Assignment – 2

Assignment Date	05 October 2022
Student Name	Carline Imakulate V
Student Roll Number	811519104019
Maximum Marks	2 Marks

```
import pandas as pd
import  numpy  as np
from scipy import stats
import matplotlib.pyplot as plt
import seaborn as sns
import statsmodels.api as sm
from sklearn.model_selection import train_test_split
```

```
churn=pd.read_csv("E:/Churn_Modelling.csv")
```

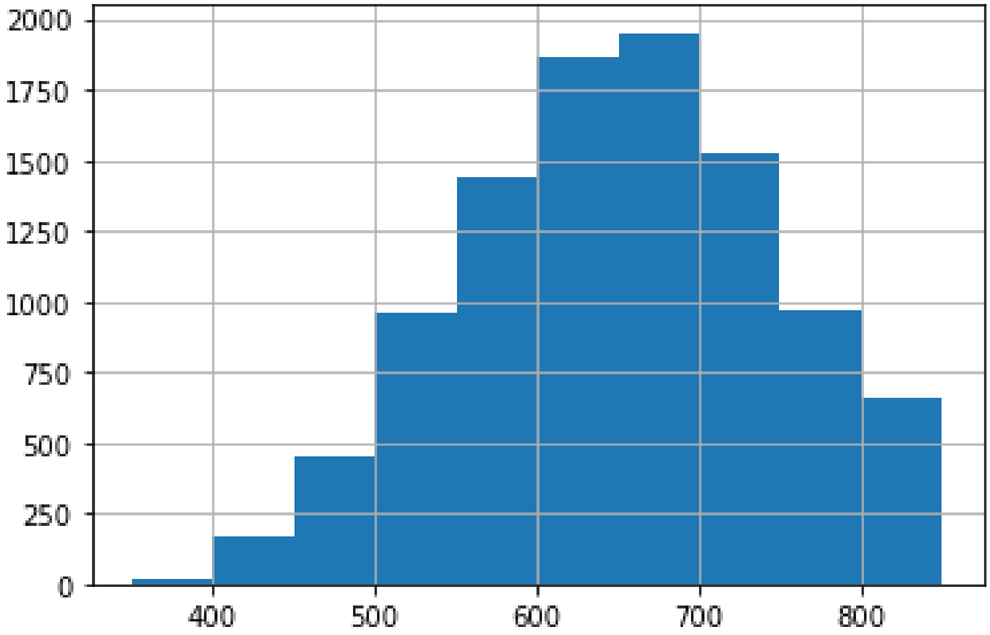
```
churn.head(10)
```

```
   RowNumber  CustomerId   Surname  CreditScore Geography  Gender  Age  
\
0          1    15634602  Hargrave          619    France  Female   42   

1          2    15647311      Hill          608     Spain  Female   41   

2          3    15619304      Onio          502    France  Female   42   

3          4    15701354      Boni          699    France  Female   39   

4          5    15737888  Mitchell          850     Spain  Female   43   

5          6    15574012       Chu          645     Spain    Male   44   

6          7    15592531  Bartlett          822    France    Male   50   

7          8    15656148    Obinna          376   Germany  Female   29   

8          9    15792365        He          501    France    Male   44   

9         10    15592389        H?          684    France    Male   27   


   Tenure    Balance  NumOfProducts  HasCrCard  IsActiveMember  \
0       2       0.00              1          1               1   
1       1   83807.86              1          0               1   
2       8  159660.80              3          1               0   
3       1       0.00              2          0               0   
4       2  125510.82              1          1               1   
5       8  113755.78              2          1               0   
6       7       0.00              2          1               1   
7       4  115046.74              4          1               0   
8       4  142051.07              2          0               1   
9       2  134603.88              1          1               1   
```

```
2        113931.57       1
3         93826.63       0
4         79084.10       0
5        149756.71       1
6         10062.80       0
7        119346.88       1
8         74940.50       0
9         71725.73       0
```

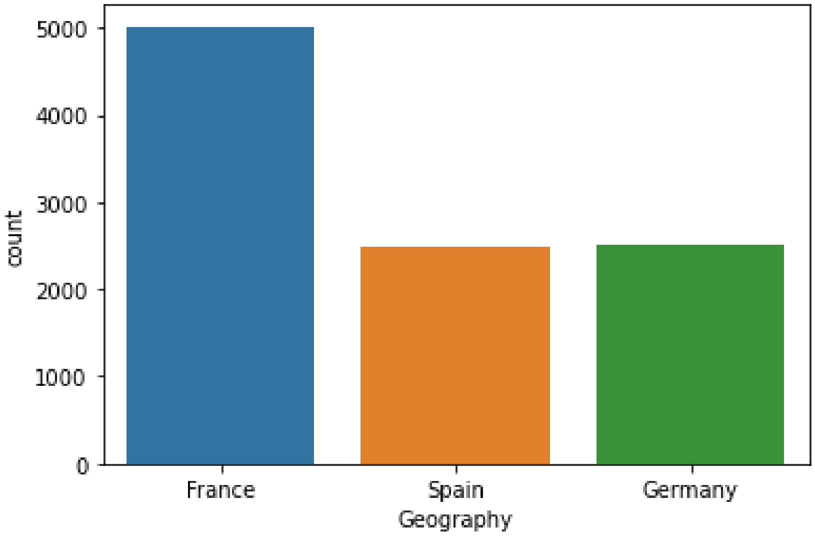
```
churn.CreditScore.hist()
```

```
<AxesSubplot:>
```



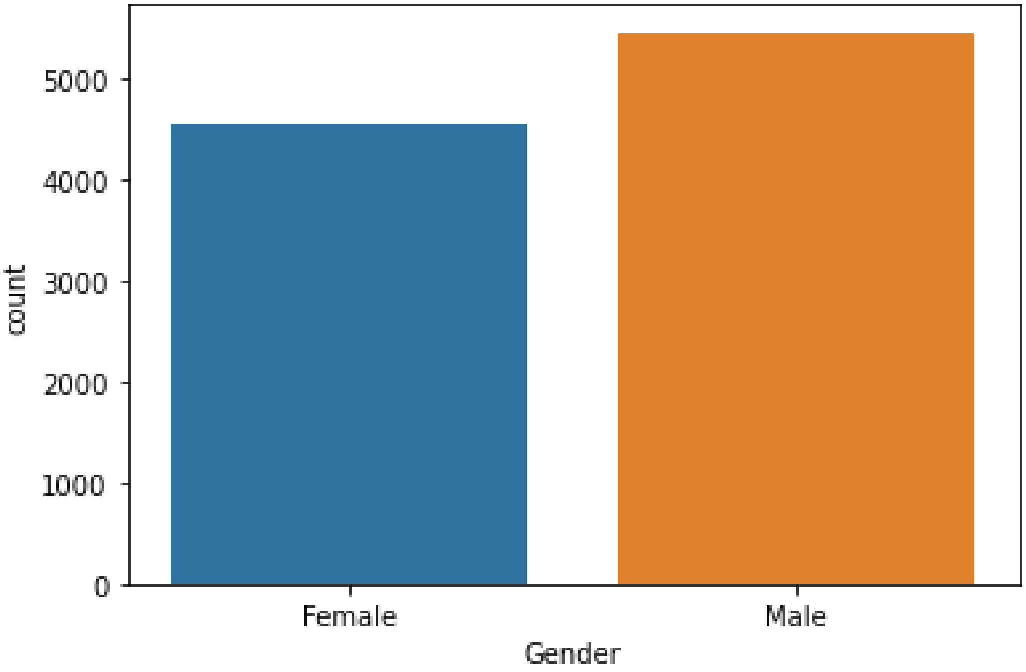
```
sns.countplot(x="Geography",data=churn)
```

```
<AxesSubplot:xlabel='Geography', ylabel='count'>
```



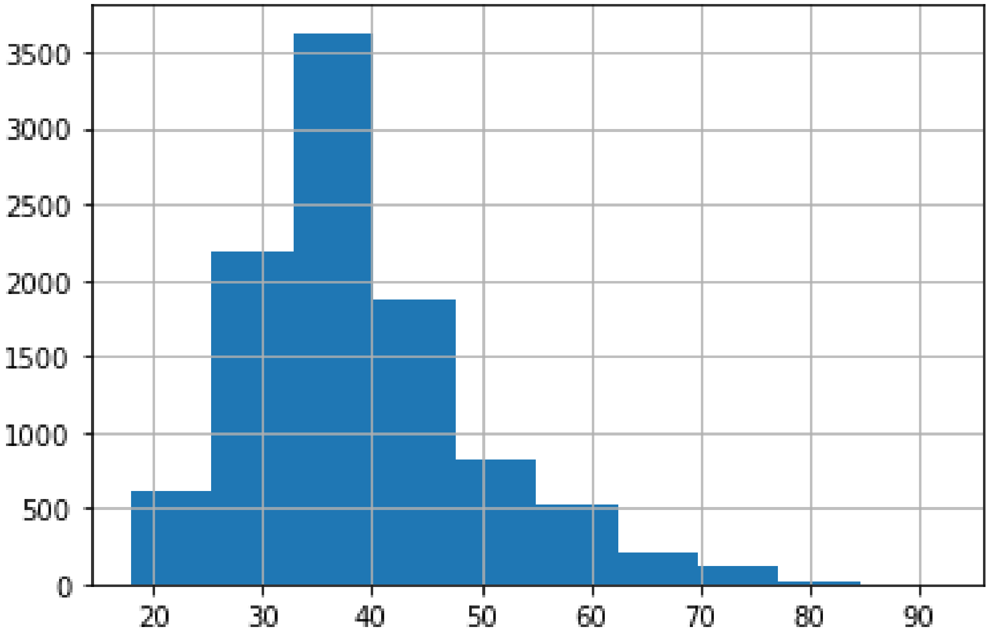
```
sns.countplot(x="Gender",data=churn)
```

```
<AxesSubplot:xlabel='Gender', ylabel='count'>
```



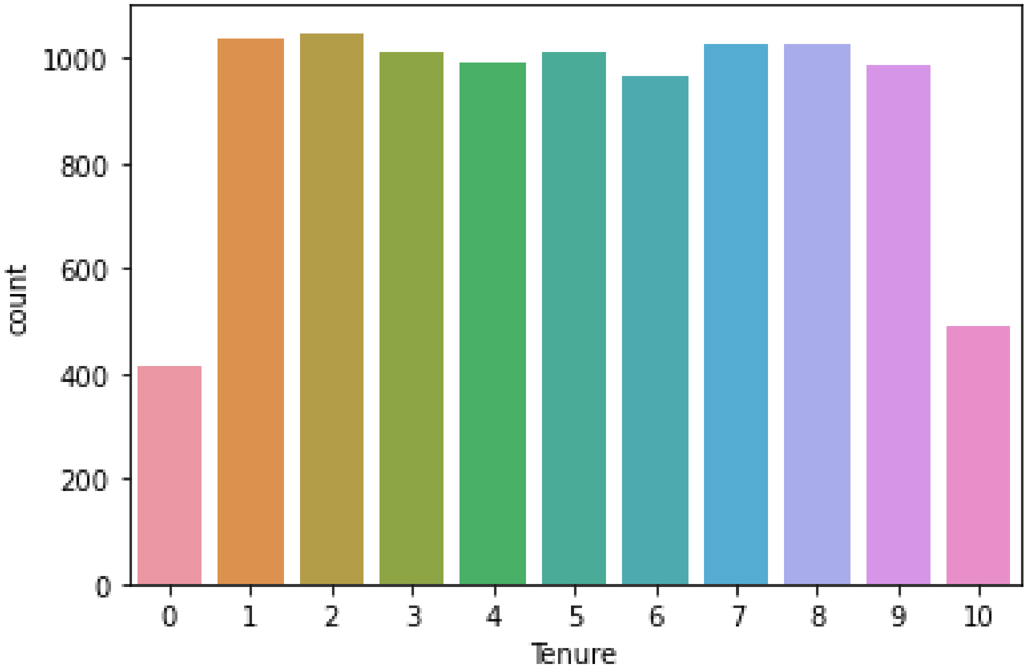
```
churn.Age.hist()
```

```
<AxesSubplot:>
```



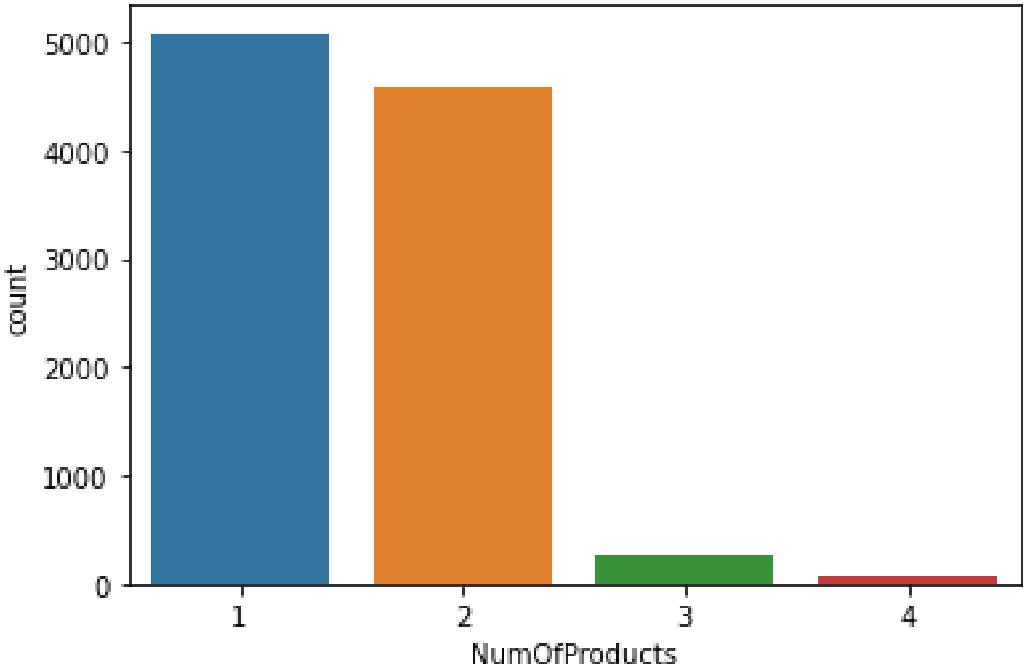
```
sns.countplot(x="Tenure",data=churn)
```

```
<AxesSubplot:xlabel='Tenure', ylabel='count'>
```



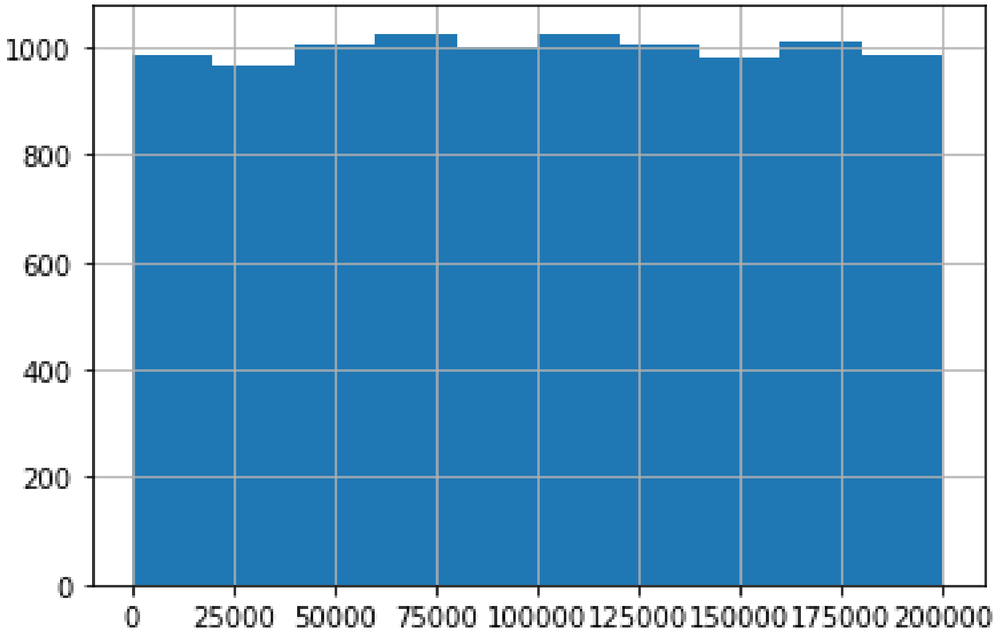
```
sns.countplot(x="NumOfProducts",data=churn)
```

```
<AxesSubplot:xlabel='NumOfProducts', ylabel='count'>
```

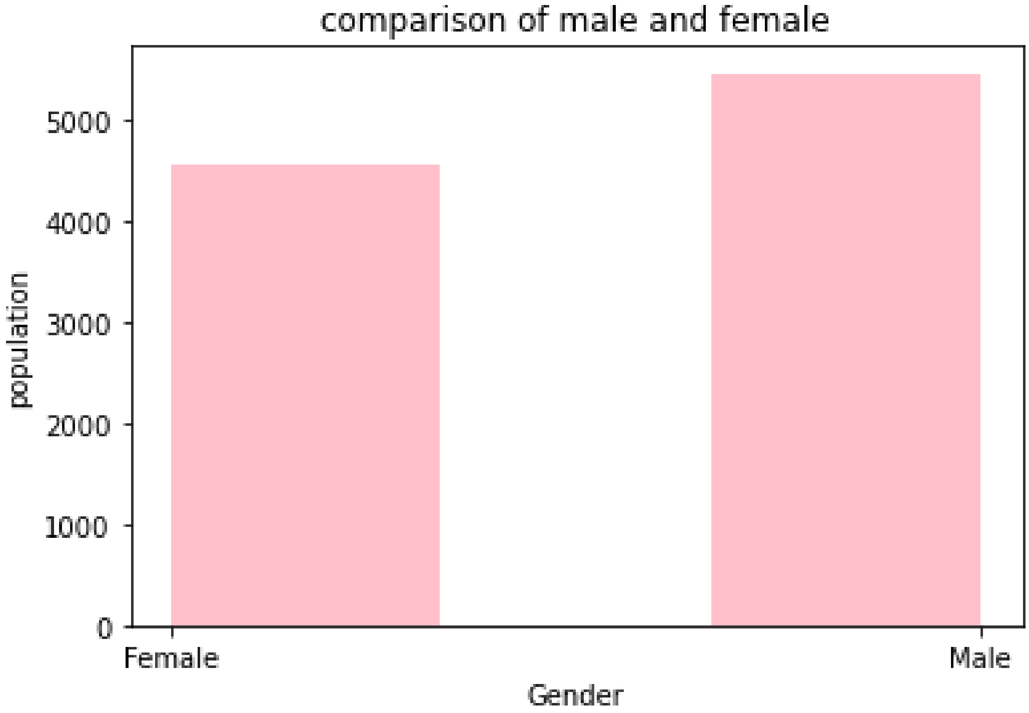


```
churn.EstimatedSalary.hist()
```

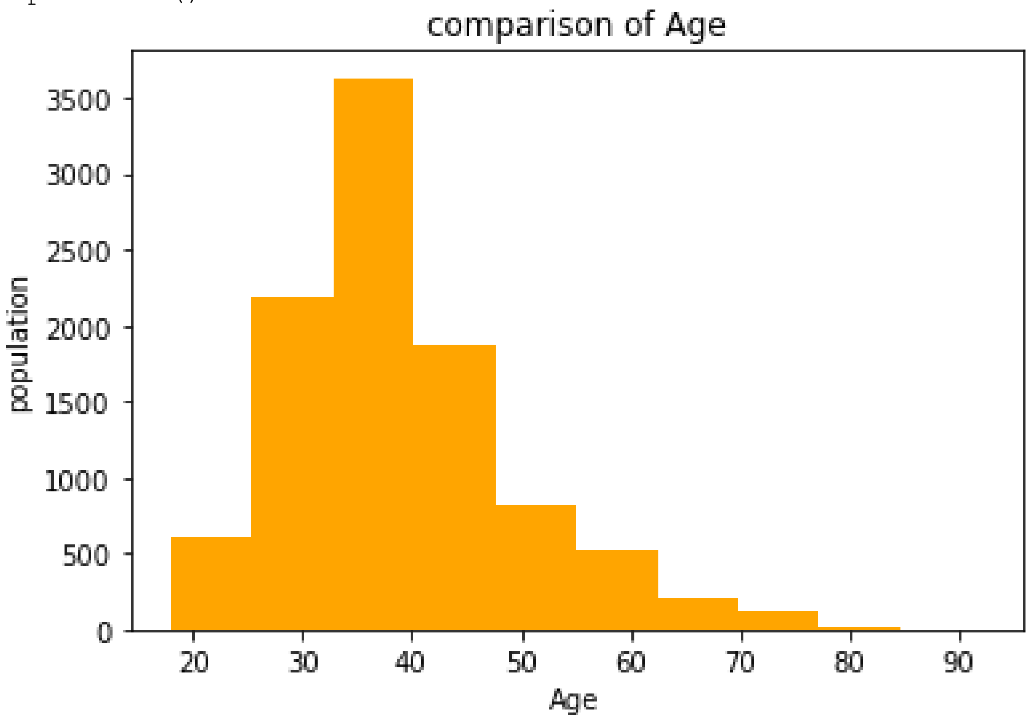
```
<AxesSubplot:>
```



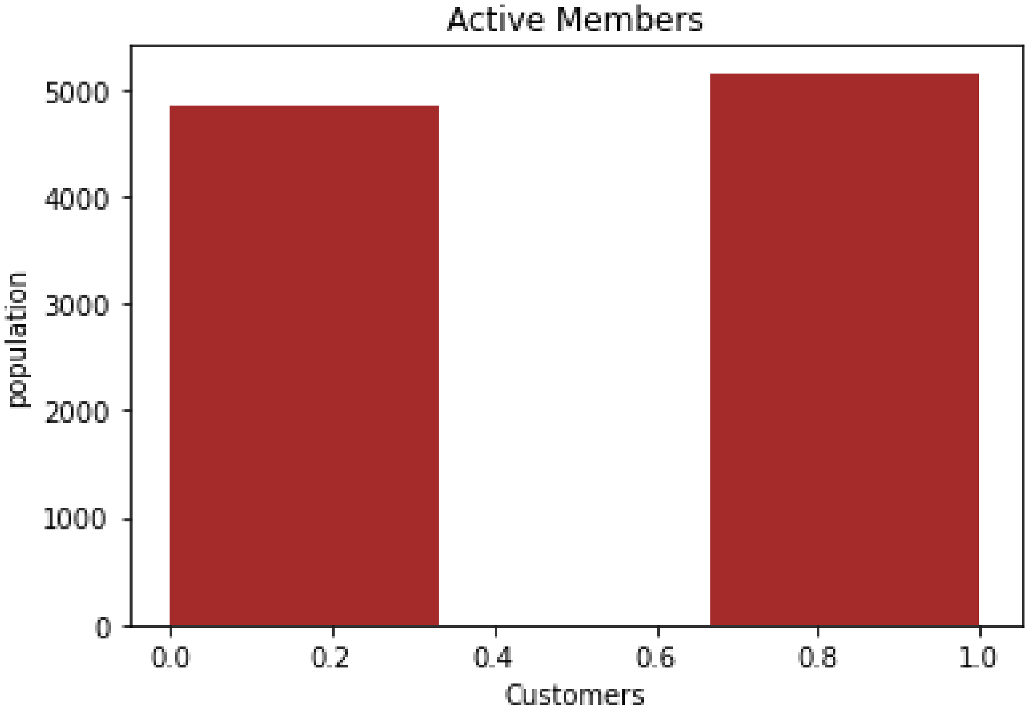
```
plt.hist(x = churn.Gender, bins = 3, color = 'pink')
plt.title('comparison of male and female')
plt.xlabel('Gender')
plt.ylabel('population')
plt.show()
```



```
plt.hist(x = churn.Age, bins = 10, color = 'orange')
plt.title('comparison of Age')
 plt.xlabel('Age')
 plt.ylabel('population')
 plt.show()
```



```
 plt.hist(x = churn.IsActiveMember, bins = 3, color = 'brown')
 plt.title('Active Members')
 plt.xlabel('Customers')
 plt.ylabel('population')
 plt.show()
```



```
churn.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 14 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   RowNumber        10000 non-null  int64  
 1   CustomerId       10000 non-null  int64  
 2   Surname          10000 non-null  object 
 3   CreditScore      10000 non-null  int64  
 4   Geography        10000 non-null  object 
 5   Gender           10000 non-null  object 
 6   Age              10000 non-null  int64  
 7   Tenure           10000 non-null  int64  
 8   Balance          10000 non-null  float64
 9   NumOfProducts    10000 non-null  int64  
 10  HasCrCard        10000 non-null  int64  
 11  IsActiveMember   10000 non-null  int64  
 12  EstimatedSalary  10000 non-null  float64
 13  Exited           10000 non-null  int64  


dtypes: float64(2), int64(9), object(3)
memory usage: 1.1+ MB
```

```
churn.CreditScore.describe()
```

```
count    10000.000000
mean       650.528800
std         96.653299
min        350.000000
25%        584.000000
50%        652.000000
75%        718.000000
max        850.000000
Name: CreditScore, dtype: float64
```

```
churn.Geography.describe()
```

```
count      10000
unique         3
top       France
freq        5014
Name: Geography, dtype: object
```

```
churn.Gender.describe()
```

```
count     10000
unique        2
top        Male
freq       5457
Name: Gender, dtype: object
```

```
churn.Age.describe()
```

```
count    10000.000000
```

```
mean        38.921800
std         10.487806
min         18.000000
25%         32.000000
50%         37.000000
75%         44.000000
max         92.000000
Name: Age, dtype: float64
```

```
churn.Tenure.describe()
```

```
count    10000.000000
mean         5.012800
std          2.892174
min          0.000000
25%          3.000000
50%          5.000000
75%          7.000000
max         10.000000
Name: Tenure, dtype: float64
```

```
churn.EstimatedSalary.describe()
```

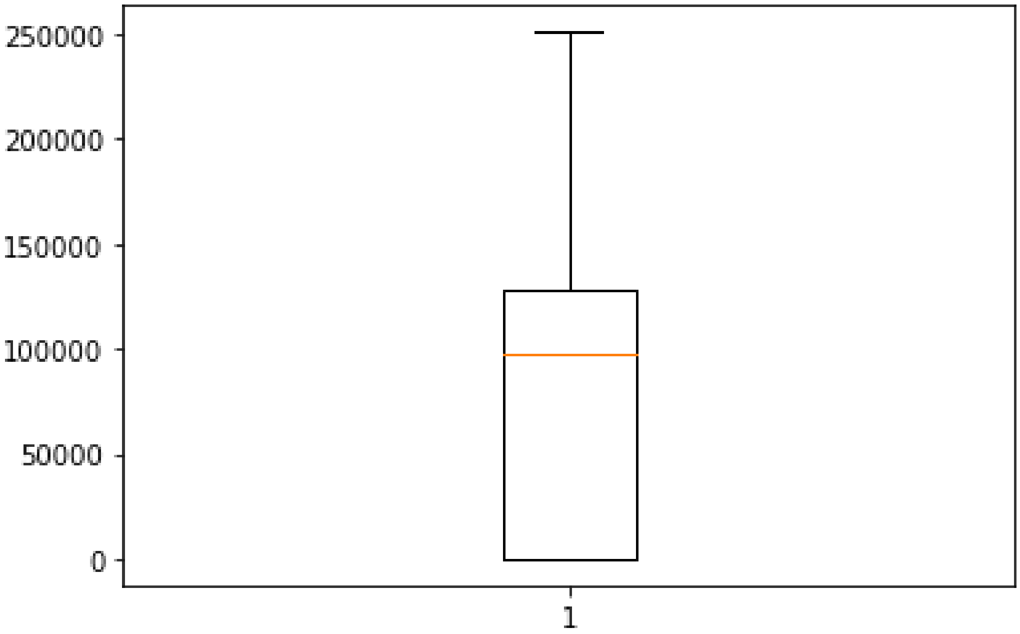
```
count     10000.000000
mean     100090.239881
std       57510.492818
min          11.580000
25%       51002.110000
50%      100193.915000
75%      149388.247500
max      199992.480000
Name: EstimatedSalary, dtype: float64
```

```
churn.isnull().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
```

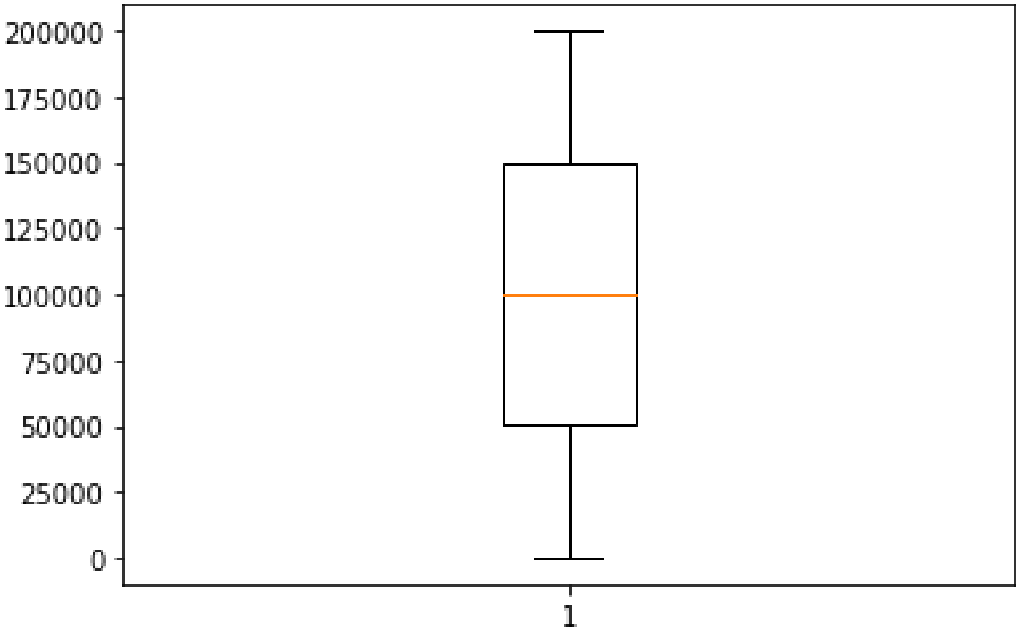
```
plt.boxplot(churn.Balance)
```

```
{'whiskers': [<matplotlib.lines.Line2D at 0x1c6e4427340>,
  <matplotlib.lines.Line2D at 0x1c6e4427610>],
 'caps': [<matplotlib.lines.Line2D at 0x1c6e44279a0>,
  <matplotlib.lines.Line2D at 0x1c6e4427bb0>],
 'boxes': [<matplotlib.lines.Line2D at 0x1c6e4427070>],
 'medians': [<matplotlib.lines.Line2D at 0x1c6e4427e80>],
 'fliers': [<matplotlib.lines.Line2D at 0x1c6e4439190>],
 'means': []}
```



```
plt.boxplot(churn.EstimatedSalary)
```

```
{'whiskers': [<matplotlib.lines.Line2D at 0x1c6e4491670>,
  <matplotlib.lines.Line2D at 0x1c6e4491940>],
 'caps': [<matplotlib.lines.Line2D at 0x1c6e4491c10>,
  <matplotlib.lines.Line2D at 0x1c6e4491ee0>],
 'boxes': [<matplotlib.lines.Line2D at 0x1c6e4491370>],
 'medians': [<matplotlib.lines.Line2D at 0x1c6e449b1f0>],
 'fliers': [<matplotlib.lines.Line2D at 0x1c6e449b4c0>],
 'means': []}
```



```
from sklearn import preprocessing
label_encoder = preprocessing.LabelEncoder()
churn['Geography']= label_encoder.fit_transform(churn['Geography'])
churn['Gender']= label_encoder.fit_transform(churn['Gender'])
```

```
churn = churn.drop(['CustomerId', 'Surname', 'RowNumber'], axis = 1)
```

```
y=churn.Exited
churn.drop(['Exited'], axis = 1,inplace=True)
x=churn
```

```
from sklearn.preprocessing import MinMaxScaler
scaler = MinMaxScaler().fit(x)
scaled_data=scaler.transform(x)
```

```
x= pd.DataFrame(scaled_data)
```

```
x_train,x_test,y_train,y_test= train_test_split(x,y,train_size = 0.8,
test_size = 0.2,random_state =42)
```

```
x_train.head(5)
```

```
          0    1    2         3    4         5         6    7    8
9
9254  0.672  0.0  1.0  0.189189  0.6  0.000000  0.333333  1.0  1.0
0.895494
1561  0.564  0.5  1.0  0.324324  0.4  0.476786  0.333333  1.0  1.0
0.979930
1670  0.418  1.0  1.0  0.081081  0.3  0.457317  0.000000  1.0  0.0
0.429438
6087  0.422  0.0  0.0  0.121622  0.9  0.540606  0.000000  1.0  0.0
0.765417
6669  0.334  0.0  1.0  0.513514  0.9  0.566554  0.000000  0.0  0.0
0.197401
```

```
y_train.head(5)
```

```
9254    0
1561    0
1670    1
6087    1
6669    1
Name: Exited, dtype: int64
```

```
x_test.head(5)
```

```
          0    1    2         3    4         5         6    7    8
9
6252  0.492  0.5  1.0  0.189189  0.3  0.385452  0.333333  0.0  0.0
0.208904
4684  0.546  0.0  1.0  0.337838  0.1  0.000000  0.333333  1.0  1.0
0.731908
1731  0.502  1.0  0.0  0.351351  0.4  0.000000  0.333333  1.0  0.0
```

```
0.292777
4742  0.312  0.5  1.0  0.554054  0.8  0.474902  0.333333  1.0  1.0
0.853422
4521  0.420  1.0  0.0  0.121622  0.7  0.498194  0.000000  1.0  1.0
0.573346
```

```
y_test.head(5)
```

```
6252    0
4684    0
1731    0
4742    0
4521    0
Name: Exited, dtype: int64
```