Black Friday Sales Prediction

In [201]:

```
# manipulation data
import pandas as pd
import numpy as np

#visualiation data
import matplotlib.pyplot as plt
import seaborn as sns
import matplotlib
import plotly.graph_objects as go
import plotly.express as px
from plotly.subplots import make_subplots
from plotly.offline import init_notebook_mode, iplot
```

In [202]:

```
df_train=pd.read_csv('train.csv')
df_train.head()
```

Out[202]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current_City_Yea
0	1000001	P00069042	F	0-17	10	A	
1	1000001	P00248942	F	0-17	10	A	
2	1000001	P00087842	F	0-17	10	A	
3	1000001	P00085442	F	0-17	10	A	
4	1000002	P00285442	M	55+	16	C	4

In [203]:

```
df_train.shape
```

Out[203]:

```
(550068, 12)
```

In [204]:

```
## import the test data
df_test=pd.read_csv('test.csv')
df_test.head()
```

Out[204]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current_City_Yea
0	1000004	P00128942	M	46-50	7	B	
1	1000009	P00113442	M	26-35	17	C	
2	1000010	P00288442	F	36-45	1	B	4
3	1000010	P00145342	F	36-45	1	B	4
4	1000011	P00053842	F	26-35	1	C	

In [205]:

```
df=df_train.append(df_test)
df.head()
```

```
C:\Users\DELL\AppData\Local\Temp\ipykernel_14112\2683340988.py:1: FutureW
arning:

The frame.append method is deprecated and will be removed from pandas in
a future version. Use pandas.concat instead.
```

Out[205]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current_City_Yea
0	1000001	P00069042	F	0-17	10	A	
1	1000001	P00248942	F	0-17	10	A	
2	1000001	P00087842	F	0-17	10	A	
3	1000001	P00085442	F	0-17	10	A	
4	1000002	P00285442	M	55+	16	C	4

In [206]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 783667 entries, 0 to 233598
Data columns (total 12 columns):
 #   Column                      Non-Null Count   Dtype  
---  ------                      --------------   -----  
 0   User_ID                     783667 non-null  int64  
 1   Product_ID                  783667 non-null  object 
 2   Gender                      783667 non-null  object 
 3   Age                         783667 non-null  object 
 4   Occupation                  783667 non-null  int64  
 5   City_Category               783667 non-null  object 
 6   Stay_In_Current_City_Years  783667 non-null  object 
 7   Marital_Status              783667 non-null  int64  
 8   Product_Category_1          783667 non-null  int64  
 9   Product_Category_2          537685 non-null  float64
 10  Product_Category_3          237858 non-null  float64
 11  Purchase                    550068 non-null  float64
dtypes: float64(3), int64(4), object(5)
memory usage: 77.7+ MB
```

In [207]:

```
df.drop('User_ID',axis=1,inplace=True)
```

In [208]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 783667 entries, 0 to 233598
Data columns (total 11 columns):
 #   Column                      Non-Null Count   Dtype  
---  ------                      --------------   -----  
 0   Product_ID                  783667 non-null  object 
 1   Gender                      783667 non-null  object 
 2   Age                         783667 non-null  object 
 3   Occupation                  783667 non-null  int64  
 4   City_Category               783667 non-null  object 
 5   Stay_In_Current_City_Years  783667 non-null  object 
 6   Marital_Status              783667 non-null  int64  
 7   Product_Category_1          783667 non-null  int64  
 8   Product_Category_2          537685 non-null  float64
 9   Product_Category_3          237858 non-null  float64
 10  Purchase                    550068 non-null  float64
dtypes: float64(3), int64(3), object(5)
memory usage: 71.7+ MB
```

In [209]:

```
df.head()
```

Out[209]:

	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current_City_Years	Marital
0	P00069042	F	0-17	10	A	2	
1	P00248942	F	0-17	10	A	2	
2	P00087842	F	0-17	10	A	2	
3	P00085442	F	0-17	10	A	2	
4	P00285442	M	55+	16	C	4+	

In [210]:

```
# Categorical feature to umerical conversion
df.Gender=df.Gender.map({'F':0,'M':1})
```

In [211]:

```
df.head()
```

Out[211]:

	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current_City_Years	Marital
0	P00069042	0	0-17	10	A	2	
1	P00248942	0	0-17	10	A	2	
2	P00087842	0	0-17	10	A	2	
3	P00085442	0	0-17	10	A	2	
4	P00285442	1	55+	16	C	4+	

In [212]:

```
df.Age.unique()
```

Out[212]:

```
array(['0-17', '55+', '26-35', '46-50', '51-55', '36-45', '18-25'],
      dtype=object)
```

In [213]:

```
df.Age=df.Age.map({'0-17':0,'18-25':1,'26-35':2,'36-45':3,'46-50':4,'51-55':5,'55+':6})
```

In [214]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 783667 entries, 0 to 233598
Data columns (total 11 columns):
 #   Column                      Non-Null Count   Dtype  
---  ------                      --------------   -----  
 0   Product_ID                  783667 non-null  object 
 1   Gender                      783667 non-null  int64  
 2   Age                         783667 non-null  int64  
 3   Occupation                  783667 non-null  int64  
 4   City_Category               783667 non-null  object 
 5   Stay_In_Current_City_Years  783667 non-null  object 
 6   Marital_Status              783667 non-null  int64  
 7   Product_Category_1          783667 non-null  int64  
 8   Product_Category_2          537685 non-null  float64
 9   Product_Category_3          237858 non-null  float64
 10  Purchase                    550068 non-null  float64
dtypes: float64(3), int64(5), object(3)
memory usage: 71.7+ MB
```

In [215]:

```
'''# Import label encoder
from sklearn import preprocessing

# label_encoder object knows
# how to understand word labels.
label_encoder = preprocessing.LabelEncoder()

# Encode labels in column 'species'.
df['species']= label_encoder.fit_transform(df['species'])

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

Out[215]:

```
"# Import label encoder\nfrom sklearn import preprocessing\n  \n# label_e
ncoder object knows \n# how to understand word labels.\nlabel_encoder = p
reprocessing.LabelEncoder()\n  \n# Encode labels in column 'species'.\ndf
['species']= label_encoder.fit_transform(df['species'])\n  \ndf['specie
s'].unique()"
```

In [216]:

```
df.head()
```

Out[216]:

	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current_City_Years	Marital
0	P00069042	0	0	10	A	2	
1	P00248942	0	0	10	A	2	
2	P00087842	0	0	10	A	2	
3	P00085442	0	0	10	A	2	
4	P00285442	1	6	16	C	4+	

In [217]:

```
## Fixing categorical City_ctegory
df_city=pd.get_dummies(df['City_Category'],drop_first=True)
```

In [218]:

```
df_city
```

Out[218]:

	B	C
0	0	0
1	0	0
2	0	0
3	0	0
4	0	1
...	...	...
233594	1	0
233595	1	0
233596	1	0
233597	0	1
233598	1	0

783667 rows × 2 columns

In [219]:

```
df=pd.concat([df,df_city],axis=1)
```

In [220]:

```
df.head()
```

Out[220]:

	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current_City_Years	Marital
0	P00069042	0	0	10	A	2	
1	P00248942	0	0	10	A	2	
2	P00087842	0	0	10	A	2	
3	P00085442	0	0	10	A	2	
4	P00285442	1	6	16	C	4+	

In [221]:

```
df.drop('City_Category',axis=1,inplace=True)
```

In [222]:

```
df.head()
```

Out[222]:

	Product_ID	Gender	Age	Occupation	Stay_In_Current_City_Years	Marital_Status	Produ
0	P00069042	0	0	10	2	0	
1	P00248942	0	0	10	2	0	
2	P00087842	0	0	10	2	0	
3	P00085442	0	0	10	2	0	
4	P00285442	1	6	16	4+	0	

Missing values

In [223]:

```
df.dtypes
```

Out[223]:

```
Product_ID                   object
Gender                        int64
Age                           int64
Occupation                    int64
Stay_In_Current_City_Years   object
Marital_Status                int64
Product_Category_1            int64
Product_Category_2          float64
Product_Category_3          float64
Purchase                    float64
B                             uint8
C                             uint8
dtype: object
```

In [224]:

```
df.isnull().sum()
```

Out[224]:

```
Product_ID                      0
Gender                          0
Age                             0
Occupation                      0
Stay_In_Current_City_Years      0
Marital_Status                  0
Product_Category_1              0
Product_Category_2         245982
Product_Category_3         545809
Purchase                   233599
B                               0
C                               0
dtype: int64
```

In [225]:

```
## Replace the missing value with mode
df['Product_Category_2']=df['Product_Category_2'].fillna(df['Product_Category_2'].mode(
df['Product_Category_3']=df['Product_Category_3'].fillna(df['Product_Category_3'].mode(
```

In [226]:

```
df.head()
```

Out[226]:

	Product_ID	Gender	Age	Occupation	Stay_In_Current_City_Years	Marital_Status	Produ
0	P00069042	0	0	10	2	0	
1	P00248942	0	0	10	2	0	
2	P00087842	0	0	10	2	0	
3	P00085442	0	0	10	2	0	
4	P00285442	1	6	16	4+	0	

In [227]:

```
df.dtypes
```

Out[227]:

```
Product_ID                   object
Gender                        int64
Age                           int64
Occupation                    int64
Stay_In_Current_City_Years   object
Marital_Status                int64
Product_Category_1            int64
Product_Category_2          float64
Product_Category_3          float64
Purchase                    float64
B                             uint8
C                             uint8
dtype: object
```

In [228]:

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

Out[228]:

```
array(['2', '4+', '3', '1', '0'], dtype=object)
```

In [229]:

```
df['Stay_In_Current_City_Years']=df['Stay_In_Current_City_Years'].str.replace('+','')
```

```
C:\Users\DELL\AppData\Local\Temp\ipykernel_14112\2063355665.py:1: FutureW
arning:

The default value of regex will change from True to False in a future ver
sion. In addition, single character regular expressions will *not* be tre
ated as literal strings when regex=True.
```

In [230]:

```
df.head()
```

Out[230]:

	Product_ID	Gender	Age	Occupation	Stay_In_Current_City_Years	Marital_Status	Produ
0	P00069042	0	0	10	2	0	
1	P00248942	0	0	10	2	0	
2	P00087842	0	0	10	2	0	
3	P00085442	0	0	10	2	0	
4	P00285442	1	6	16	4	0	

In [231]:

```
#Convert object into integer
df['Stay_In_Current_City_Years']=df['Stay_In_Current_City_Years'].astype(int)
```

In [232]:

```
df['B']=df['B'].astype(int)
df['C']=df['C'].astype(int)
```

In [233]:

```
df.dtypes
```

Out[233]:

```
Product_ID                   object
Gender                        int64
Age                           int64
Occupation                    int64
Stay_In_Current_City_Years    int32
Marital_Status                int64
Product_Category_1            int64
Product_Category_2          float64
Product_Category_3          float64
Purchase                    float64
B                             int32
C                             int32
dtype: object
```

In [234]:

```
df.drop('Product_ID',axis=1,inplace=True)
```

In [235]:

```
df.head()
```

Out[235]:

	Gender	Age	Occupation	Stay_In_Current_City_Years	Marital_Status	Product_Category_
0	0	0	10	2	0	3
1	0	0	10	2	0	
2	0	0	10	2	0	12
3	0	0	10	2	0	12
4	1	6	16	4	0	8

In [236]:

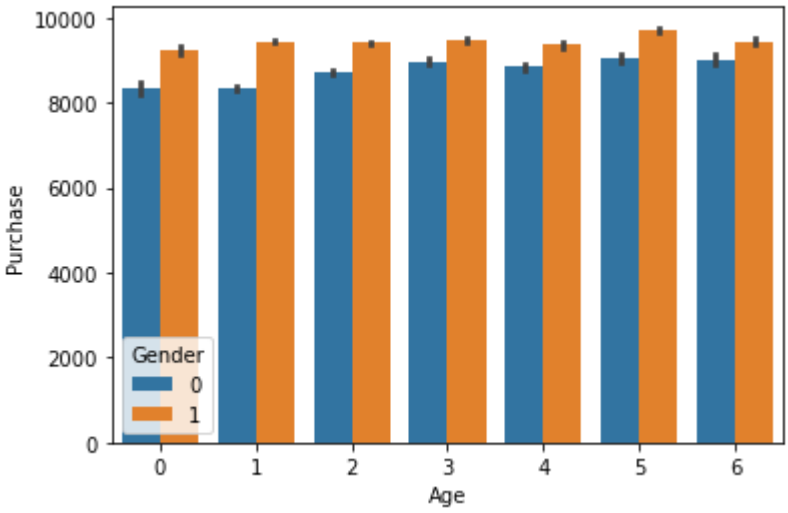
```
### Visualisation
sns.barplot('Age','Purchase',hue='Gender',data=df)
```

```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\_decorators.py:36: Fut
ureWarning:

Pass the following variables as keyword args: x, y. From version 0.12, th
e only valid positional argument will be `data`, and passing other argume
nts without an explicit keyword will result in an error or misinterpretat
ion.
```

Out[236]:

```
<AxesSubplot:xlabel='Age', ylabel='Purchase'>
```



In [237]:

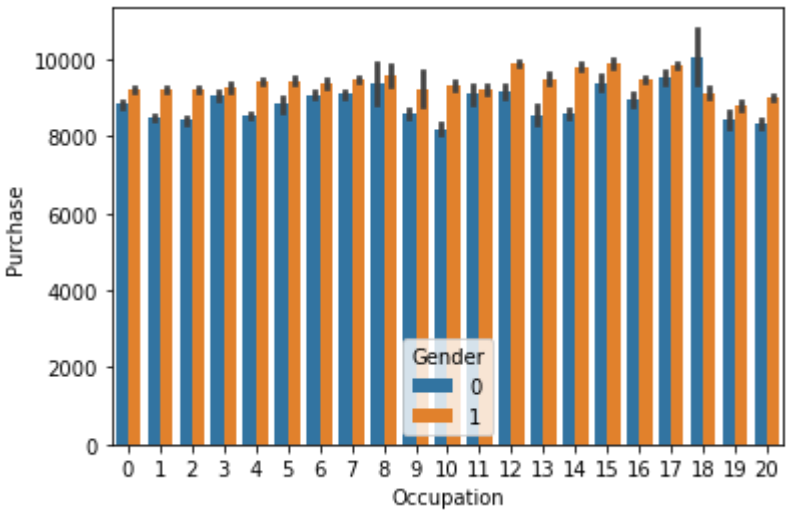
```
sns.barplot('Occupation','Purchase',hue='Gender',data=df)
```

```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\_decorators.py:36: Fut
ureWarning:

Pass the following variables as keyword args: x, y. From version 0.12, th
e only valid positional argument will be `data`, and passing other argume
nts without an explicit keyword will result in an error or misinterpretat
ion.
```

Out[237]:

```
<AxesSubplot:xlabel='Occupation', ylabel='Purchase'>
```



In [238]:

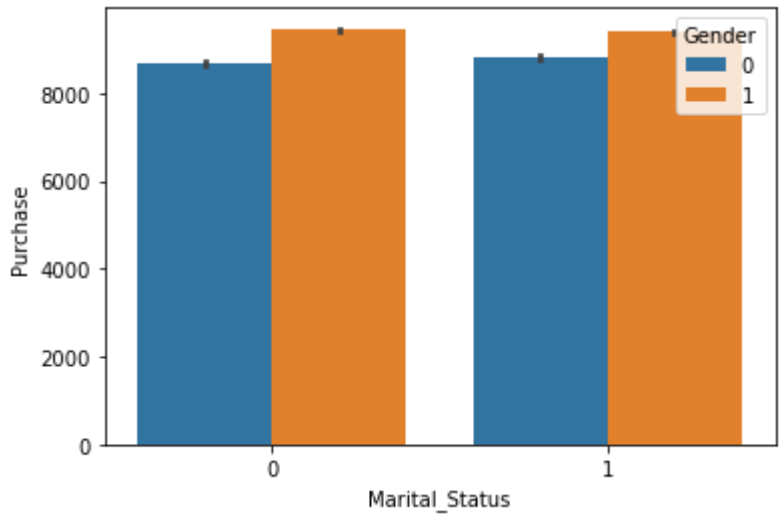
```
sns.barplot('Marital_Status','Purchase',hue='Gender',data=df)
```

```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\_decorators.py:36: Fut
ureWarning:

Pass the following variables as keyword args: x, y. From version 0.12, th
e only valid positional argument will be `data`, and passing other argume
nts without an explicit keyword will result in an error or misinterpretat
ion.
```

Out[238]:

```
<AxesSubplot:xlabel='Marital_Status', ylabel='Purchase'>
```



In [239]:

```
pd.crosstab(df['Marital_Status'],df['Gender'])
```

Out[239]:

Gender	0	1
Marital_Status		
0	112469	350069
1	81167	239962

In [240]:

```
### Feature scaling
df_test=df[df['Purchase'].isnull()]
```

In [241]:

```
df_test
```

Out[241]:

	Gender	Age	Occupation	Stay_In_Current_City_Years	Marital_Status	Product_Cate
0	1	4	7	2	1	
1	1	2	17	0	0	
2	0	3	1	4	1	
3	0	3	1	4	1	
4	0	2	1	1	0	
...	...	...	...	...	...	
233594	0	2	15	4	1	
233595	0	2	15	4	1	
233596	0	2	15	4	1	
233597	0	4	1	4	0	
233598	0	4	0	4	1	

233599 rows × 11 columns

In [242]:

```
df_train=df[~df['Purchase'].isnull()]
```

In [243]:

```
df_train
```

Out[243]:

	Gender	Age	Occupation	Stay_In_Current_City_Years	Marital_Status	Product_Category_1	Proc
0	0	0	10	2	0	3	
1	0	0	10	2	0	1	
2	0	0	10	2	0	12	
3	0	0	10	2	0	12	
4	1	6	16	4	0	8	
...	...	...	...	...	...	...	
550063	1	5	13	1	1	20	
550064	0	2	1	3	0	20	
550065	0	2	15	4	1	20	
550066	0	6	1	2	0	20	

In [244]:

```
X=df_train.drop('Purchase',axis=1)
```

In [249]:

```
X.shape
```

Out[249]:

```
(550068, 10)
```

In [247]:

```
y=df_train['Purchase']
```

In [250]:

```
X.shape
```

Out[250]:

```
(550068, 10)
```

In [251]:

```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.33, random_state=
```

In [254]:

```
df_train.drop('Purchase',axis=1,inplace=True)
df_test.drop('Purchase',axis=1,inplace=True)
```

```
C:\Users\DELL\AppData\Local\Temp\ipykernel_14112\2261737455.py:1: Setting
WithCopyWarning:


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-do
cs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (http
s://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returni
ng-a-view-versus-a-copy)

C:\Users\DELL\AppData\Local\Temp\ipykernel_14112\2261737455.py:2: Setting
WithCopyWarning:


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-do
cs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (http
s://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returni
ng-a-view-versus-a-copy)
```

In [257]:

```
from sklearn.preprocessing import StandardScaler

scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.fit_transform(X_test)

print(X_train)
```

```
[[ 0.57141282 -1.10505734  0.90867822 ...  0.36891877  1.17569512
  -0.67282374]
 [ 0.57141282  1.84716932 -1.23820419 ...  0.36891877 -0.85056064
  -0.67282374]
 [ 0.57141282  0.37105599  1.36872445 ... -1.09182956 -0.85056064
   1.48627336]
 ...
 [-1.75004823 -1.10505734 -1.08485545 ...  0.36891877  1.17569512
  -0.67282374]
 [-1.75004823 -1.10505734 -0.62480922 ...  0.36891877  1.17569512
  -0.67282374]
 [-1.75004823 -1.10505734 -0.93150671 ...  0.36891877 -0.85056064
  -0.67282374]]
```

In [258]:

```
print(X_test)
```

```
[[ 0.57491817  1.85432241  1.67314502 ...  0.36853635 -0.85317164
   1.490841  ]
 [-1.73937798  0.37396835  0.44724923 ...  0.36853635  1.1720971
  -0.67076234]
 [-1.73937798  0.37396835 -1.23835749 ...  0.36853635 -0.85317164
  -0.67076234]
 ...
 [ 0.57491817 -1.10638572 -0.93188354 ...  0.36853635 -0.85317164
   1.490841  ]
 [ 0.57491817  0.37396835 -0.16569867 ...  0.00396261 -0.85317164
   1.490841  ]
 [ 0.57491817 -1.10638572 -0.62540959 ...  0.36853635  1.1720971
  -0.67076234]]
```

In [ ]:

```

```