```
import pandas as pd
import numpy as np
from matplotlib import pyplot as plt
import seaborn as sns
from sklearn.preprocessing import scale


##loading dataset


data=pd.read_csv("Churn_Modelling.csv")


data.head()
```

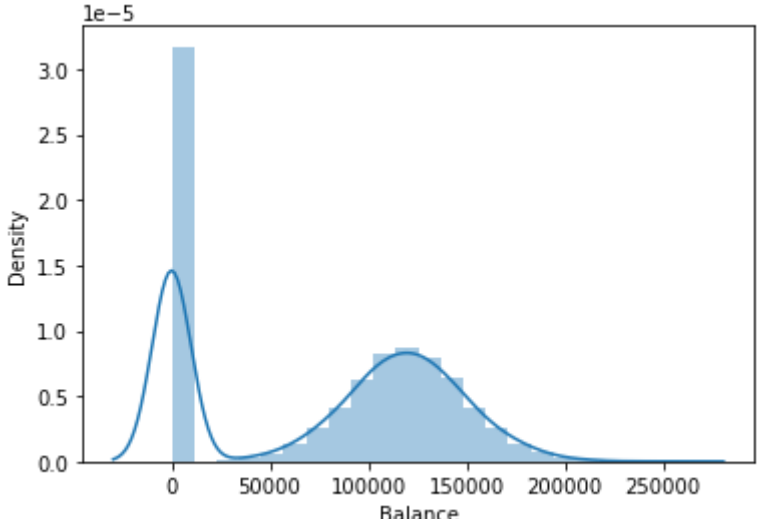
	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Ba
0	1	15634602	Hargrave	619	France	Female	42	2	
1	2	15647311	Hill	608	Spain	Female	41	1	838
2	3	15619304	Onio	502	France	Female	42	8	1596
3	4	15701354	Boni	699	France	Female	39	1	
4	5	15737888	Mitchell	850	Spain	Female	43	2	1255

```
data.tail()
```

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

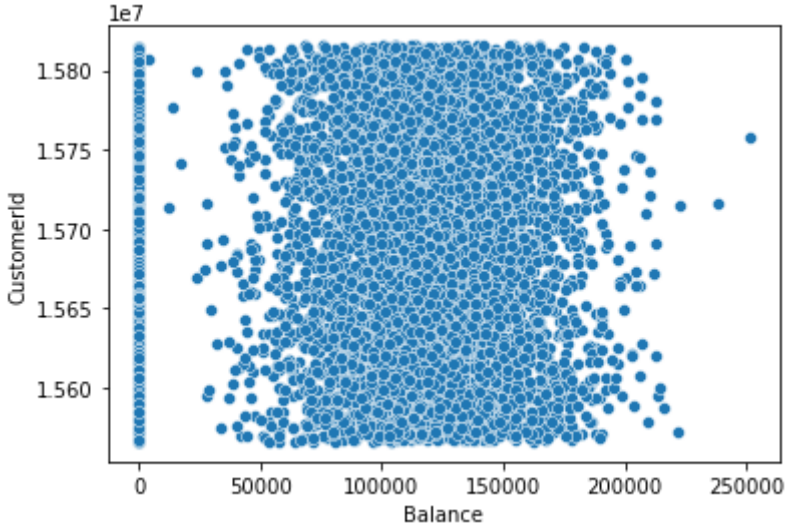
```
  #univariate analysis




sns.distplot(data.Balance)
```

```
C:\Users\amarnath\anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWa
  warnings.warn(msg, FutureWarning)
<AxesSubplot:xlabel='Balance', ylabel='Density'>
```



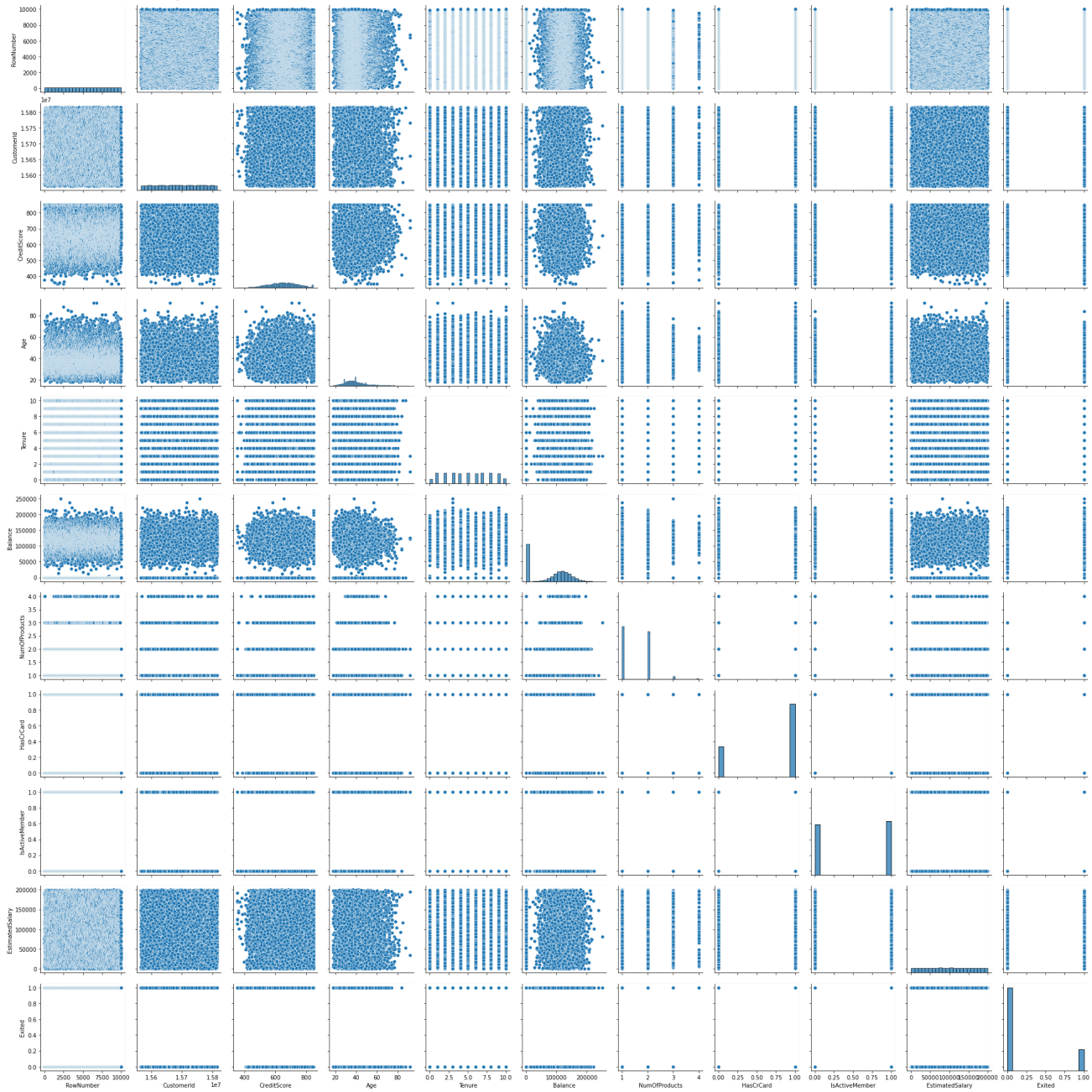

```
#bivariate analysis


sns.scatterplot(data.Balance,data.CustomerId)
```

```
C:\Users\amarnath\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarnir
  warnings.warn(
<AxesSubplot:xlabel='Balance', ylabel='CustomerId'>
```




```
#multivariate analysis


sns.pairplot(data)
```

```
<seaborn.axisgrid.PairGrid at 0x1e27ba06820>
```



```
#descriptive statics

data.describe()
```

	RowNumber	CustomerId	CreditScore	Age	Tenure	Balar
count	10000.00000	1.000000e+04	10000.000000	10000.000000	10000.000000	10000.000(
mean	5000.50000	1.569094e+07	650.528800	38.921800	5.012800	76485.889:
std	2886.89568	7.193619e+04	96.653299	10.487806	2.892174	62397.405:
min	1.00000	1.556570e+07	350.000000	18.000000	0.000000	0.000(
25%	2500.75000	1.562853e+07	584.000000	32.000000	3.000000	0.000(
50%	5000.50000	1.569074e+07	652.000000	37.000000	5.000000	97198.540(
75%	7500.25000	1.575323e+07	718.000000	44.000000	7.000000	127644.240(
max	10000.00000	1.581569e+07	850.000000	92.000000	10.000000	250898.090(

```
#handling the missing values


data.isna().sum()
```

```
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
```

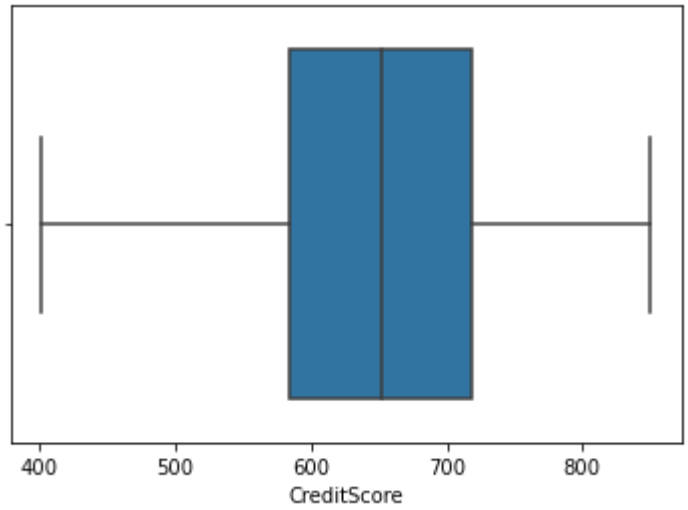
```
#handling outliers


sns.boxplot(data['CreditScore'])
```

```
C:\Users\amarnath\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarnir
  warnings.warn(
<AxesSubplot:xlabel='CreditScore'>
```

```
data['CreditScore']=np.where(data['CreditScore']<400,650,data['CreditScore'])
```

```
sns.boxplot(data['CreditScore'])
```

```
C:\Users\amarnath\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarnir
  warnings.warn(
<AxesSubplot:xlabel='CreditScore'>
```




```
#encoding


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


data.tail()
```

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

```
#Split the data into dependent and independent variables

y=data['EstimatedSalary']
y
```

```
0       101348.88
1       112542.58
2       113931.57
3        93826.63
4        79084.10
          ...
9995     96270.64
9996    101699.77
9997     42085.58
9998     92888.52
9999     38190.78
Name: EstimatedSalary, Length: 10000, dtype: float64
```

```
x=data.drop(columns=['EstimatedSalary'],axis=1)
x
```

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

10000 rows × 13 columns

```
# Scaling the independent variables


x=data.drop(columns=['Geography'])
```

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

```
x=data.drop(columns=['Surname','Geography'])
```

```
x
```

	RowNumber	CustomerId	CreditScore	Gender	Age	Tenure	Balance	NumOfProduc
0	1	15634602	619	0	42	2	0.00	
1	2	15647311	608	0	41	1	83807.86	
2	3	15619304	502	0	42	8	159660.80	
3	4	15701354	699	0	39	1	0.00	
4	5	15737888	850	0	43	2	125510.82	
...	...	...	...	...	...	...	...	
9995	9996	15606229	771	1	39	5	0.00	
9996	9997	15569892	516	1	35	10	57369.61	
9997	9998	15584532	709	0	36	7	0.00	
9998	9999	15682355	772	1	42	3	75075.31	
9999	10000	15628319	792	0	28	4	130142.79	

10000 rows × 12 columns

```
x=scale(x)
```

```
x
```

```
array([[-1.73187761, -0.78321342, -0.33452426, ...,  0.97024255,
         0.02188649,  1.97716468],
       [-1.7315312 , -0.60653412, -0.44928208, ...,  0.97024255,
         0.21653375, -0.50577476],
       [-1.73118479, -0.99588476, -1.55513017, ..., -1.03067011,
```

```
         0.2406869 ,  1.97716468],
       ...,
       [ 1.73118479, -1.47928179,  0.60440336, ...,  0.97024255,
        -1.00864308,  1.97716468],
       [ 1.7315312 , -0.11935577,  1.26165269, ..., -1.03067011,
        -0.12523071,  1.97716468],
       [ 1.73187761, -0.87055909,  1.47030328, ..., -1.03067011,
        -1.07636976, -0.50577476]])
```

```
# Splitting the data into training and testing
```

```
from sklearn.model_selection import train_test_split
```

```
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=0)
```

```
x_train.shape
```

```
(8000, 12)
```

```
x_test.shape
```

```
(2000, 12)
```

```
y_test.shape
```

```
(2000,)
```