

Assignment Date	19 September 2022
Student Name	Lakshmi narayanan
Team ID Number	PNT2022TMID28949
Maximum Marks	2 Marks

### Question-1:

Download the dataset:

### Question-2:

Load the dataset.

### Solution:

```
import pandas as pd
df=pd.read_csv('/content/Churn_Modelling.csv')
```

**Load Dataset**

In [1]: `import pandas as pd`

In [3]: `df=pd.read_csv('/content/Churn_Modelling.csv')`

In [4]: `df`

Out[4]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	1	15634602	Hargrave	619	France	Female	42	2	0.00	1	1	1	101348.88	1
1	2	15647311	Hill	608	Spain	Female	41	1	83807.86	1	0	1	112542.58	0
2	3	15619304	Onio	502	France	Female	42	8	159660.80	3	1	0	113931.57	1
3	4	15701354	Boni	699	France	Female	39	1	0.00	2	0	0	93826.63	0
4	5	15737888	Mitchell	850	Spain	Female	43	2	125510.82	1	1	1	79084.10	0
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9995	9996	15606229	Obijaku	771	France	Male	39	5	0.00	2	1	0	96270.64	0
9996	9997	15569892	Johnstone	516	France	Male	35	10	57369.61	1	1	1	101699.77	0
9997	9998	15584532	Liu	709	France	Female	36	7	0.00	1	0	1	42085.58	1
9998	9999	15682355	Sabbatini	772	Germany	Male	42	3	75075.31	2	1	0	92888.52	1
9999	10000	15628319	Walker	792	France	Female	28	4	130142.79	1	1	0	38190.78	0

10000 rows × 14 columns

### Question-3:

Perform Below Visualizations.

1)Univariate Analysis

## Solution:

```
import matplotlib.pyplot as plt
import numpy as np
df_ex_0=df.loc[df['Exited']==0]
df_ex_1=df.loc[df['Exited']==1]
plt.plot(df_ex_0['Balance'],np.zeros_like(df_ex_0['Balance']),color='green')
plt.xlabel('Balance')
plt.show()
```

### Visualizations

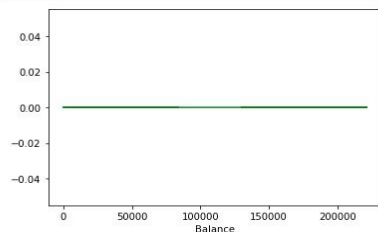
#### 1)Univariate Analysis

```
In [5]: import matplotlib.pyplot as plt
import numpy as np

In [6]: df_ex_0=df.loc[df['Exited']==0]

In [7]: df_ex_1=df.loc[df['Exited']==1]

In [8]: plt.plot(df_ex_0['Balance'],np.zeros_like(df_ex_0['Balance']),color='green')
plt.xlabel('Balance')
plt.show()
```



## 2)Bi - Variate Analysis

## Solution:

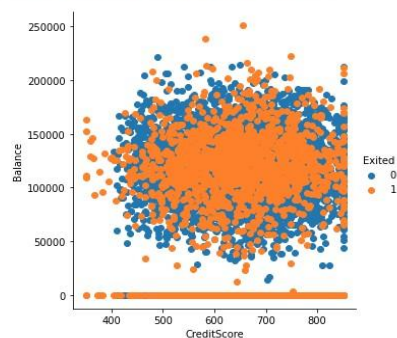
```
import seaborn as sns
sns.FacetGrid(df,hue='Exited',size=5).map(plt.scatter,'CreditScore','Balance').add_legend()
```

#### 2)Bivariate Analysis

```
In [10]: import seaborn as sns
sns.FacetGrid(df,hue='Exited',size=5).map(plt.scatter,'CreditScore','Balance').add_legend()
```

/usr/local/lib/python3.7/dist-packages/seaborn/axisgrid.py:337: UserWarning: The "size" parameter has been renamed to "height"; please update your code.  
warnings.warn(msg, UserWarning)

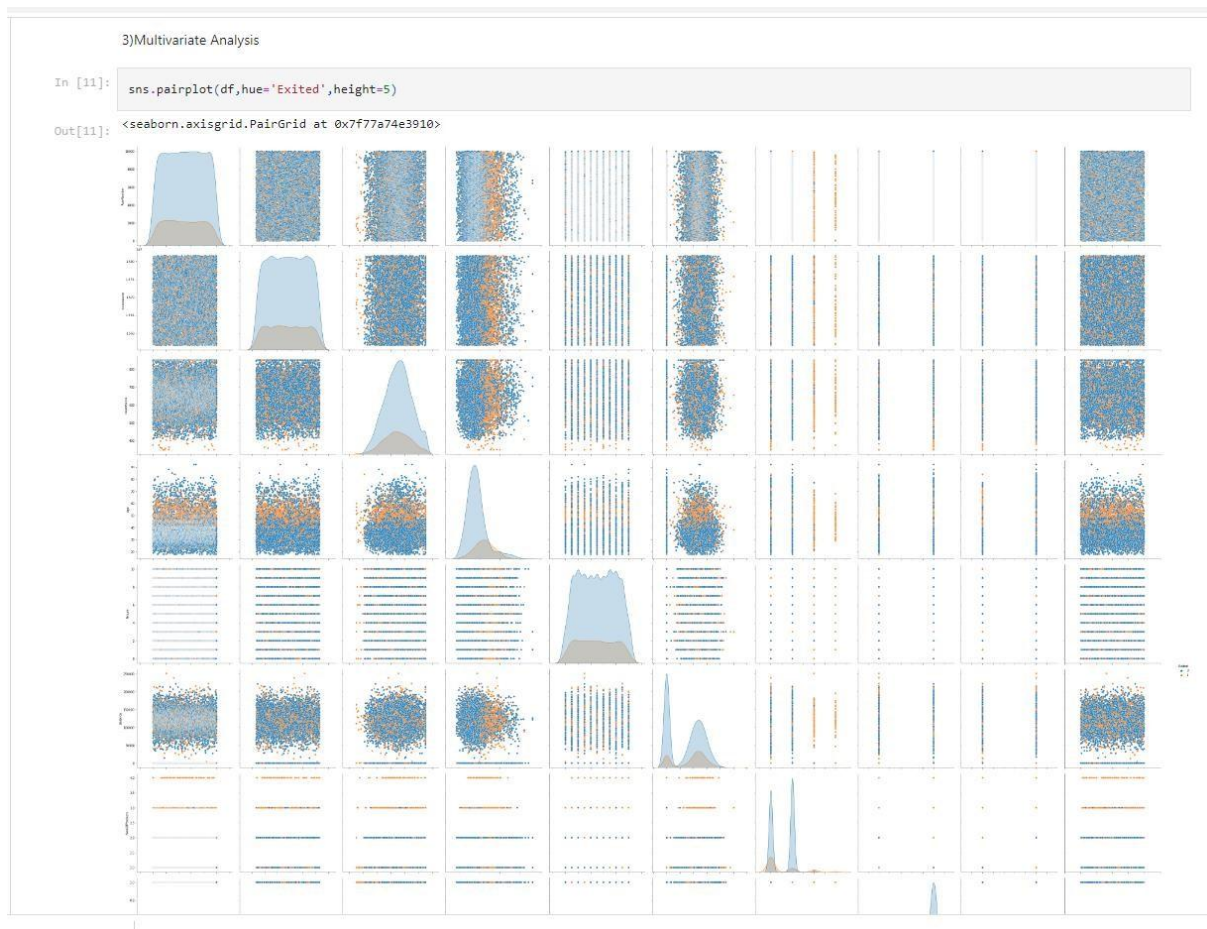
```
Out[10]: <seaborn.axisgrid.FacetGrid at 0x7f7b612a7d0>
```



## 1)Multivariate Analysis

### Solution:

```
sns.pairplot(df,hue='Exited',height=5)
```



### Question-4:

Perform descriptive statistics on the dataset.

**Solution:** `df.describe(include='all')`

Descriptive Statistics

```
In [12]: df.describe(include='all')
```

Out[12]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary
count	10000.00000	1.000000e+04	10000	10000.000000	10000	10000	10000.000000	10000.000000	10000.000000	10000.000000	10000.00000	10000.000000	10000.000000
unique	NaN	NaN	2932	NaN	3	2	NaN	NaN	NaN	NaN	NaN	NaN	NaN
top	NaN	NaN	Smith	NaN	France	Male	NaN	NaN	NaN	NaN	NaN	NaN	NaN
freq	NaN	NaN	32	NaN	5014	5457	NaN	NaN	NaN	NaN	NaN	NaN	NaN
mean	5000.50000	1.569094e+07	NaN	650.528800	NaN	NaN	38.921800	5.012800	76485.889288	1.530200	0.70550	0.515100	10000.000000
std	2886.89568	7.193619e+04	NaN	96.653299	NaN	NaN	10.487806	2.892174	62397.405202	0.581654	0.45584	0.499797	57000.000000
min	1.00000	1.556570e+07	NaN	350.000000	NaN	NaN	18.000000	0.000000	0.000000	1.000000	0.00000	0.000000	0.000000
25%	2500.75000	1.562853e+07	NaN	584.000000	NaN	NaN	32.000000	3.000000	0.000000	1.000000	0.00000	0.000000	51000.000000
50%	5000.50000	1.569074e+07	NaN	652.000000	NaN	NaN	37.000000	5.000000	97198.540000	1.000000	1.00000	1.000000	100000.000000
75%	7500.25000	1.575323e+07	NaN	718.000000	NaN	NaN	44.000000	7.000000	127644.240000	2.000000	1.00000	1.000000	149000.000000
max	10000.00000	1.581569e+07	NaN	850.000000	NaN	NaN	92.000000	10.000000	250898.090000	4.000000	1.00000	1.000000	199000.000000

### Question-5:

Handle the Missing values.

### Solution:

`df.isnull().sum()`

```
Handling Missing Values

In [13]: df.isnull().sum()

Out[13]: RowNumber      0
         CustomerId     0
         Surname        0
         CreditScore     0
         Geography      0
         Gender          0
         Age            0
         Tenure          0
         Balance         0
         NumOfProducts  0
         HasCrCard       0
         IsActiveMember  0
         EstimatedSalary 0
         Exited          0
         dtype: int64
```

### Question-6:

Find the outliers and replace the outliers

### Solution:

```
import seaborn as sns
sns.boxplot(df['Balance'])
```

```
Find and Replace Outliers

In [14]: import seaborn as sns

In [15]: sns.boxplot(df['Balance'])

/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
  FutureWarning

Out[15]: <matplotlib.axes._subplots.AxesSubplot at 0x7f77a4b64550>
```



### Question-7:

Check for Categorical columns and perform encoding.

### Solution:

```
from sklearn.preprocessing import LabelEncoder
from collections import Counter
count = Counter(df['Geography'])
le = LabelEncoder()
df['Geography'] = le.fit_transform(df['Geography'])
df['Gender'] = le.fit_transform(df['Gender'])
df['Surname'] = le.fit_transform(df['Surname'])
```

balance

**Encoding**

```
In [16]: from sklearn.preprocessing import LabelEncoder
         from collections import Counter as count
```

```
In [17]: le=LabelEncoder()
```

```
In [18]: df['Geography']=le.fit_transform(df['Geography'])
         df['Gender']=le.fit_transform(df['Gender'])
         df['Surname']=le.fit_transform(df['Surname'])
```

```
In [19]: df
```

```
Out[19]:
```

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	1	15634602	1115	619	0	0	42	2	0.00	1	1	1	101348.88	1
1	2	15647311	1177	608	2	0	41	1	83807.86	1	0	1	112542.58	0
2	3	15619304	2040	502	0	0	42	8	159660.80	3	1	0	113931.57	1
3	4	15701354	289	699	0	0	39	1	0.00	2	0	0	93826.63	0
4	5	15737888	1822	850	2	0	43	2	125510.82	1	1	1	79084.10	0
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9995	9996	15606229	1999	771	0	1	39	5	0.00	2	1	0	96270.64	0
9996	9997	15569892	1336	516	0	1	35	10	57369.61	1	1	1	101699.77	0
9997	9998	15584532	1570	709	0	0	36	7	0.00	1	0	1	42085.58	1
9998	9999	15682355	2345	772	1	1	42	3	75075.31	2	1	0	92888.52	1
9999	10000	15628319	2751	792	0	0	28	4	130142.79	1	1	0	38190.78	0

10000 rows × 14 columns

### Question-8:

Split the data into dependent and independent variables.

#### Solution:

```
x=df.iloc[:,0:13]
```

```
y=df['Exited']
```

**Dependent and Independent variables**

```
In [20]: x=df.iloc[:,0:13]
```

```
In [21]: y=df['Exited']
```

### Question-9:

Scale the independent variables

#### Solution: from sklearn.preprocessing import

```
StandardScaler sc=StandardScaler()
```

```
sc_xtrain=sc.fit_transform(xtrain)
```

```
sc_xtest=sc.transform(xtest)
```

### Scaling

```
In [24]: from sklearn.preprocessing import StandardScaler

In [25]: sc=StandardScaler()

In [26]: sc_xtrain=sc.fit_transform(xtrain)

In [27]: sc_xtest=sc.transform(xtest)

In [28]: sc_xtrain

Out[28]: array([[ 0.21769112,  1.02728282, -0.54142705, ...,  0.63998842,
                -1.03223352, -1.58012433],
                [-0.75855874,  0.31643278,  1.57333206, ...,  0.63998842,
                -1.03223352, -1.29494016],
                [-0.16720654,  1.55633397,  1.0120802 , ...,  0.63998842,
                -1.03223352, -0.1037722 ],
                ...,
                [-1.27590547, -0.00205524, -0.13765725, ...,  0.63998842,
                -1.03223352, -0.14337009],
                [ 0.78137772,  0.34722286, -0.13765725, ...,  0.63998842,
                -1.03223352, -0.74440202],
                [-1.29492557, -0.03291471, -1.69471672, ...,  0.63998842,
                -1.03223352, -1.71465666]])

In [29]: sc_xtest

Out[29]: array([[ -1.41665421, -0.40450487, -0.31882083, ..., -1.56252827,
                  0.96877303,  1.24099349],
                [ 1.49445857, -0.96272266, -0.43841247, ...,  0.63998842,
                -1.03223352,  1.17022775],
                [-0.94772228,  1.5265013 ,  1.26784054, ...,  0.63998842,
                -1.03223352,  1.70585853],
                ...,
                [ 0.86679527,  0.61160968,  1.23942272, ...,  0.63998842,
                -1.03223352, -1.20683567],
                [ 0.08351296, -1.54902479, -0.55800411, ..., -1.56252827,
                  0.96877303,  1.71161804],
                [ 1.59785875,  1.1356656 , -1.26016096, ..., -1.56252827,
                -1.03223352, -0.80693265]])
```

### Question-10:

Testing and training data

**Solution:** from sklearn.model\_selection import  
train\_test\_split  
xtrain,xtest,ytrain,ytest=train\_test\_split(x,y,test\_size=0.3,random\_state=10)

```
[ ] sc_xtrain

array([[ 0.21769112,  1.02728282, -0.54142705, ...,  0.63998842,
                -1.03223352, -1.58012433],
                [-0.75855874,  0.31643278,  1.57333206, ...,  0.63998842,
                -1.03223352, -1.29494016],
                [-0.16720654,  1.55633397,  1.0120802 , ...,  0.63998842,
                -1.03223352, -0.1037722 ],
                ...,
                [-1.27590547, -0.00205524, -0.13765725, ...,  0.63998842,
                -1.03223352, -0.14337009],
                [ 0.78137772,  0.34722286, -0.13765725, ...,  0.63998842,
                -1.03223352, -0.74440202],
                [-1.29492557, -0.03291471, -1.69471672, ...,  0.63998842,
                -1.03223352, -1.71465666]])

[ ] sc_xtest

array([[ -1.41665421, -0.40450487, -0.31882083, ..., -1.56252827,
                  0.96877303,  1.24099349],
                [ 1.49445857, -0.96272266, -0.43841247, ...,  0.63998842,
                -1.03223352,  1.17022775],
                [-0.94772228,  1.5265013 ,  1.26784054, ...,  0.63998842,
                -1.03223352,  1.70585853],
                ...,
                [ 0.86679527,  0.61160968,  1.23942272, ...,  0.63998842,
```

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