Assignment -2

Python Programming

Assignment Date	27 September 2022
Student Name	PRIYADHARSHINI D
Student Roll Number	820419106041
Maximum Marks	2 Marks

1.Download Data set

2.Load the dataset

In [26]:
```
import pandas as pd
data = pd.read_csv("Churn_Modelling.csv")
data.head()
```

Out[26]:

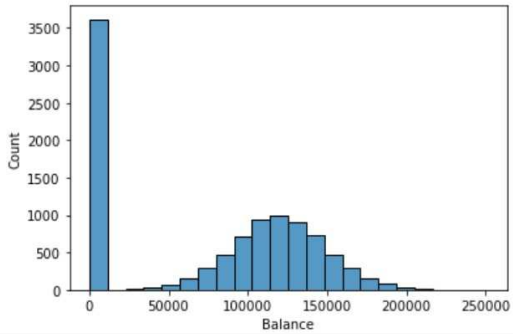
CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
619	France	Female	42	2	0.00	1	1	1	101348.88	1
608	Spain	Female	41	1	83807.86	1	0	1	112542.58	0
502	France	Female	42	8	159660.80	3	1	0	113931.57	1
699	France	Female	39	1	0.00	2	0	0	93826.63	0
850	Spain	Female	43	2	125510.82	1	1	1	79084.10	0

3. Perform Below Visualizations.

- Univariate Analysis

In [48]:
```
sns.histplot(data, x="Balance")
```

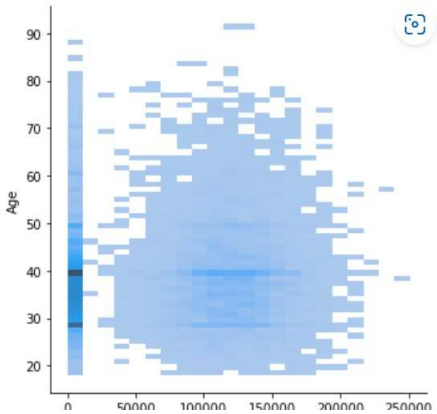
Out[48]:
```
<AxesSubplot:xlabel='Balance', ylabel='Count'>
```



- Bi - Variate Analysis

In [51]:
```
sns.displot(data, x="Balance", y="Age")
```

Out[51]:
```
<seaborn.axisgrid.FacetGrid at 0x181064ebd60>
```



- Multi - Variate Analysis

In [46]:
```
sns.pairplot(data)
```

Out[46]:
```
<seaborn.axisgrid.PairGrid at 0x1810650aee0>
```

4. Perform descriptive statistics on the dataset.

central Tendancy

In [5]:
```
data.mean()
```

```
C:\Users\welcome\AppData\Local\Temp/ipykernel_11976/531903386.py:1: FutureWarning: Dropping of nuisance columns in DataFrame reductions (with 'numeric_only=None') is deprecated; in a future version this will raise TypeError.  Select only valid columns before calling the reduction.
  data.mean()
```

Out[5]:
```
RowNumber          5.000500e+03
CustomerId         1.569094e+07
CreditScore        6.505288e+02
Age                3.892180e+01
Tenure             5.012800e+00
Balance            7.648589e+04
NumOfProducts      1.530200e+00
HasCrCard          7.055000e-01
IsActiveMember     5.151000e-01
EstimatedSalary    1.000902e+05
Exited             2.037000e-01
dtype: float64
```

In [6]:
```
data.median()
```

```
C:\Users\welcome\AppData\Local\Temp/ipykernel_11976/4184645713.py:1: FutureWarning: Dropping of nuisa
nce columns in DataFrame reductions (with 'numeric_only=None') is deprecated; in a future version thi
s will raise TypeError.  Select only valid columns before calling the reduction.
  data.median()
```

Out[6]:
```
RowNumber          5.000500e+03
CustomerId         1.569074e+07
CreditScore        6.520000e+02
Age                3.700000e+01
Tenure             5.000000e+00
Balance            9.719854e+04
NumOfProducts      1.000000e+00
HasCrCard          1.000000e+00
IsActiveMember     1.000000e+00
EstimatedSalary    1.001939e+05
Exited             0.000000e+00
dtype: float64
```

In [7]:
```
data.mode()
```

Out[7]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard
0	1	15565701	Smith	850.0	France	Male	37.0	2.0	0.0	1.0	1.0
1	2	15565706	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
2	3	15565714	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
3	4	15565779	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
4	5	15565796	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
...	...	...	...	...	...	...	...	...	...	...	...
9995	9996	15815628	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
9996	9997	15815645	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
9997	9998	15815656	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
9998	9999	15815660	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
9999	10000	15815690	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN

10000 rows × 14 columns

In [8]:
```
data.skew()
```

```
C:\Users\welcome\AppData\Local\Temp/ipykernel_11976/1188251951.py:1: FutureWarning: Dropping of nuisa
nce columns in DataFrame reductions (with 'numeric_only=None') is deprecated; in a future version thi
s will raise TypeError.  Select only valid columns before calling the reduction.
  data.skew()
```

Out[8]:
```
RowNumber          0.000000
CustomerId         0.001149
CreditScore       -0.071607
Age                1.011320
Tenure             0.010991
Balance           -0.141109
NumOfProducts      0.745568
HasCrCard         -0.901812
IsActiveMember    -0.060437
EstimatedSalary    0.002085
Exited             1.471611
dtype: float64
```

In [9]:
```
data.kurt()
```

```
C:\Users\welcome\AppData\Local\Temp/ipykernel_11976/2907027414.py:1: FutureWarning: Dropping of nuisa
nce columns in DataFrame reductions (with 'numeric_only=None') is deprecated; in a future version thi
s will raise TypeError.  Select only valid columns before calling the reduction.
  data.kurt()
```

Out[9]:
```
RowNumber         -1.200000
CustomerId        -1.196113
CreditScore       -0.425726
Age                1.395347
Tenure            -1.165225
Balance           -1.489412
NumOfProducts      0.582981
HasCrCard         -1.186973
IsActiveMember    -1.996747
EstimatedSalary   -1.181518
Exited             0.165671
dtype: float64
```

In [10]:
```
data.var()
```

```
C:\Users\welcome\AppData\Local\Temp/ipykernel_11976/445316826.py:1: FutureWarning: Dropping of nuisan
ce columns in DataFrame reductions (with 'numeric_only=None') is deprecated; in a future version this
will raise TypeError.  Select only valid columns before calling the reduction.
  data.var()
```

Out[10]:
```
RowNumber          8.334167e+06
CustomerId         5.174815e+09
CreditScore        9.341860e+03
Age                1.099941e+02
Tenure             8.364673e+00
Balance            3.893436e+09
NumOfProducts      3.383218e-01
HasCrCard          2.077905e-01
IsActiveMember     2.497970e-01
EstimatedSalary    3.307457e+09
Exited             1.622225e-01
dtype: float64
```

In [11]:
```
data.std()
```

```
C:\Users\welcome\AppData\Local\Temp/ipykernel_11976/2723740006.py:1: FutureWarning: Dropping of nuisa
nce columns in DataFrame reductions (with 'numeric_only=None') is deprecated; in a future version thi
s will raise TypeError.  Select only valid columns before calling the reduction.
  data.std()
```

Out[11]:
```
RowNumber           2886.895680
CustomerId         71936.186123
CreditScore           96.653299
Age                   10.487806
Tenure                 2.892174
Balance            62397.405202
NumOfProducts          0.581654
HasCrCard              0.455840
IsActiveMember         0.499797
EstimatedSalary    57510.492818
Exited                 0.402769
dtype: float64
```

5. Handle the Missing values.

In [12]:
```
data.isna().sum()
```

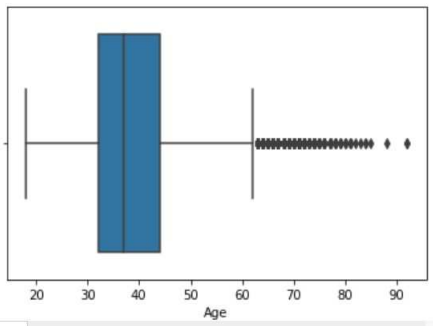
Out[12]:
```
RowNumber          0
CustomerId         0
Surname            0
CreditScore        0
Geography          0
Gender             0
Age                0
Tenure             0
Balance            0
NumOfProducts      0
HasCrCard          0
IsActiveMember     0
EstimatedSalary    0
Exited             0
dtype: int64
```

6. Find the outliers and replace the outliers

In [56]:
```
sns.boxplot(data['Age'])
```

```
C:\Users\welcome\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the follo
wing variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `dat
a`, and passing other arguments without an explicit keyword will result in an error or misinterpretat
ion.
  warnings.warn(
```

Out[56]: <AxesSubplot:xlabel='Age'>

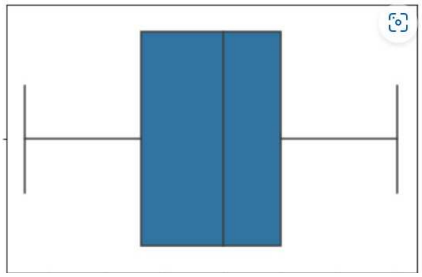


In [54]:
```
import numpy as np
data['Age']=np.where(data['Age']>50,20,data['Age']) #replacing
```

In [68]:
```
import seaborn as sns
sns.boxplot(data['Age'])
```

```
C:\Users\welcome\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the follo
wing variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `dat
a`, and passing other arguments without an explicit keyword will result in an error or misinterpretat
ion.
  warnings.warn(
```

Out[68]: <AxesSubplot:xlabel='Age'>



7. Check for Categorical columns and perform encoding

In [56]:
```
data.tail()#Gender categorical column
```

Out[56]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCa
9995	9996	15606229	Obijiaku	771	France	Male	39	5	0.00	2	
9996	9997	15569892	Johnstone	516	France	Male	35	10	57369.61	1	
9997	9998	15584532	Liu	709	France	Female	36	7	0.00	1	
9998	9999	15682355	Sabbatini	772	Germany	Male	42	3	75075.31	2	
9999	10000	15628319	Walker	792	France	Female	28	4	130142.79	1	

Encoding

In [57]:
```
data['Gender'].replace({'Female':1,'Male':0},inplace=True)
data.tail()
```

Out[57]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCa
9995	9996	15606229	Obijiaku	771	France	0	39	5	0.00	2	
9996	9997	15569892	Johnstone	516	France	0	35	10	57369.61	1	
9997	9998	15584532	Liu	709	France	1	36	7	0.00	1	
9998	9999	15682355	Sabbatini	772	Germany	0	42	3	75075.31	2	
9999	10000	15628319	Walker	792	France	1	28	4	130142.79	1	

In [58]:
```
data_main=pd.get_dummies(data,columns=['Geography'])
data_main
```

Out[58]:

	RowNumber	CustomerId	Surname	CreditScore	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveI
0	1	15634602	Hargrave	619	1	42	2	0.00	1	1	
1	2	15647311	Hill	608	1	41	1	83807.86	1	0	
2	3	15619304	Onio	502	1	42	8	159660.80	3	1	
3	4	15701354	Boni	699	1	39	1	0.00	2	0	
4	5	15737888	Mitchell	850	1	43	2	125510.82	1	1	
...	...	...	...	...	...	...	...	...	...	...	...
9995	9996	15606229	Obijiaku	771	0	39	5	0.00	2	1	
9996	9997	15569892	Johnstone	516	0	35	10	57369.61	1	1	
9997	9998	15584532	Liu	709	1	36	7	0.00	1	0	
9998	9999	15682355	Sabbatini	772	0	42	3	75075.31	2	1	
9999	10000	15628319	Walker	792	1	28	4	130142.79	1	1	

10000 rows × 16 columns

8. Split the data into dependent and independent variables.

In [59]:
```
y=data_main['Exited']
y.head()
```

Out[59]:
```
0    1
1    0
2    1
3    0
4    0
Name: Exited, dtype: int64
```

In [60]:
```
x=data_main.drop(columns=['Exited'],axis=1)
x.head()
```

Out[60]:

	RowNumber	CustomerId	Surname	CreditScore	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMem
0	1	15634602	Hargrave	619	1	42	2	0.00	1	1	
1	2	15647311	Hill	608	1	41	1	83807.86	1	0	
2	3	15619304	Onio	502	1	42	8	159660.80	3	1	
3	4	15701354	Boni	699	1	39	1	0.00	2	0	
4	5	15737888	Mitchell	850	1	43	2	125510.82	1	1	

9. Scale the independent variables

In [61]:
```
x=data_main.drop(columns=['Surname',],axis=1)
x.head()
```

Out[61]:

	RowNumber	CustomerId	CreditScore	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	Estim
0	1	15634602	619	1	42	2	0.00	1	1	1	
1	2	15647311	608	1	41	1	83807.86	1	0	1	
2	3	15619304	502	1	42	8	159660.80	3	1	0	
3	4	15701354	699	1	39	1	0.00	2	0	0	
4	5	15737888	850	1	43	2	125510.82	1	1	1	

In [62]:
```
from sklearn.preprocessing import scale
x=scale(x)
x
```

Out[62]:
```
array([[-1.73187761, -0.78321342, -0.32622142, ...,  0.99720391,
        -0.57873591, -0.57380915],
       [-1.7315312 , -0.60653412, -0.44003595, ..., -1.00280393,
        -0.57873591,  1.74273971],
       [-1.73118479, -0.99588476, -1.53679418, ...,  0.99720391,
        -0.57873591, -0.57380915],
       ...,
       [ 1.73118479, -1.47928179,  0.60498839, ...,  0.99720391,
        -0.57873591, -0.57380915],
       [ 1.7315312 , -0.11935577,  1.25683526, ..., -1.00280393,
         1.72790383, -0.57380915],
       [ 1.73187761, -0.87055909,  1.46377078, ...,  0.99720391,
        -0.57873591, -0.57380915]])
```

10. Split the data into training and testing

In [63]:
```
from sklearn.model_selection import train_test_split
```

In [64]:
```
x_train,x_test,y_train,y_test = train_test_split(x,y,test_size=0.2,random_state=0)
```

In [65]:
```
x_train.shape
```

Out[65]: (8000, 15)

In [66]:
```
x_test.shape
```

Out[66]: (2000, 15)

In [67]:
```
y_train.shape
```

Out[67]: (8000,)

In [98]:
```
y_test.shape
```

Out[98]: (2000,)