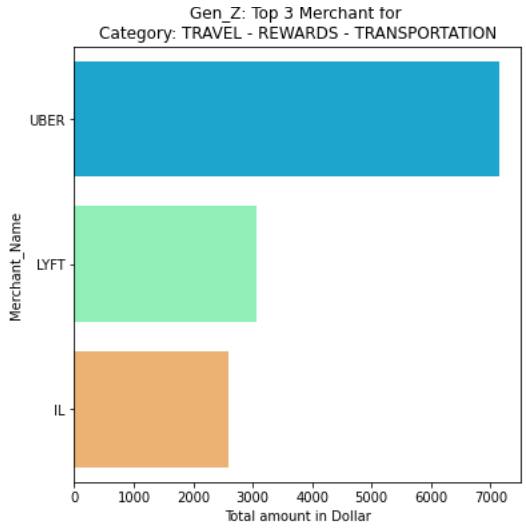

Gen_Z: Top 3 Merchant for
Category: TRAVEL - REWARDS - AIRLINES
DELTA

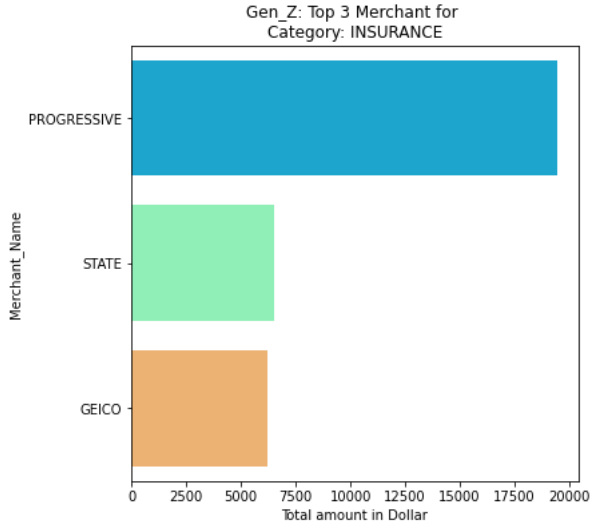

Merchant_Name
UNITED
SOUTHWES
0
2000
4000
6000
8000
10000
12000
14000
16000
Total amount in Dollar

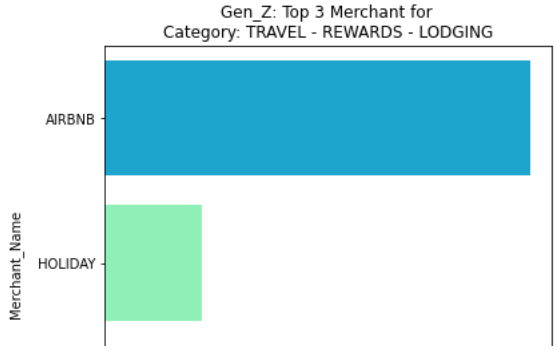

Gen_Z: Top 3 Merchant for
Category: APPAREL & ACCESSORIES
Merchant_Name
PAYPAL
SP
SHEIN
0
2000
4000
6000
8000
Total amount in Dollar


Gen_Z: Top 3 Merchant for
Category: RETAIL SERVICES
Merchant_Name
SQ
PP
PAYPAL
0
2000
4000
6000
8000
10000
12000
14000
16000
Total amount in Dollar


Gen_Z: Top 3 Merchant for
Category: EDUCATION & GOVERNMENT
Merchant_Name
US
UNT
COCC
0
1000
2000
3000
4000
5000
Total amount in Dollar







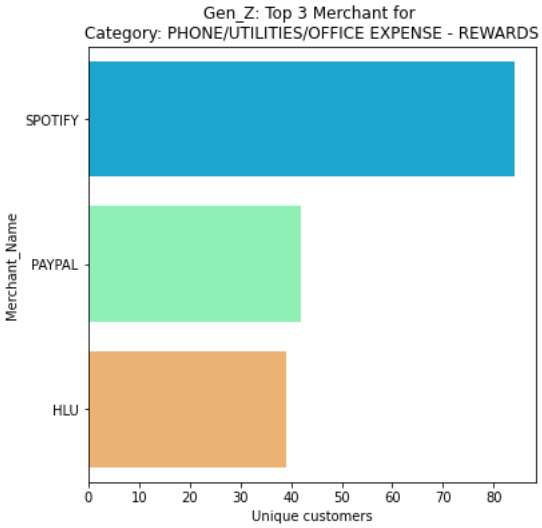
Top 4 Merchant on each category on Unique Customers:

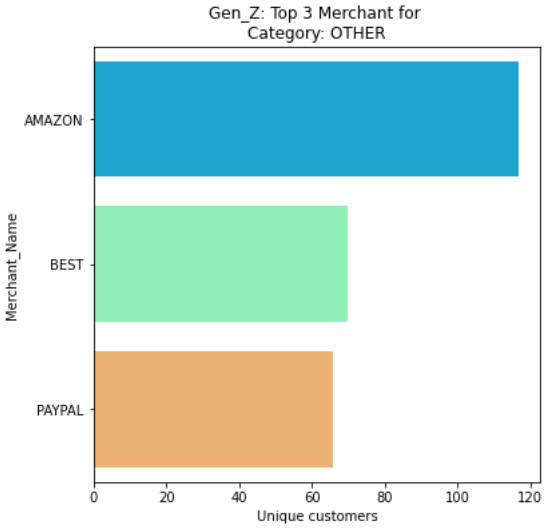

```
category=pd.unique(Gen_Z['SPENDCATEGORYNM'])
for item in category:
  data=Gen_Z[Gen_Z['SPENDCATEGORYNM']==item]
  unique_customer = pd.DataFrame(data.groupby('Merchant_Name')['acct_id'].nunique())
  x=unique_customer.nlargest(n=3, columns=['acct_id']).reset_index('Merchant_Name')
  plt.figure(figsize = (6,6))
  titl='Gen_Z: Top 3 Merchant for \nCategory: '+item
  des="/content/drive/MyDrive/Research/Datathon/Figure/Gen_Z "+item[:4]+" Top 3 Merchant on Unique Customers for Category "+item[:4]+".png"
  sn.barplot(x="acct_id", y="Merchant_Name", data=x,label="Merchant",palette='rainbow').set(title=titl,xlabel="Unique customers")
  plt.savefig(des)

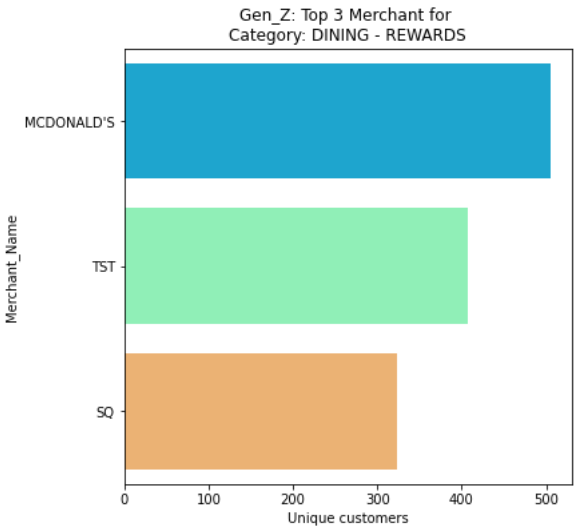
  # data=Boomers[Boomers['SPENDCATEGORYNM']==item]
  # unique_customer = pd.DataFrame(data.groupby('Merchant_Name')['acct_id'].nunique())
  # x=unique_customer.nlargest(n=4, columns=['acct_id']).reset_index('Merchant_Name')
  # plt.figure(figsize = (6,6))
  # titl='Boomers: Top 4 Merchant for Category: '+item
  # des="/content/drive/MyDrive/Research/Datathon/Figure/Boomers "+item[:4]+" Top 4 on Unique Customers Merchant for Category.png"
  # sn.barplot(x="acct_id", y="Merchant_Name", data=x,label="Merchant").set(title=titl)
```

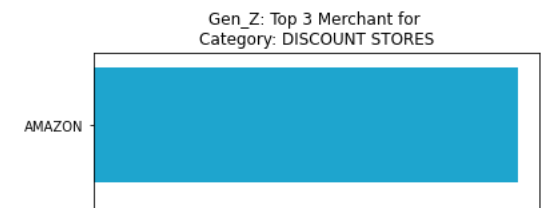
```
# plt.savefig(des)
# data=mil[mil['SPENDCATEGORYNM']==item]
# unique_customer = pd.DataFrame(data.groupby('Merchant_Name')['acct_id'].nunique())
# x=unique_customer.nlargest(n=4, columns=['acct_id']).reset_index('Merchant_Name')
# plt.figure(figsize = (6,6))
# titl='MIL: Top 4 Merchant for Category: '+item
# des="/content/drive/MyDrive/Research/Datathon/Figure/Boomers "+item[:4]+" Top 4 on Unique Customers Merchant for Category.png"
# sn.barplot(x="acct_id", y="Merchant_Name", data=x,label="Merchant").set(title=titl)
# #plt.savefig(des)
```

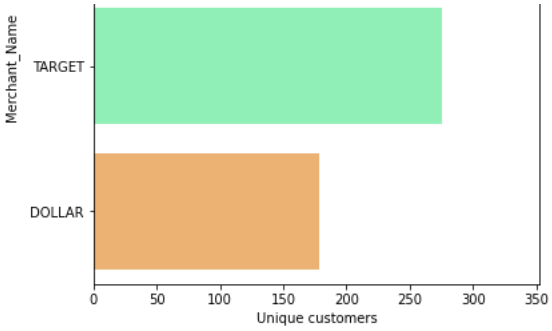
```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:6: RuntimeWarning: More than 20 figures have been opened. Figures create
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:6: RuntimeWarning: More than 20 figures have been opened. Figures create
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:6: RuntimeWarning: More than 20 figures have been opened. Figures create
```



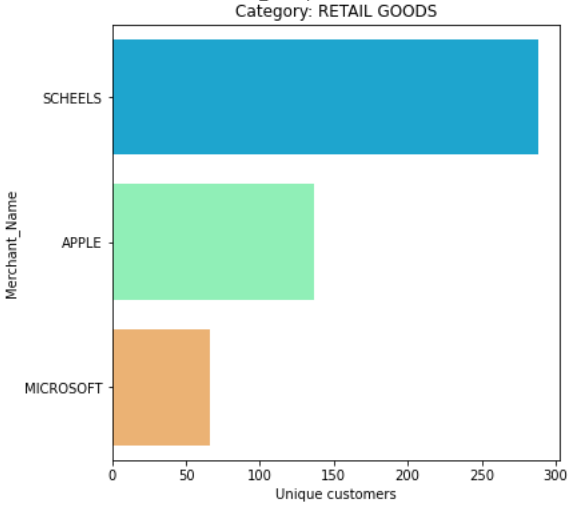




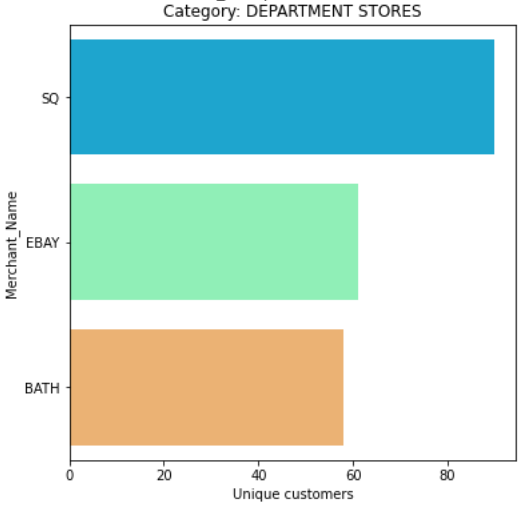




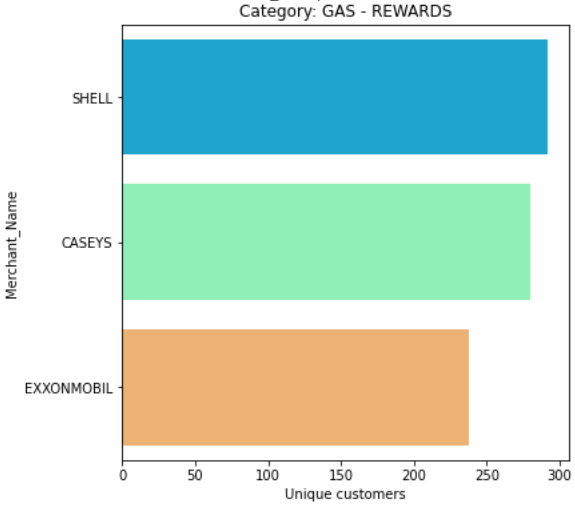
Gen_Z: Top 3 Merchant for
Category: RETAIL GOODS



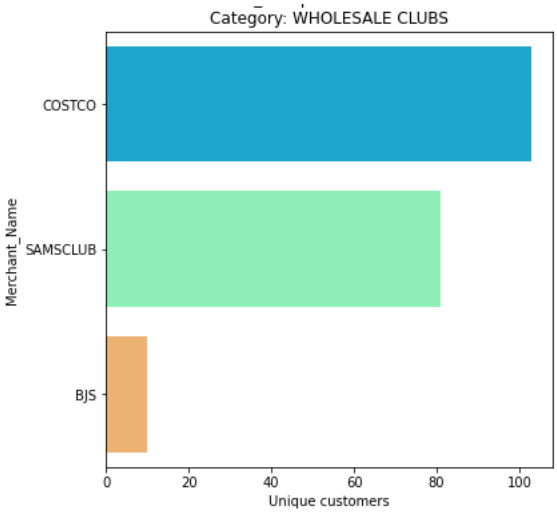
Gen_Z: Top 3 Merchant for
Category: DEPARTMENT STORES

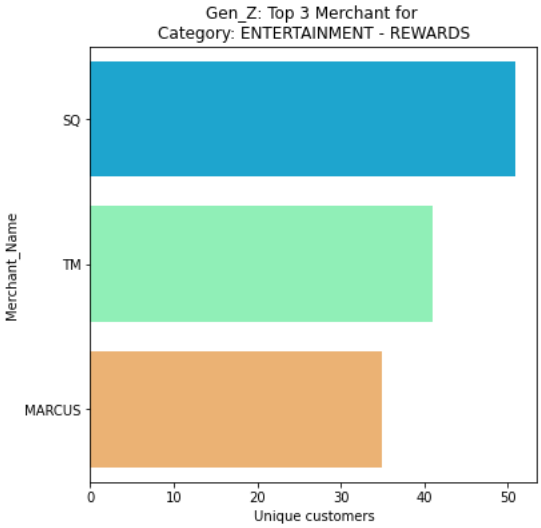


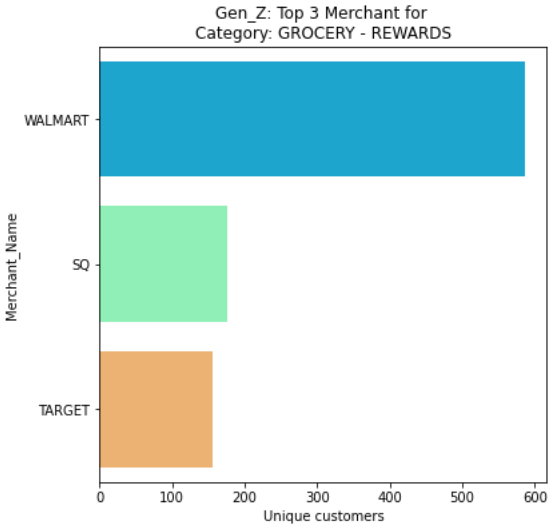
Gen_Z: Top 3 Merchant for
Category: GAS - REWARDS

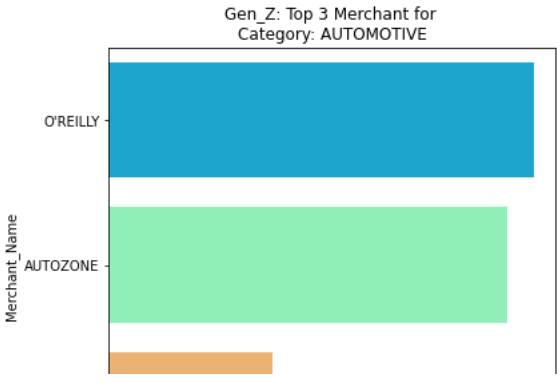


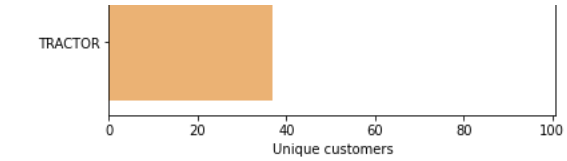
Gen_Z: Top 3 Merchant for

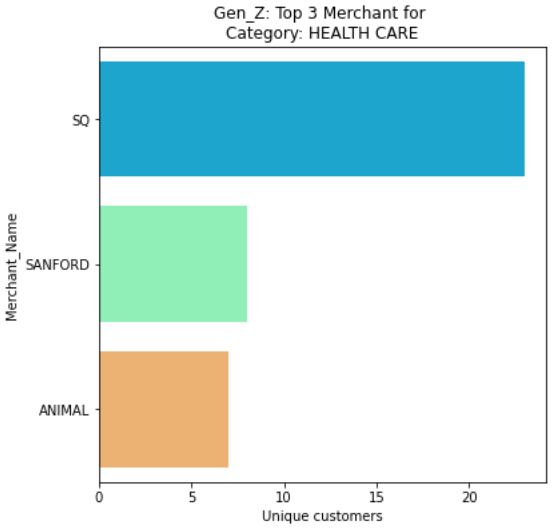

Category: WHOLESALE CLUBS
COSTCO
SAMSCLUB
BJS
Merchant_Name
0
20
40
60
80
100
Unique customers

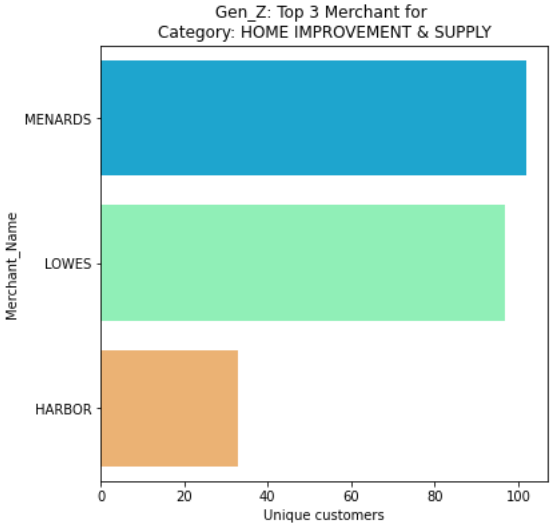

Gen_Z: Top 3 Merchant for
Category: ENTERTAINMENT - REWARDS
SQ
TM
MARCUS
Merchant_Name
0
10
20
30
40
50
Unique customers

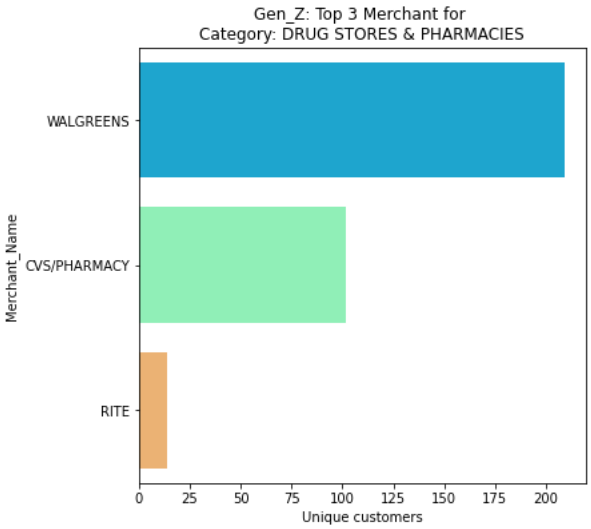

Gen_Z: Top 3 Merchant for
Category: GROCERY - REWARDS
WALMART
SQ
TARGET
Merchant_Name
0
100
200
300
400
500
600
Unique customers

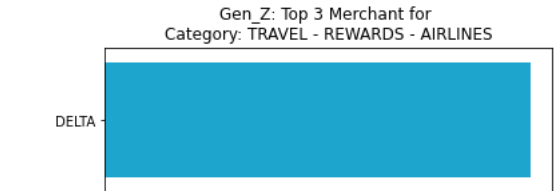

Gen_Z: Top 3 Merchant for
Category: AUTOMOTIVE
O'REILLY
AUTOZONE
Merchant_Name

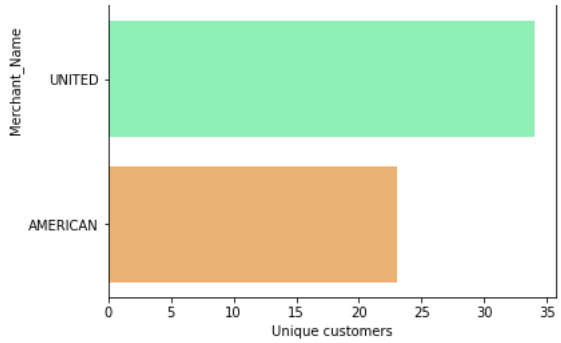

TRACTOR
0
20
40
60
80
100
Unique customers

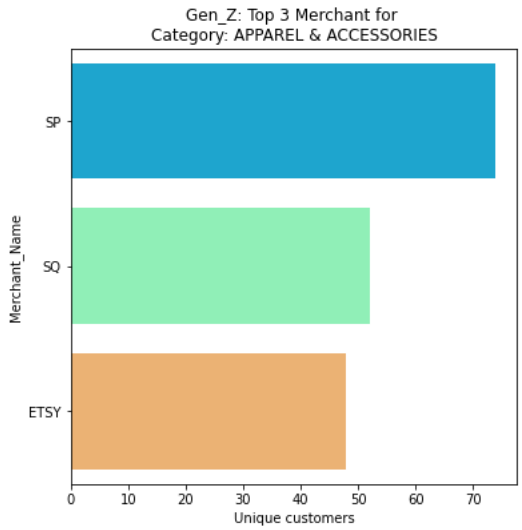

Gen_Z: Top 3 Merchant for
Category: HEALTH CARE
SQ
SANFORD
ANIMAL
Merchant_Name
0
5
10
15
20
Unique customers

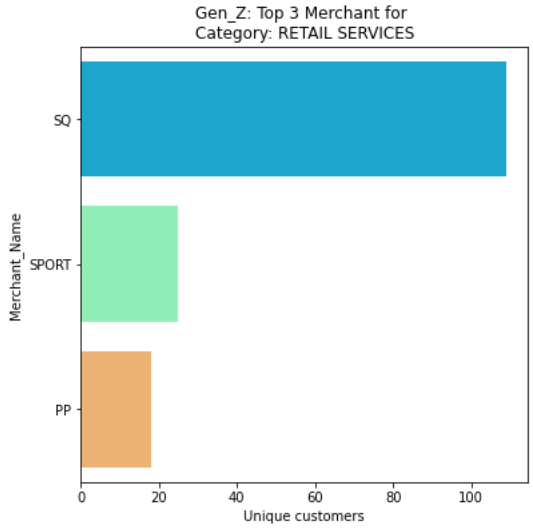

Gen_Z: Top 3 Merchant for
Category: HOME IMPROVEMENT & SUPPLY
MENARDS
LOWES
HARBOR
Merchant_Name
0
20
40
60
80
100
Unique customers

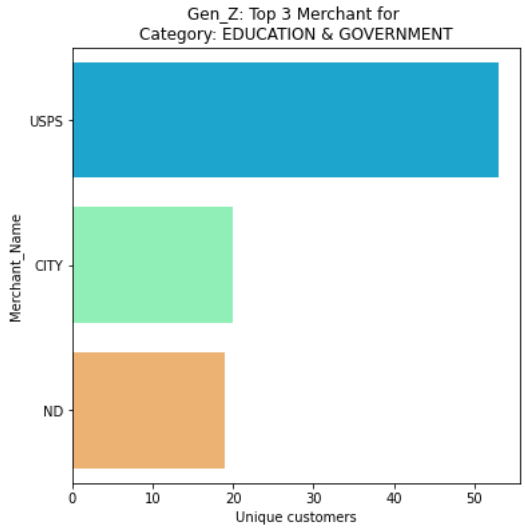

Gen_Z: Top 3 Merchant for
Category: DRUG STORES & PHARMACIES
WALGREENS
CVS/PHARMACY
RITE
Merchant_Name
0
25
50
75
100
125
150
175
200
Unique customers

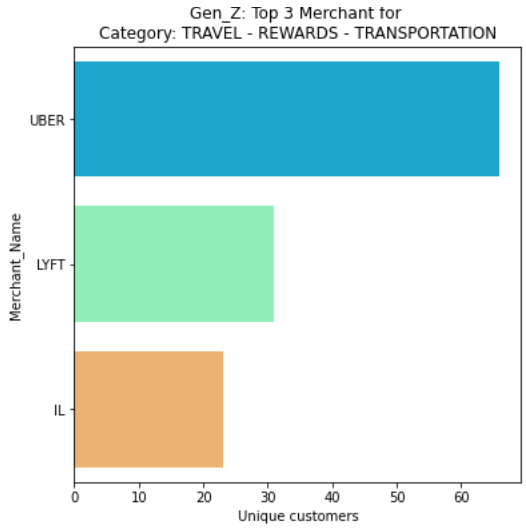

Gen_Z: Top 3 Merchant for
Category: TRAVEL - REWARDS - AIRLINES
DELTA

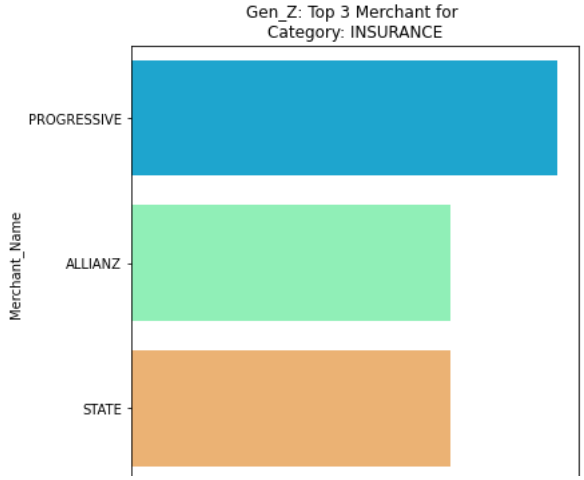

Merchant_Name
UNITED
AMERICAN
0
5
10
15
20
25
30
35
Unique customers


Gen_Z: Top 3 Merchant for
Category: APPAREL & ACCESSORIES
Merchant_Name
SP
SQ
ETSY
0
10
20
30
40
50
60
70
Unique customers


Gen_Z: Top 3 Merchant for
Category: RETAIL SERVICES
Merchant_Name
SQ
SPORT
PP
0
20
40
60
80
100
Unique customers


Gen_Z: Top 3 Merchant for
Category: EDUCATION & GOVERNMENT
Merchant_Name
USPS
CITY
ND
0
10
20
30
40
50
Unique customers



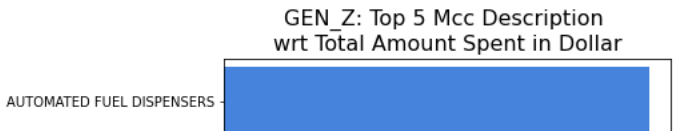


Analysis of MCC_DESRIPTION for GEN_Z

Gen_Z: Top 3 Merchant for

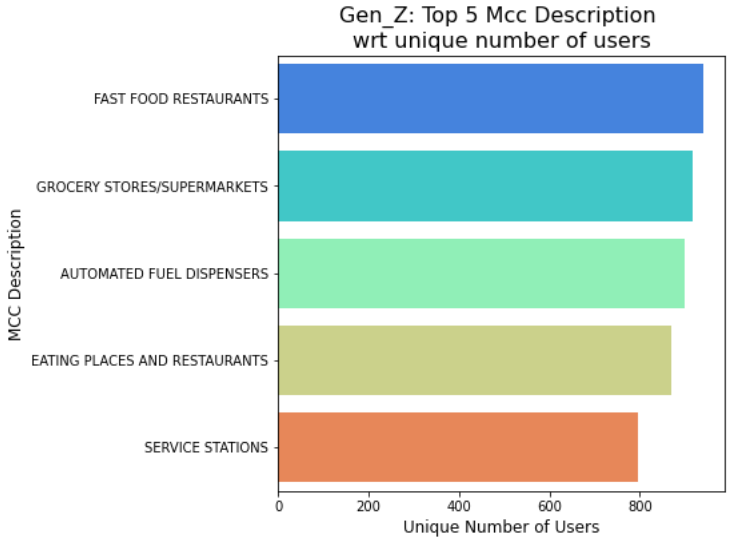
```
x=Gen_Z['MCC_DESCRIPTION'].value_counts().rename_axis('MCC_DESCRIPTION').reset_index(name='Total_Transactions')
avg_transaction = pd.DataFrame(Gen_Z.groupby('MCC_DESCRIPTION')['TRANSACTIONAMT'].mean())
total_transaction = pd.DataFrame(Gen_Z.groupby('MCC_DESCRIPTION')['TRANSACTIONAMT'].sum())
unique_customer = pd.DataFrame(Gen_Z.groupby('MCC_DESCRIPTION')['acct_id'].nunique())
merchant_avg=pd.merge(x, avg_transaction, on = 'MCC_DESCRIPTION')
merchant_all=pd.merge(merchant_avg, total_transaction, on = 'MCC_DESCRIPTION')
merchant_all=pd.merge(merchant_all, unique_customer, on = 'MCC_DESCRIPTION')
merchant_all_min_trans_30=merchant_all[merchant_all['Total_Transactions']>30]
merchant_all_min_trans_30=merchant_all_min_trans_30.rename(columns={"TRANSACTIONAMT_x": "AVG", "TRANSACTIONAMT_y": "SUM"})
Gen_Z_Top_merchant=merchant_all_min_trans_30.nlargest(n=5, columns=['SUM'])
fig=plt.figure(figsize = (6,6))
plt.title('GEN_Z: Top 5 Mcc Description \nwrt Total Amount Spent in Dollar', fontsize=16)
plt.xlabel('xlabel', fontsize=12)
plt.ylabel('ylabel', fontsize=12)
sn.barplot(x="SUM", y="MCC_DESCRIPTION", data=Gen_Z_Top_merchant,label="MCC_DESCRIPTION", palette='rainbow').set(xlabel='Amount in Dollar',yl
```

```
[Text(0, 0.5, 'MCC Description'), Text(0.5, 0, 'Amount in Dollar')]
```




```
Gen_Z_Top_merchant=merchant_all_min_trans_30.nlargest(n=5, columns=['acct_id'])
fig=plt.figure(figsize = (6,6))
fig=plt.figure(figsize = (6,6))
plt.title('Gen_Z: Top 5 Mcc Description \nwrt unique number of users', fontsize=16)
plt.xlabel('xlabel', fontsize=12)
plt.ylabel('ylabel', fontsize=12)
sn.barplot(x="acct_id", y="MCC_DESCRIPTION", data=Gen_Z_Top_merchant,label="MCC_DESCRIPTION", palette='rainbow').set(xlabel='Unique Number of
```

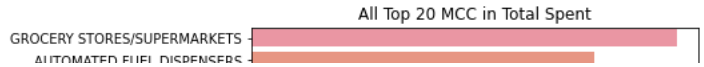
```
[Text(0, 0.5, 'MCC Description'), Text(0.5, 0, 'Unique Number of Users')]
<Figure size 432x432 with 0 Axes>
```



Double-click (or enter) to edit

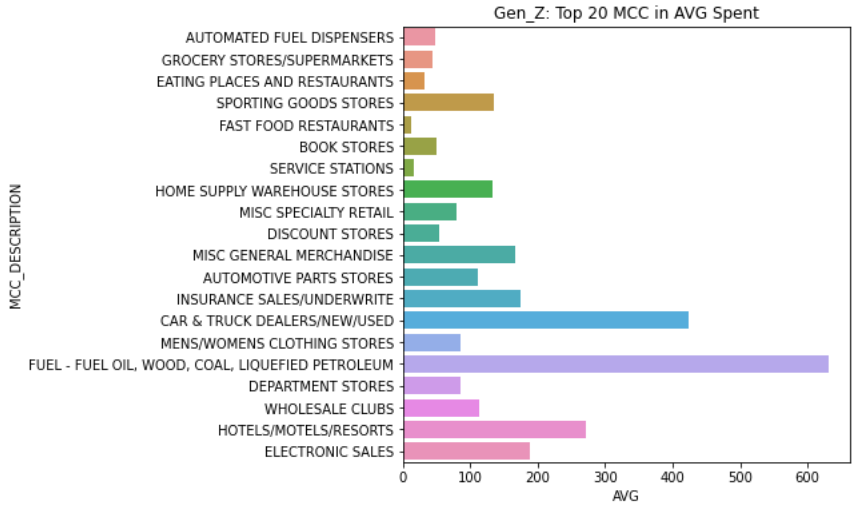
```
x=df['MCC_DESCRIPTION'].value_counts().rename_axis('MCC_DESCRIPTION').reset_index(name='Total_Transactions')
avg_transaction = pd.DataFrame(df.groupby('MCC_DESCRIPTION')['TRANSACTIONAMT'].mean())
total_transaction = pd.DataFrame(df.groupby('MCC_DESCRIPTION')['TRANSACTIONAMT'].sum())
unique_customer = pd.DataFrame(df.groupby('MCC_DESCRIPTION')['acct_id'].nunique())
merchant_avg=pd.merge(x, avg_transaction, on = 'MCC_DESCRIPTION')
merchant_all=pd.merge(merchant_avg, total_transaction, on = 'MCC_DESCRIPTION')
merchant_all=pd.merge(merchant_all, unique_customer, on = 'MCC_DESCRIPTION')
merchant_all_min_trans_30=merchant_all[merchant_all['Total_Transactions']>30]
merchant_all_min_trans_30=merchant_all_min_trans_30.rename(columns={"TRANSACTIONAMT_x": "AVG", "TRANSACTIONAMT_y": "SUM"})
Gen_Z_Top_merchant=merchant_all_min_trans_30.nlargest(n=20, columns=['SUM'])
plt.figure(figsize = (6,6))
sn.barplot(x="SUM", y="MCC_DESCRIPTION", data=Gen_Z_Top_merchant,label="MCC_DESCRIPTION").set(title='All Top 20 MCC in Total Spent')
```

```
[Text(0.5, 1.0, 'All Top 20 MCC in Total Spent')]
```



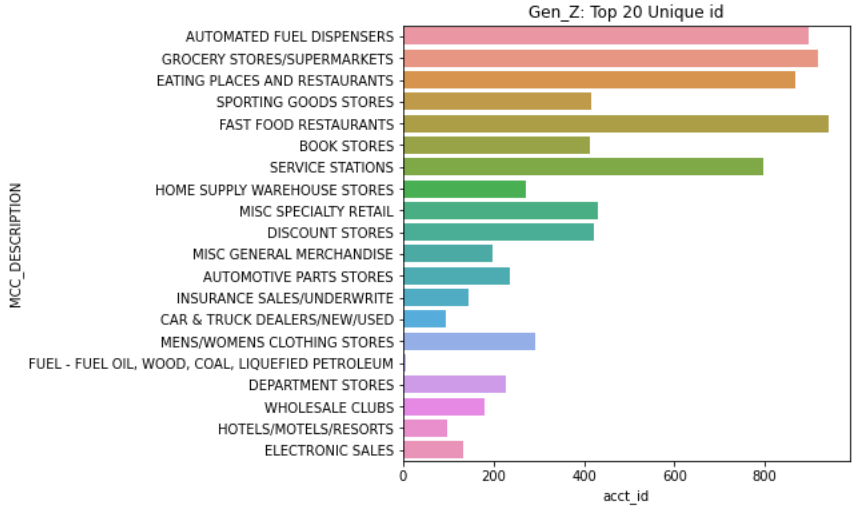

```
plt.figure(figsize = (6,6))
sn.barplot(x="AVG", y="MCC_DESCRIPTION", data=Gen_Z_Top_merchant,label="MCC_DESCRIPTION").set(title='Gen_Z: Top 20 MCC in AVG Spent')
```

```
[Text(0.5, 1.0, 'Gen_Z: Top 20 MCC in AVG Spent')]
```




```
plt.figure(figsize = (6,6))
sn.barplot(x="acct_id", y="MCC_DESCRIPTION", data=Gen_Z_Top_merchant,label="MCC_DESCRIPTION").set(title='Gen_Z: Top 20 Unique id')
```

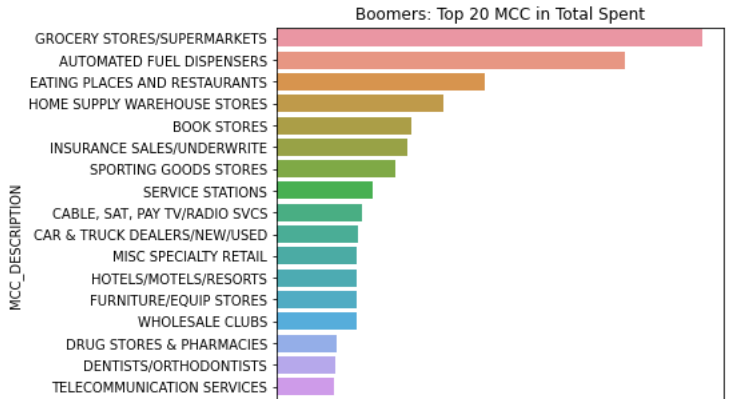
```
[Text(0.5, 1.0, 'Gen_Z: Top 20 Unique id')]
```



Analysis of MCC_DESRIPTION for Boomers

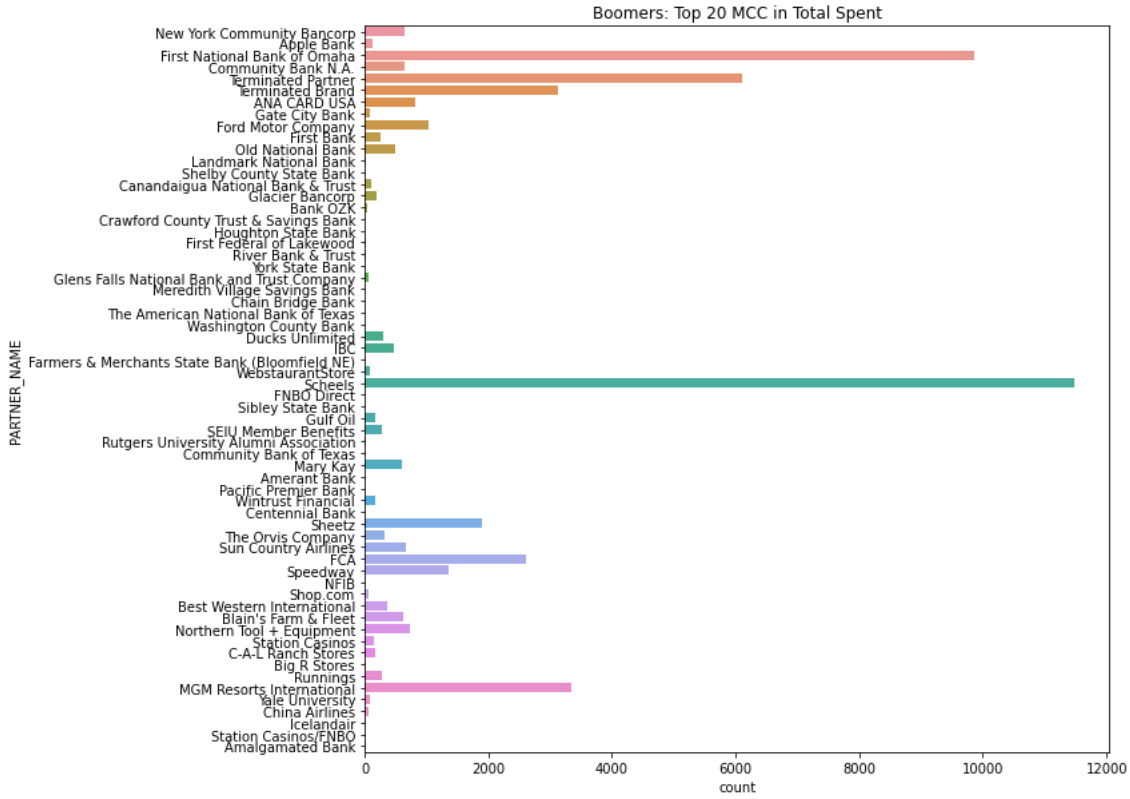
```
x=Boomers['MCC_DESCRIPTION'].value_counts().rename_axis('MCC_DESCRIPTION').reset_index(name='Total_Transactions')
avg_transaction = pd.DataFrame(Boomers.groupby('MCC_DESCRIPTION')['TRANSACTIONAMT'].mean())
total_transaction = pd.DataFrame(Boomers.groupby('MCC_DESCRIPTION')['TRANSACTIONAMT'].sum())
unique_customer = pd.DataFrame(Boomers.groupby('MCC_DESCRIPTION')['acct_id'].nunique())
merchant_avg=pd.merge(x, avg_transaction, on = 'MCC_DESCRIPTION')
merchant_all=pd.merge(merchant_avg, total_transaction, on = 'MCC_DESCRIPTION')
merchant_all=pd.merge(merchant_all, unique_customer, on = 'MCC_DESCRIPTION')
merchant_all_min_trans_30=merchant_all[merchant_all['Total_Transactions']>30]
merchant_all_min_trans_30=merchant_all_min_trans_30.rename(columns={"TRANSACTIONAMT_x": "AVG", "TRANSACTIONAMT_y": "SUM"})
Gen_Z_Top_merchant=merchant_all_min_trans_30.nlargest(n=20, columns=['SUM'])
plt.figure(figsize = (6,6))
sn.barplot(x="SUM", y="MCC_DESCRIPTION", data=Gen_Z_Top_merchant,label="MCC_DESCRIPTION").set(title='Boomers: Top 20 MCC in Total Spent')
```

```
[Text(0.5, 1.0, 'Boomers: Top 20 MCC in Total Spent')]
```




```
plt.figure(figsize = (10,10))
sn.countplot(y="PARTNER_NAME", data=cus_data,label="MCC_DESCRIPTION").set(title='Boomers: Top 20 MCC in Total Spent')
```

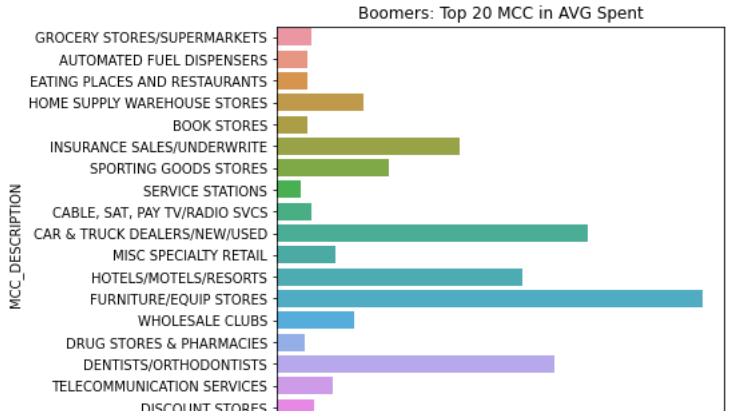
```
[Text(0.5, 1.0, 'Boomers: Top 20 MCC in Total Spent')]
```




```
x=Boomers['MCC_DESCRIPTION'].value_counts().rename_axis('MCC_DESCRIPTION').reset_index(name='Total_Transactions')
avg_transaction = pd.DataFrame(Boomers.groupby('MCC_DESCRIPTION')['TRANSACTIONAMT'].mean())
total_transaction = pd.DataFrame(Boomers.groupby('MCC_DESCRIPTION')['TRANSACTIONAMT'].sum())
unique_customer = pd.DataFrame(Boomers.groupby('MCC_DESCRIPTION')['acct_id'].nunique())
merchant_avg=pd.merge(x, avg_transaction, on = 'MCC_DESCRIPTION')
merchant_all=pd.merge(merchant_avg, total_transaction, on = 'MCC_DESCRIPTION')
merchant_all=pd.merge(merchant_all, unique_customer, on = 'MCC_DESCRIPTION')
merchant_all_min_trans_30=merchant_all[merchant_all['Total_Transactions']>30]
merchant_all_min_trans_30=merchant_all_min_trans_30.rename(columns={"TRANSACTIONAMT_x": "AVG", "TRANSACTIONAMT_y": "SUM"})
Gen_Z_Top_merchant=merchant_all_min_trans_30.nlargest(n=20, columns=['SUM'])
plt.figure(figsize = (6,6))
sn.barplot(x="SUM", y="MCC_DESCRIPTION", data=Gen_Z_Top_merchant,label="MCC_DESCRIPTION").set(title='Boomers: Top 20 MCC in Total Spent')

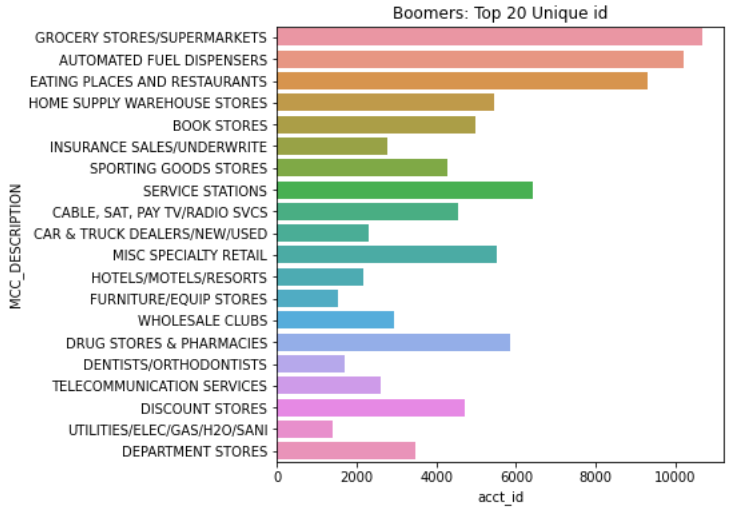

plt.figure(figsize = (6,6))
sn.barplot(x="AVG", y="MCC_DESCRIPTION", data=Gen_Z_Top_merchant,label="MCC_DESCRIPTION").set(title='Boomers: Top 20 MCC in AVG Spent')
```

```
[Text(0.5, 1.0, 'Boomers: Top 20 MCC in AVG Spent')]
```




```
plt.figure(figsize = (6,6))
sn.barplot(x="acct_id", y="MCC_DESCRIPTION", data=Gen_Z_Top_merchant,label="MCC_DESCRIPTION").set(title='Boomers: Top 20 Unique id')
```

```
[Text(0.5, 1.0, 'Boomers: Top 20 Unique id')]
```




```
Gen_Z.columns
```

```
Index(['acct_id', 'VINTAGE_YEAR', 'STATE', 'GENERATION', 'AGE', 'FICO',
       'MONTHLY_INCOME', 'PRODUCT_SEGMENT', 'PARTNERBUSINESSKEY',
       'PARTNER_NAME', 'CREDIT_LIMIT', 'TRANSACTIONPOSTDT', 'TRANSACTIONAMT',
       'MERCHANTDESC', 'MCC', 'MCC_DESCRIPTION', 'SPENDCATEGORYNM', 'ENTRYNBR',
       'ME_BALANCE', 'date', 'buy_month', 'time_series', 'buy_weekday',
       'Merchant_Name', 'Spending_ratio'],
      dtype='object')
```

Spending Ratio

```
spending=pd.DataFrame(Gen_Z.groupby(['acct_id','buy_month'])['TRANSACTIONAMT'].sum().round(2))
spending.reset_index(inplace=True)
```

```
len(spending)
```

```
7692
```

```
Gen_Z['acct_id'].nunique()
```

```
1277
```

```
limit=pd.DataFrame(Gen_Z.groupby('acct_id')['CREDIT_LIMIT'].max())
limit.reset_index(inplace=True)
```

```
spending=spending.merge(limit, on='acct_id')
```

```
id=Gen_Z['acct_id'].unique()
for i in range(10):
  data=spending[spending['acct_id']== id[random.randint(0,1200)]]
  print(data)
```

```
                acct_id  buy_month  TRANSACTIONAMT  CREDIT_LIMIT
6765  EDM0000008753475          1            33.4        1600.0
6766  EDM0000008753475          3           106.5        1600.0
                acct_id  buy_month  TRANSACTIONAMT  CREDIT_LIMIT
2459  EDM0000003536736          1          122.10         900.0
2460  EDM0000003536736          2          290.15         900.0
2461  EDM0000003536736          3          228.34         900.0
2462  EDM0000003536736          4          257.02         900.0
2463  EDM0000003536736          5          393.34         900.0
2464  EDM0000003536736          6          484.31         900.0
2465  EDM0000003536736          7          249.52         900.0
                acct_id  buy_month  TRANSACTIONAMT  CREDIT_LIMIT
3003  EDM0000003907290          1          410.50        1000.0
3004  EDM0000003907290          2          275.24        1000.0
3005  EDM0000003907290          3          487.45        1000.0
3006  EDM0000003907290          4          472.18        1000.0
3007  EDM0000003907290          5          271.40        1000.0
3008  EDM0000003907290          6          744.55        1000.0
3009  EDM0000003907290          7           13.45        1000.0
                acct_id  buy_month  TRANSACTIONAMT  CREDIT_LIMIT
6271  EDM0000008600049          1           46.70         500.0
6272  EDM0000008600049          5          629.70         500.0
6273  EDM0000008600049          6          256.74         500.0
6274  EDM0000008600049          7            2.16         500.0
                acct_id  buy_month  TRANSACTIONAMT  CREDIT_LIMIT
6712  EDM0000008732375          1          152.03        9400.0
6713  EDM0000008732375          2         1371.79        9400.0
6714  EDM0000008732375          3          331.52        9400.0
6715  EDM0000008732375          4            8.82        9400.0
                acct_id  buy_month  TRANSACTIONAMT  CREDIT_LIMIT
6250  EDM0000008595453          1          433.25        1000.0
6251  EDM0000008595453          2          309.94        1000.0
6252  EDM0000008595453          3          425.30        1000.0
6253  EDM0000008595453          4          336.31        1000.0
6254  EDM0000008595453          5          101.39        1000.0
6255  EDM0000008595453          6          521.73        1000.0
6256  EDM0000008595453          7          553.94        1000.0
                acct_id  buy_month  TRANSACTIONAMT  CREDIT_LIMIT
6257  EDM0000008596634          1          144.90        1000.0
6258  EDM0000008596634          2          352.54        1000.0
6259  EDM0000008596634          3          277.68        1000.0
6260  EDM0000008596634          4           66.84        1000.0
6261  EDM0000008596634          5          387.01        1000.0
6262  EDM0000008596634          6          861.20        1000.0
6263  EDM0000008596634          7          301.95        1000.0
                acct_id  buy_month  TRANSACTIONAMT  CREDIT_LIMIT
6297  EDM0000008602752          1          215.86        1500.0
6298  EDM0000008602752          2           61.00        1500.0
6299  EDM0000008602752          3          362.36        1500.0
6300  EDM0000008602752          4          292.76        1500.0
6301  EDM0000008602752          5           80.09        1500.0
6302  EDM0000008602752          6         1352.30        1500.0
6303  EDM0000008602752          7          323.57        1500.0
                acct_id  buy_month  TRANSACTIONAMT  CREDIT_LIMIT
5555  EDM0000006696916          1           54.00        1400.0
5556  EDM0000006696916          2           15.12        1400.0
5557  EDM0000006696916          7          123.29        1400.0
                acct_id  buy_month  TRANSACTIONAMT  CREDIT_LIMIT
```

```
spending['Credit_Utilization']=((spending['TRANSACTIONAMT']/spending['CREDIT_LIMIT'])*100).round(2)
```

```
spending.take([103,104,105,106,107,108])
```

	acct_id	buy_month	TRANSACTIONAMT	CREDIT_LIMIT	Credit_Utilization
103	EDM0000000376174	1	726.70	5000.0	14.53
104	EDM0000000376174	2	1035.33	5000.0	20.71
105	EDM0000000376174	3	1610.14	5000.0	32.20
106	EDM0000000376174	4	1475.95	5000.0	29.52
107	EDM0000000376174	5	461.39	5000.0	9.23
108	EDM0000000376174	6	858.26	5000.0	17.17

```
#sns.set_theme(style="ticks")

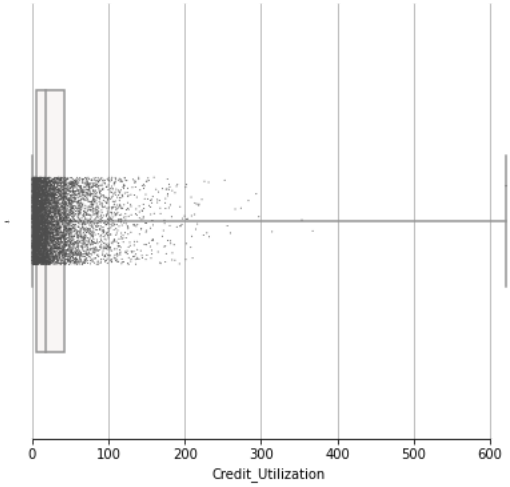
# Initialize the figure with a logarithmic x axis
f, ax = plt.subplots(figsize=(7, 6))
#ax.set_xscale("log")

# Load the example planets dataset
#planets = sns.load_dataset("planets")

# Plot the orbital period with horizontal boxes
sn.boxplot(x="Credit_Utilization", data=spending, whis=[0, 100], width=.6, palette="vlag")

# Add in points to show each observation
sn.stripplot(x="Credit_Utilization", data=spending, size=1, color=".3", linewidth=0)

# Tweak the visual presentation
ax.xaxis.grid(True)
ax.set(ylabel="")
sn.despine(trim=True, left=True)
```




```
f, ax = plt.subplots(figsize=(20, 8))
sn.histplot(x='Credit_Utilization', data = spending).set(title='Gen_Z Credit_Utilization')
ax.set_xticks([i for i in range(-100,650,10)])
```

```
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```

```
spending=pd.DataFrame(Gen_Z.groupby(['acct_id','buy_month'])['TRANSACTIONAMT'].sum().round(2))
spending.reset_index(inplace=True)
limit=pd.DataFrame(Gen_Z.groupby('acct_id')['CREDIT_LIMIT'].max())
limit.reset_index(inplace=True)
spending=spending.merge(limit, on='acct_id')
spending['Credit_Utilization']=((spending['TRANSACTIONAMT']/spending['CREDIT_LIMIT'])*100).round(2)
f, ax = plt.subplots(figsize=(20, 8))
sn.histplot(x='Credit_Utilization', data = spending).set(title='Gen_Z Credit_Utilization')
ax.set_xticks([i for i in range(-100,650,20)])
```

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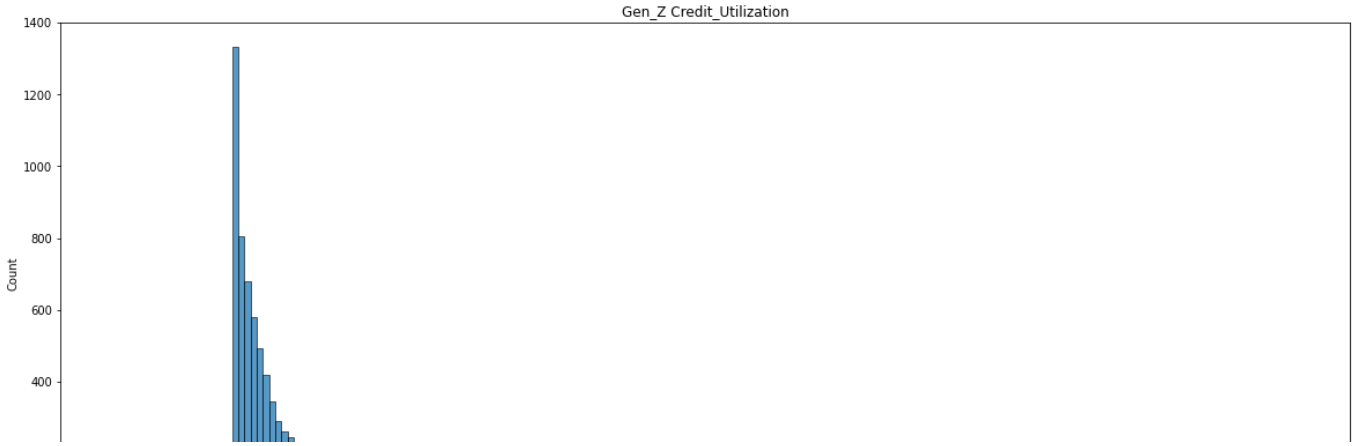


```
spending=pd.DataFrame(Boomers.groupby(['acct_id','buy_month'])['TRANSACTIONAMT'].sum().round(2))
spending.reset_index(inplace=True)
limit=pd.DataFrame(Boomers.groupby('acct_id')['CREDIT_LIMIT'].mean())
limit.reset_index(inplace=True)
spending=spending.merge(limit, on='acct_id')
spending['Credit_Utilization']=((spending['TRANSACTIONAMT']/spending['CREDIT_LIMIT'])*100).round(2)
f, ax = plt.subplots(figsize=(20, 8))
sn.histplot(x='Credit_Utilization', data = spending).set(title='Boomers Credit_Utilization')
ax.set_xticks([i for i in range(-100,200,20)])
```

```
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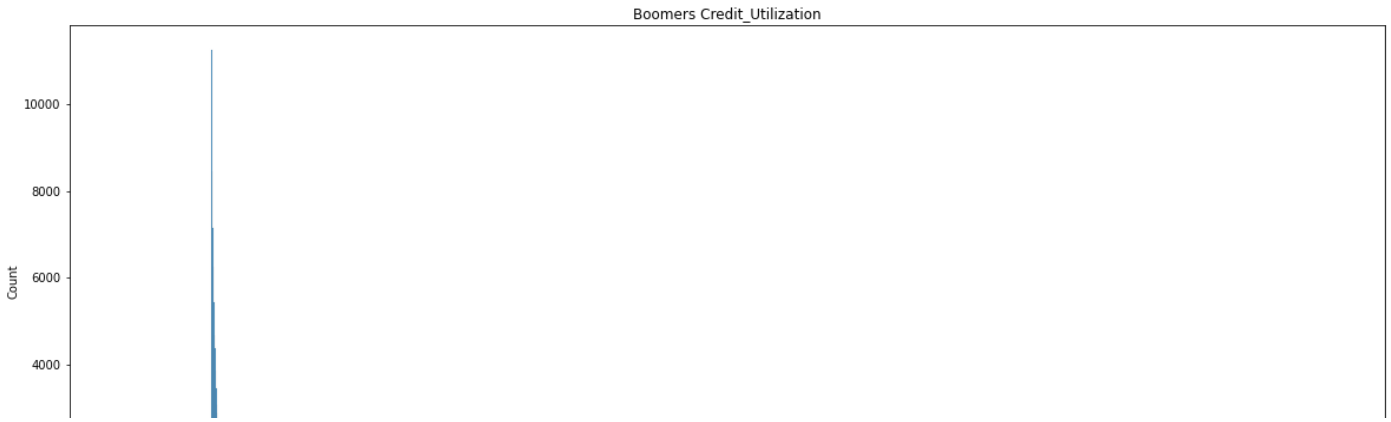


Credit Utilization based on age

```
data=df[((df['AGE']<31 ) | (df['GENERATION']=='2. Boomers')) & (df['TRANSACTIONAMT']>0 )]
#data=df[(df['AGE']<31 ) ]
```

```
spending=pd.DataFrame(data.groupby(['acct_id','buy_month'])['TRANSACTIONAMT'].sum().round(2))
spending.reset_index(inplace=True)
```

```
avg_spending=pd.DataFrame(data.groupby('acct_id')['TRANSACTIONAMT'].mean().round(2))
avg_spending.reset_index(inplace=True)
```

```
avg_spending.head()
```

	acct_id	TRANSACTIONAMT
0	EDM0000000002119	98.12
1	EDM0000000007360	27.90
2	EDM0000000008180	52.57
3	EDM0000000018628	15.21
4	EDM0000000022348	108.10

```
cus_data=data[['acct_id','AGE', 'CREDIT_LIMIT','FICO','MONTHLY_INCOME']]
cus_data.drop_duplicates( "acct_id" , keep='first',inplace=True)
avg_spending=avg_spending.merge(cus_data, on='acct_id')
```

```
/usr/local/lib/python3.7/dist-packages/pandas/util/_decorators.py:311: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-co
  return func(*args, **kwargs)
```

```
df.columns
```

```
Index(['acct_id', 'VINTAGE_YEAR', 'STATE', 'GENERATION', 'AGE', 'FICO',
       'MONTHLY_INCOME', 'PRODUCT_SEGMENT', 'PARTNERBUSINESSKEY',
       'PARTNER_NAME', 'CREDIT_LIMIT', 'TRANSACTIONPOSTDT', 'TRANSACTIONAMT',
       'MERCHANTDESC', 'MCC', 'MCC_DESCRIPTION', 'SPENDCATEGORYNM', 'ENTRYNBR',
```

```
       'ME_BALANCE', 'date', 'buy_month', 'time_series', 'buy_weekday'],
      dtype='object')
```

```
cus_data=df[['acct_id', 'PARTNER_NAME']]
cus_data.drop_duplicates( "acct_id" , keep='first',inplace=True)
```

```
/usr/local/lib/python3.7/dist-packages/pandas/util/_decorators.py:311: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-co
  return func(*args, **kwargs)
```

```
/usr/local/lib/python3.7/dist-packages/pandas/util/_decorators.py:311: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-co
  return func(*args, **kwargs)
```

```
avg_spending[avg_spending['acct_id']=='EDM0000000328432']
```

	acct_id	TRANSACTIONAMT	AGE	CREDIT_LIMIT	FICO	MONTHLY_INCOME
84	EDM0000000328432	18.91	26	400.0	785	4166

```
avg_spending['Credit_Utilization']=((avg_spending['TRANSACTIONAMT']/avg_spending['CREDIT_LIMIT'])*100).round(2)
```

```
avg_spending.head()
```

	acct_id	TRANSACTIONAMT	AGE	CREDIT_LIMIT	FICO	MONTHLY_INCOME	Credit_Utilization
0	EDM0000000002119	98.12	66	19250.0	799	2000	0.51
1	EDM0000000007360	27.90	68	9000.0	741	4666	0.31
2	EDM0000000008180	52.57	73	2500.0	726	3333	2.10
3	EDM0000000018628	15.21	59	2800.0	642	3750	0.54
4	EDM0000000022348	108.10	76	24650.0	734	5250	0.44

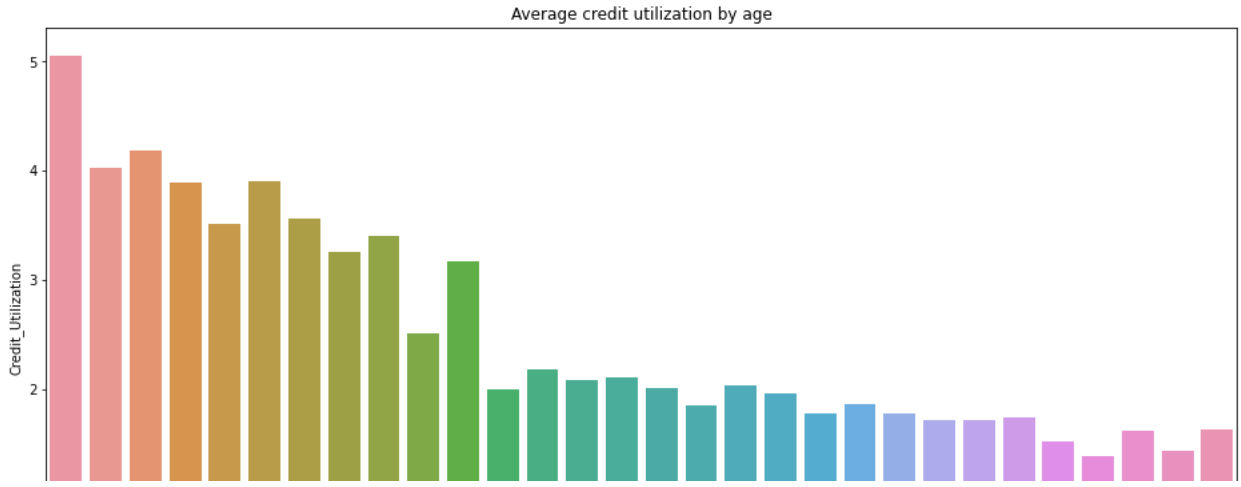
```
age_avg_utilization = pd.DataFrame(avg_spending.groupby('AGE')['Credit_Utilization'].mean())
age_avg_utilization.reset_index(inplace=True)
```

```
age_avg_utilization.head()
```

	AGE	Credit_Utilization
0	20	5.057222
1	21	4.031228
2	22	4.191824
3	23	3.895426
4	24	3.516524

```
plt.figure(figsize = (16,8))
sn.barplot(x="AGE", y="Credit_Utilization", data=age_avg_utilization).set(title='Average credit utilization by age')
```

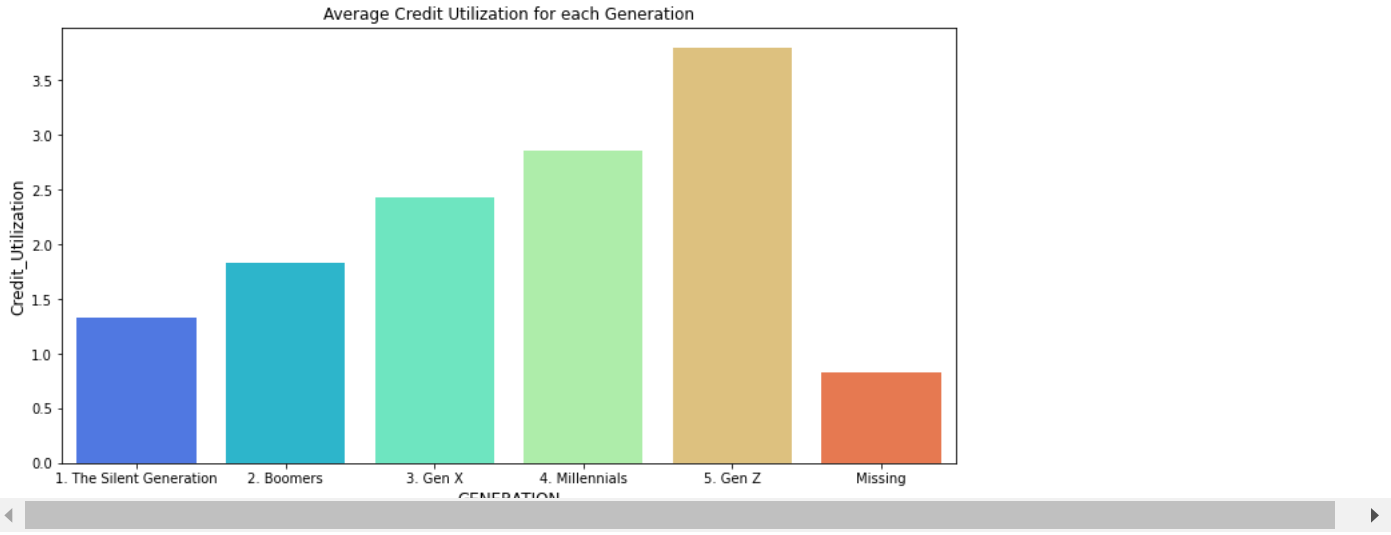
```
[Text(0.5, 1.0, 'Average credit utilization by age')]
```




```
data=df[(df['TRANSACTIONAMT']>0 )]
spending=pd.DataFrame(data.groupby(['acct_id','buy_month'])['TRANSACTIONAMT'].sum().round(2))
spending.reset_index(inplace=True)
avg_spending=pd.DataFrame(data.groupby('acct_id')['TRANSACTIONAMT'].mean().round(2))
avg_spending.reset_index(inplace=True)
cus_data=data[['acct_id','AGE', 'CREDIT_LIMIT','FICO','MONTHLY_INCOME','GENERATION']]
cus_data.drop_duplicates( "acct_id" , keep='first',inplace=True)
avg_spending=avg_spending.merge(cus_data, on='acct_id')
avg_spending['Credit_Utilization']=((avg_spending['TRANSACTIONAMT']/avg_spending['CREDIT_LIMIT'])*100).round(2)
age_avg_utilization = pd.DataFrame(avg_spending.groupby('GENERATION')['Credit_Utilization'].mean())
age_avg_utilization.reset_index(inplace=True)
fig=plt.figure(figsize = (12,6))
plt.title('Gen_Z: Top 3 Sporting Goods\n wrt unique number of users', fontsize=16)
plt.xlabel('xlabel', fontsize=12)
plt.ylabel('ylabel', fontsize=12)
sn.barplot(x="GENERATION", y="Credit_Utilization", data=age_avg_utilization, palette='rainbow').set(title='Average Credit Utilization for eacl
```

```
/usr/local/lib/python3.7/dist-packages/pandas/util/_decorators.py:311: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-co
  return func(*args, **kwargs)
[Text(0.5, 1.0, 'Average Credit Utilization for each Generation')]
```

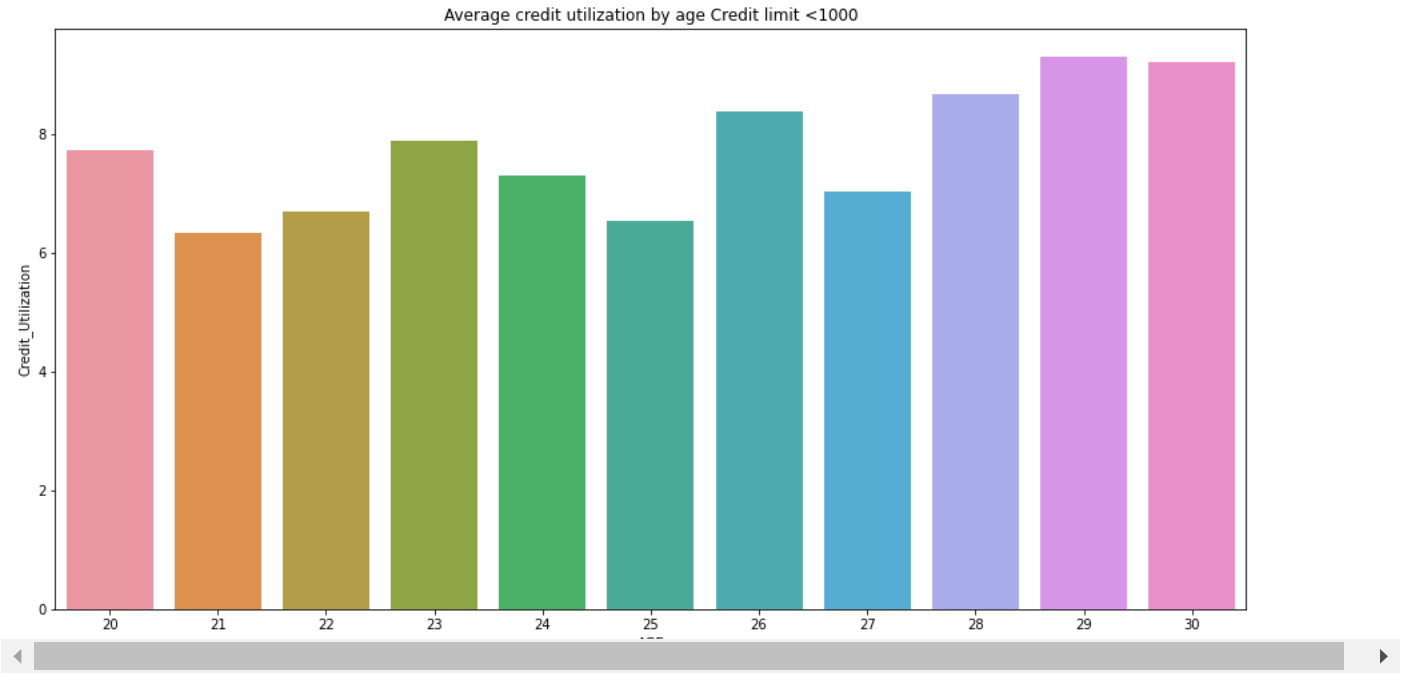



```
data=df[((df['AGE']<31 )  & (df['CREDIT_LIMIT']<1000) )& (df['TRANSACTIONAMT']>0 ) ]
spending=pd.DataFrame(data.groupby(['acct_id','buy_month'])['TRANSACTIONAMT'].sum().round(2))
spending.reset_index(inplace=True)
avg_spending=pd.DataFrame(data.groupby('acct_id')['TRANSACTIONAMT'].mean().round(2))
avg_spending.reset_index(inplace=True)
cus_data=data[['acct_id','AGE', 'CREDIT_LIMIT','FICO','MONTHLY_INCOME']]
cus_data.drop_duplicates( "acct_id" , keep='first',inplace=True)
avg_spending=avg_spending.merge(cus_data, on='acct_id')
avg_spending['Credit_Utilization']=((avg_spending['TRANSACTIONAMT']/avg_spending['CREDIT_LIMIT'])*100).round(2)
age_avg_utilization = pd.DataFrame(avg_spending.groupby('AGE')['Credit_Utilization'].mean())
age_avg_utilization.reset_index(inplace=True)
```

```
plt.figure(figsize = (16,8))
sn.barplot(x="AGE", y="Credit_Utilization", data=age_avg_utilization).set(title='Average credit utilization by age Credit limit <1000')
```

```
/usr/local/lib/python3.7/dist-packages/pandas/util/_decorators.py:311: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-co
  return func(*args, **kwargs)
[Text(0.5, 1.0, 'Average credit utilization by age Credit limit <1000')]
```




```
data=df[((df['AGE']<31 )  & (df['FICO']<650))& (df['TRANSACTIONAMT']>0 )  ]
spending=pd.DataFrame(data.groupby(['acct_id','buy_month'])['TRANSACTIONAMT'].sum().round(2))
spending.reset_index(inplace=True)
avg_spending=pd.DataFrame(data.groupby('acct_id')['TRANSACTIONAMT'].mean().round(2))
avg_spending.reset_index(inplace=True)
cus_data=data[['acct_id','AGE', 'CREDIT_LIMIT','FICO','MONTHLY_INCOME']]
cus_data.drop_duplicates( "acct_id" , keep='first',inplace=True)
avg_spending=avg_spending.merge(cus_data, on='acct_id')
avg_spending['Credit_Utilization']=((avg_spending['TRANSACTIONAMT']/avg_spending['CREDIT_LIMIT'])*100).round(2)
age_avg_utilization = pd.DataFrame(avg_spending.groupby('AGE')['Credit_Utilization'].mean())
age_avg_utilization.reset_index(inplace=True)
plt.figure(figsize = (16,8))
sn.barplot(x="AGE", y="Credit_Utilization", data=age_avg_utilization).set(title='Average credit utilization by age FICO <650')
```