ASSIGNMENT – 2

Churn_Modelling - Churn_Modelling.csv

ASSIGNMENT DATE	22-09-2022
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STUDENT ROLL NO.	913219104005
MAXIMUM MARK	2 Marks

In [1]:
```
import pandas as pd
import numpy as np
from matplotlib import pyplot as plt
import seaborn as sns
import statistics
import warnings
warnings.filterwarnings('ignore')
from scipy import stats
import statsmodels.api as sm

data=pd.read_csv('churn_modelling.csv')
data.head(10)
```

Out[1]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProdu
0	1	15634602	Hargrave	619	France	Female	42	2	0.00	
1	2	15647311	Hill	608	Spain	Female	41	1	83807.86	
2	3	15619304	Onio	502	France	Female	42	8	159660.80	
3	4	15701354	Boni	699	France	Female	39	1	0.00	
4	5	15737888	Mitchell	850	Spain	Female	43	2	125510.82	
5	6	15574012	Chu	645	Spain	Male	44	8	113755.78	
6	7	15592531	Bartlett	822	France	Male	50	7	0.00	
7	8	15656148	Obinna	376	Germany	Female	29	4	115046.74	
8	9	15792365	He	501	France	Male	44	4	142051.07	
9	10	15592389	H?	684	France	Male	27	2	134603.88	

In [2]:
```
data.mode()
```

Out[2]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfPro
0	1	15565701	Smith	850.0	France	Male	37.0	2.0	0.0	
1	2	15565706	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
2	3	15565714	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
3	4	15565779	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
4	5	15565796	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
...	...	...	...	...	...	...	...	...	...	
9995	9996	15815628	NaN	NaN	NaN	NaN	NaN	NaN	NaN	

9996	9997	15815645	NaN	NaN	NaN	NaN	NaN	NaN	NaN
9997	9998	15815656	NaN	NaN	NaN	NaN	NaN	NaN	NaN
9998	9999	15815660	NaN	NaN	NaN	NaN	NaN	NaN	NaN
9999	10000	15815690	NaN	NaN	NaN	NaN	NaN	NaN	NaN

10000 rows × 14 columns

In [4]:
```
data.mean()
```

Out[4]:
```
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 [5]:
```
data.median()
```

Out[5]:
```
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 [6]:
```
data.describe()
```

Out[6]:

	RowNumber	CustomerId	CreditScore	Age	Tenure	Balance	NumOfProducts
count	10000.00000	1.000000e+04	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000
mean	5000.50000	1.569094e+07	650.528800	38.921800	5.012800	76485.889288	1.530200
std	2886.89568	7.193619e+04	96.653299	10.487806	2.892174	62397.405202	0.581654
min	1.00000	1.556570e+07	350.000000	18.000000	0.000000	0.000000	1.000000
25%	2500.75000	1.562853e+07	584.000000	32.000000	3.000000	0.000000	1.000000
50%	5000.50000	1.569074e+07	652.000000	37.000000	5.000000	97198.540000	1.000000
75%	7500.25000	1.575323e+07	718.000000	44.000000	7.000000	127644.240000	2.000000
max	10000.00000	1.581569e+07	850.000000	92.000000	10.000000	250898.090000	4.000000

In [7]:
```
data.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
```

In [8]:
```
data.kurt(axis=1,skipna=True)
```

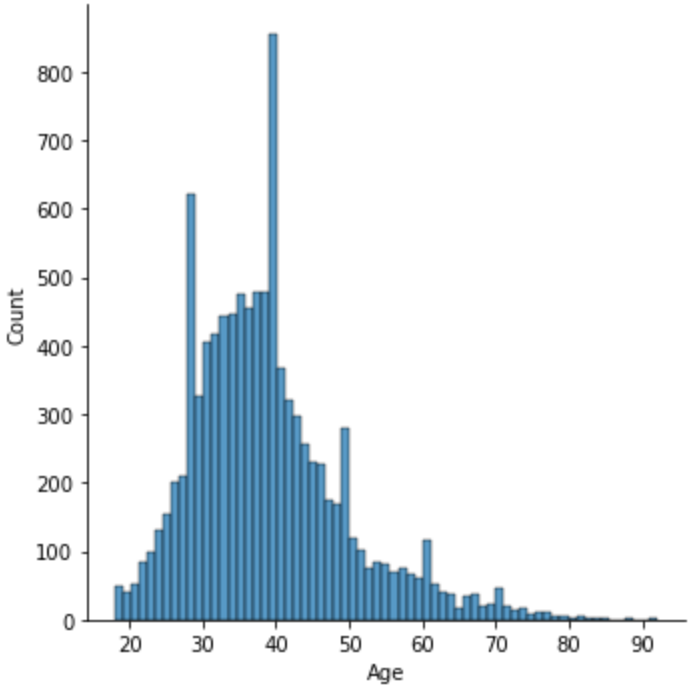
Out[8]:
```
0       10.998778
1       10.997909
2       10.995886
3       10.998962
4       10.997675
          ...
9995    10.998908
9996    10.998551
9997    10.999788
9998    10.998530
9999    10.997973
Length: 10000, dtype: float64
```

In [9]:
```
data.kurt(axis=0,skipna=True)
```

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
```

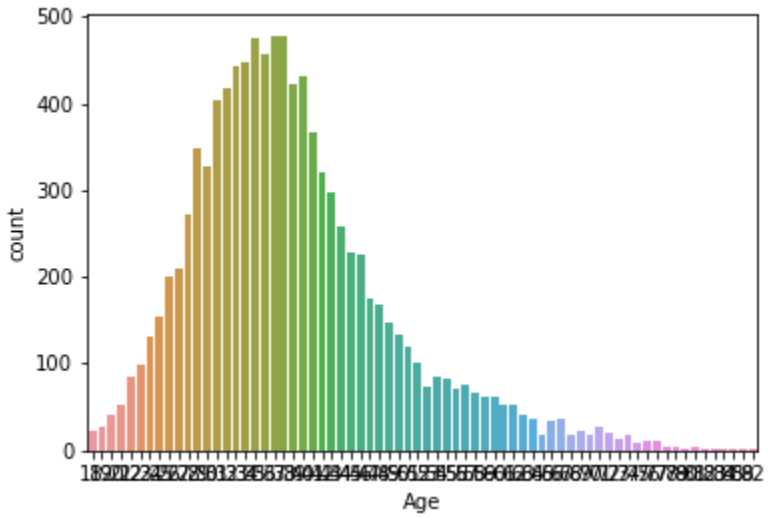
In [10]:
```
sns.displot(data['Age'])
```

Out[10]:
```
<seaborn.axisgrid.FacetGrid at 0x27cbda4dc40>
```



In [11]:
```
sns.countplot(data['Age'])
```

Out[11]:
```
<AxesSubplot:xlabel='Age',  ylabel='count'>
```



In [12]:
```
data.skew(axis=0,skipna=True)
```

Out[12]:
```
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 [13]:
```
data.skew(axis=1,skipna=True)
```

Out[13]:
```
0       3.316373
1       3.316193
2       3.315777
3       3.316411
4       3.316145
          ...
9995    3.316399
9996    3.316325
9997    3.316581
9998    3.316321
9999    3.316207
Length: 10000, dtype: float64
```

In [14]:
```
data.isnull().any()
```

Out[14]:
```
RowNumber          False
CustomerId         False
Surname            False
CreditScore        False
Geography          False
Gender             False
Age                False
Tenure             False
Balance            False
NumOfProducts      False
HasCrCard          False
IsActiveMember     False
EstimatedSalary    False
Exited             False
dtype: bool
```

In [15]:
```
data.isnull().sum()
```

Out[15]:
```
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
```

In [16]:
```
data.duplicated()
```

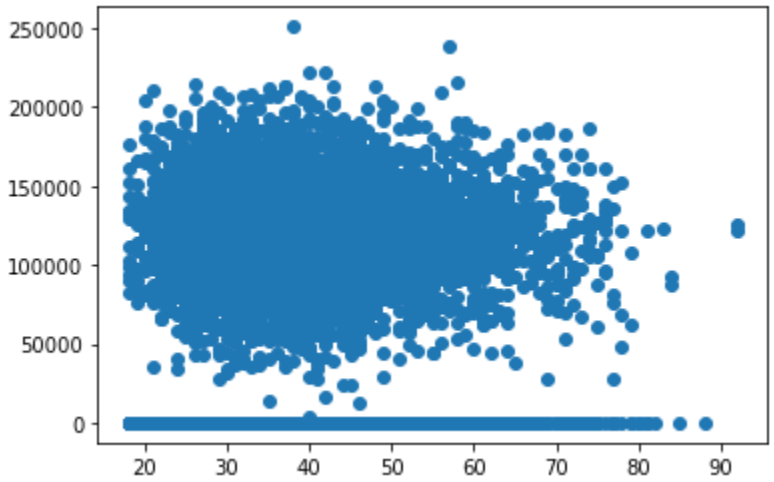
Out[16]:
```
0       False
1       False
2       False
3       False
4       False
        ...
9995    False
9996    False
9997    False
9998    False
9999    False
Length: 10000, dtype: bool
```

In [17]:
```
data.duplicated().sum()
```

Out[17]:
```
0
```

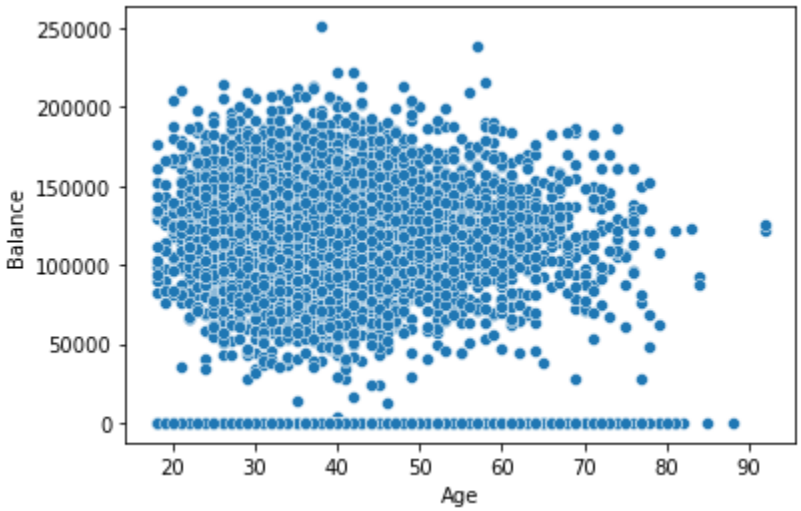
In [18]:
```
plt.scatter(data.Age,data.Balance)
```

Out[18]:
```
<matplotlib.collections.PathCollection at 0x27cbe6bfbe0>
```



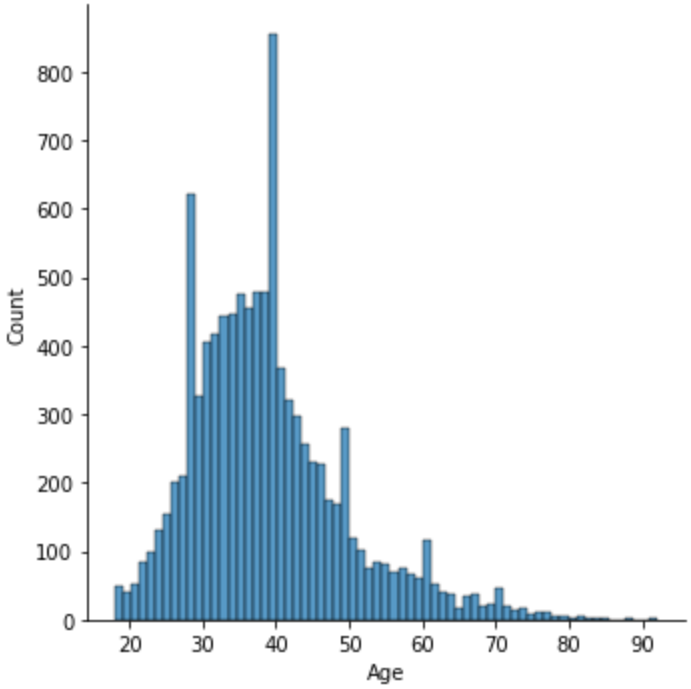
In [19]:
```
sns.scatterplot(x=data.Age,y=data.Balance)
```

Out[19]:
```
<AxesSubplot:xlabel='Age', ylabel='Balance'>
```



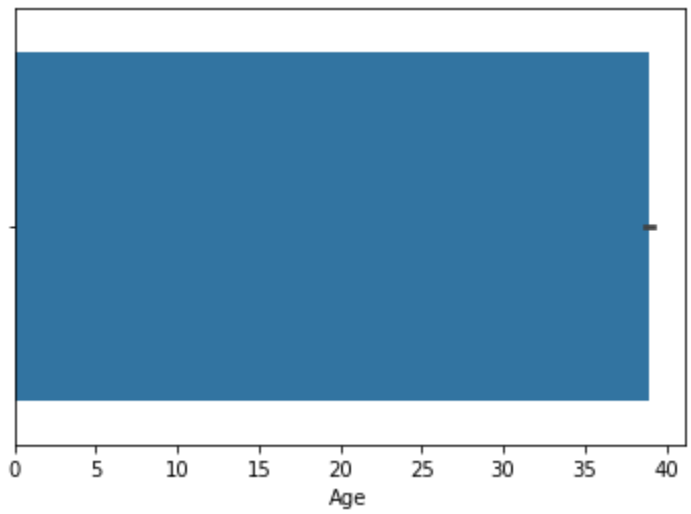
In [20]:
```
sns.displot(data['Age'])
```

Out[20]:
```
<seaborn.axisgrid.FacetGrid at 0x27cbe6aedc0>
```



In [21]:
```
sns.barplot(data['Age'])
```

Out[21]:
```
<AxesSubplot:xlabel='Age'>
```



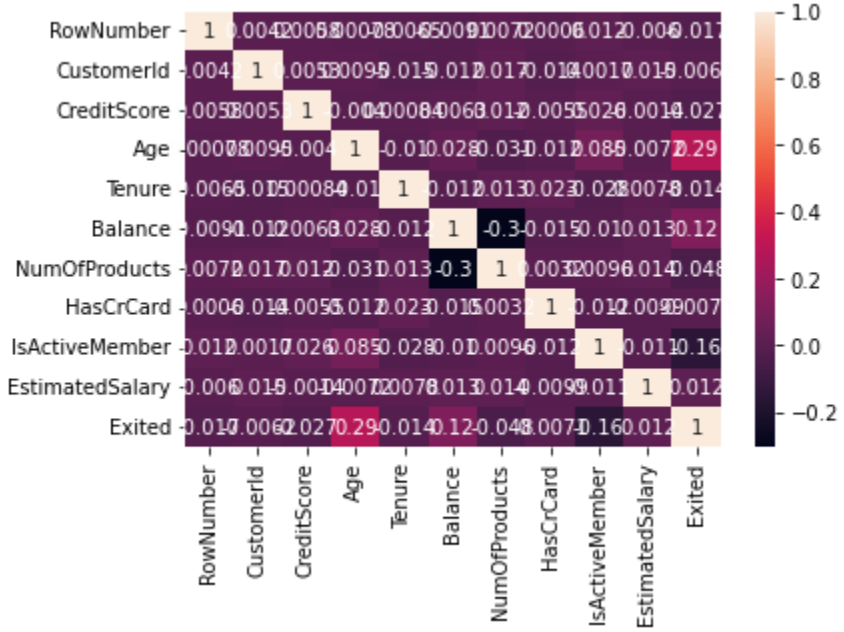
In [22]:
```
data.corr()
```

Out[22]:

	RowNumber	CustomerId	CreditScore	Age	Tenure	Balance	NumOfProducts	HasC
RowNumber	1.000000	0.004202	0.005840	0.000783	-0.006495	-0.009067	0.007246	0.00
CustomerId	0.004202	1.000000	0.005308	0.009497	-0.014883	-0.012419	0.016972	-0.01
CreditScore	0.005840	0.005308	1.000000	-0.003965	0.000842	0.006268	0.012238	-0.00
Age	0.000783	0.009497	-0.003965	1.000000	-0.009997	0.028308	-0.030680	-0.01
Tenure	-0.006495	-0.014883	0.000842	-0.009997	1.000000	-0.012254	0.013444	0.02
Balance	-0.009067	-0.012419	0.006268	0.028308	-0.012254	1.000000	-0.304180	-0.01
NumOfProducts	0.007246	0.016972	0.012238	-0.030680	0.013444	-0.304180	1.000000	0.00
HasCrCard	0.000599	-0.014025	-0.005458	-0.011721	0.022583	-0.014858	0.003183	1.00
IsActiveMember	0.012044	0.001665	0.025651	0.085472	-0.028362	-0.010084	0.009612	-0.01
EstimatedSalary	-0.005988	0.015271	-0.001384	-0.007201	0.007784	0.012797	0.014204	-0.00
Exited	-0.016571	-0.006248	-0.027094	0.285323	-0.014001	0.118533	-0.047820	-0.00

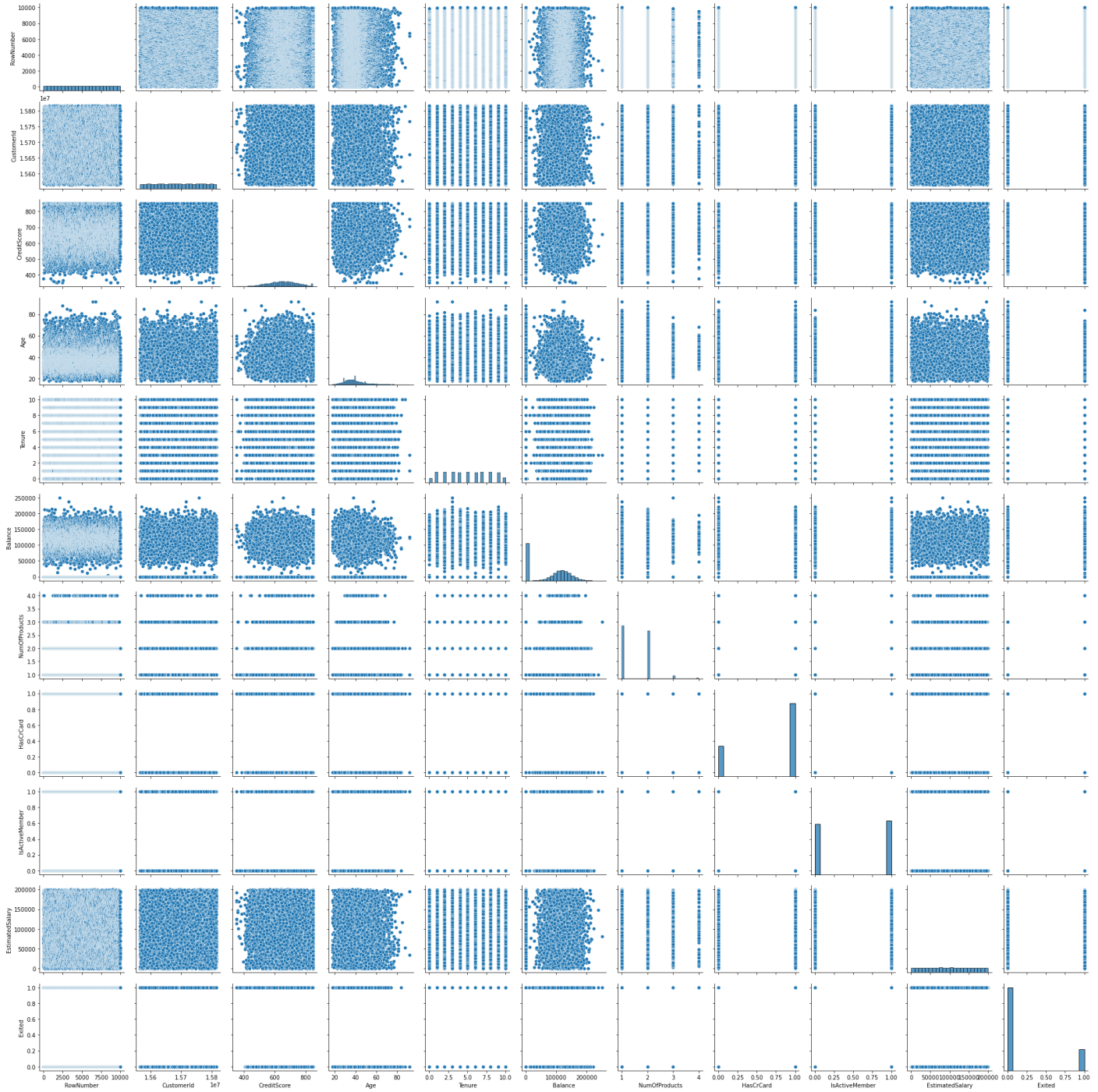
In [23]:
```
sns.heatmap(data.corr(),annot=True)
```

Out[23]:
```
<AxesSubplot:>
```



In [26]:
```
sns.pairplot(data)
```

Out[26]:
```
<seaborn.axisgrid.PairGrid at 0x27ccdefd850>
```



In [27]:
```
x=data.iloc[:,:-1].values
x
```

Out[27]:
```
array([[1, 15634602, 'Hargrave', ..., 1, 1, 101348.88],
       [2, 15647311, 'Hill', ..., 0, 1, 112542.58],
       [3, 15619304, 'Onio', ..., 1, 0, 113931.57],
       ...,
       [9998, 15584532, 'Liu', ..., 0, 1, 42085.58],
       [9999, 15682355, 'Sabbatini', ..., 1, 0, 92888.52],
       [10000, 15628319, 'Walker', ..., 1, 0, 38190.78]], dtype=object)
```

In [28]:
```
y=data.iloc[:,4].values
y
```

Out[28]:
```
array(['France', 'Spain', 'France', ..., 'France', 'Germany', 'France'],
      dtype=object)
```

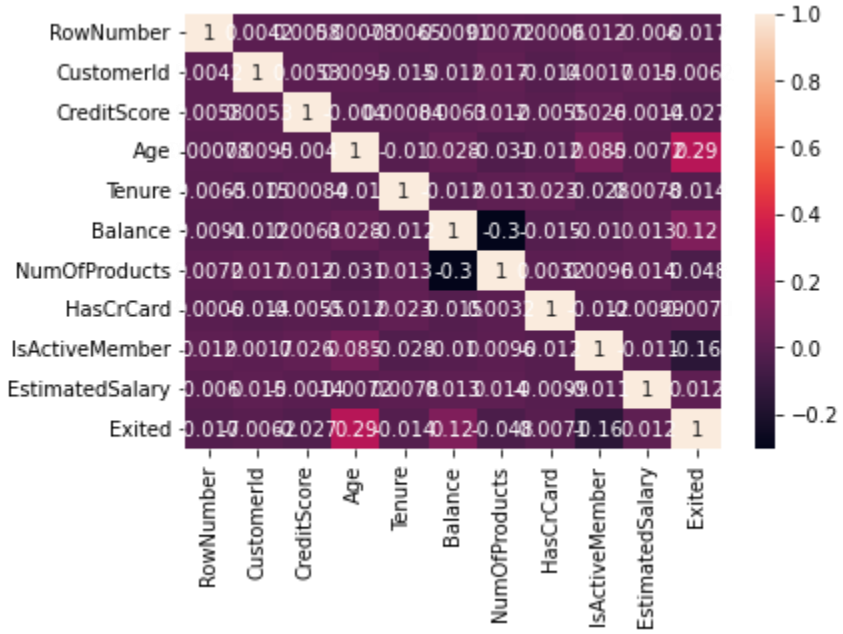
In [29]:
```
data.head(10)
```

Out[29]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProdu
0	1	15634602	Hargrave	619	France	Female	42	2	0.00	
1	2	15647311	Hill	608	Spain	Female	41	1	83807.86	
2	3	15619304	Onio	502	France	Female	42	8	159660.80	
3	4	15701354	Boni	699	France	Female	39	1	0.00	
4	5	15737888	Mitchell	850	Spain	Female	43	2	125510.82	
5	6	15574012	Chu	645	Spain	Male	44	8	113755.78	
6	7	15592531	Bartlett	822	France	Male	50	7	0.00	
7	8	15656148	Obinna	376	Germany	Female	29	4	115046.74	
8	9	15792365	He	501	France	Male	44	4	142051.07	
9	10	15592389	H?	684	France	Male	27	2	134603.88	

In [30]:
```
sns.heatmap(data.corr(),annot=True)
```

Out[30]:
```
<AxesSubplot:>
```



In [32]:
```
x=data[["EstimatedSalary"]]
y=data['CreditScore']
model=sm.OLS(y,x)
result=model.fit()
result.summary()
```

Out[32]:

OLS Regression Results

Dep. Variable:	CreditScore	**R-squared (uncentered):**	0.735
Model:	OLS	**Adj. R-squared (uncentered):**	0.735
Method:	Least Squares	**F-statistic:**	2.779e+04
Date:	Mon, 26 Sep 2022	**Prob (F-statistic):**	0.00
Time:	21:21:24	**Log-Likelihood:**	-72429.
No. Observations:	10000	**AIC:**	1.449e+05
Df Residuals:	9999	**BIC:**	1.449e+05
Df Model:	1		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
EstimatedSalary	0.0049	2.93e-05	166.705	0.000	0.005	0.005

Omnibus:	1758.359	**Durbin-Watson:**	1.554
Prob(Omnibus):	0.000	**Jarque-Bera (JB):**	376.161
Skew:	0.004	**Prob(JB):**	2.08e-82
Kurtosis:	2.050	**Cond. No.**	1.00

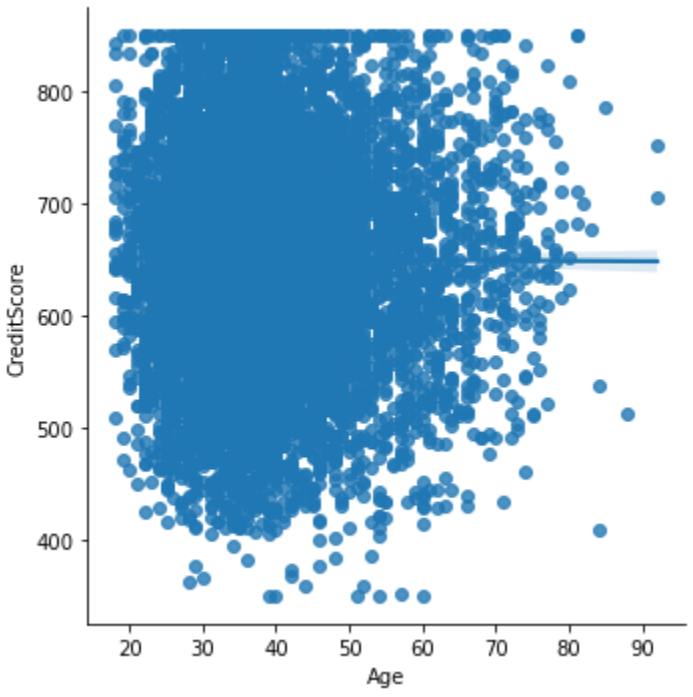
Notes:

[1] R^2 is computed without centering (uncentered) since the model does not contain a constant.

[2] Standard Errors assume that the covariance matrix of the errors is correctly specified.

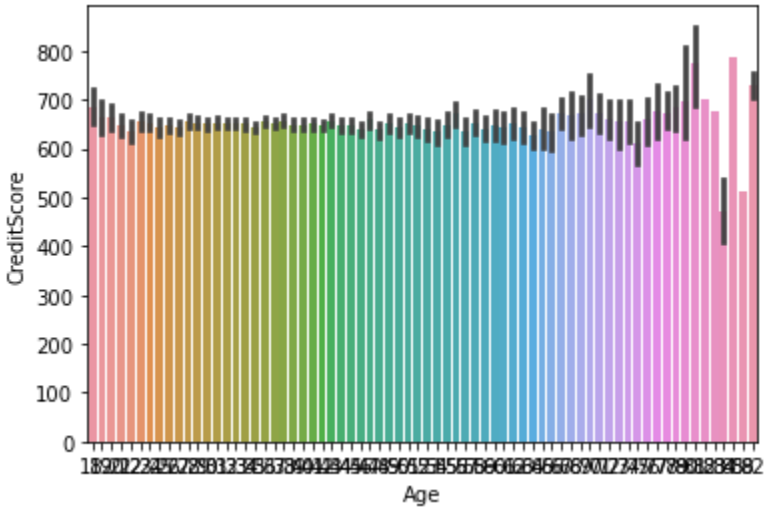
In [33]:
```
sns.lmplot(data=data,x="Age",y="CreditScore")
```

Out[33]:
```
<seaborn.axisgrid.FacetGrid at 0x27cd6f87a00>
```



In [35]:
```
sns.barplot(x="Age",y="CreditScore",data=data)
```

Out[35]: <AxesSubplot:xlabel='Age', ylabel='CreditScore'>



In [36]:
```
qnt=data.quantile(q=(0.25,0.75))
qnt
```

Out[36]:

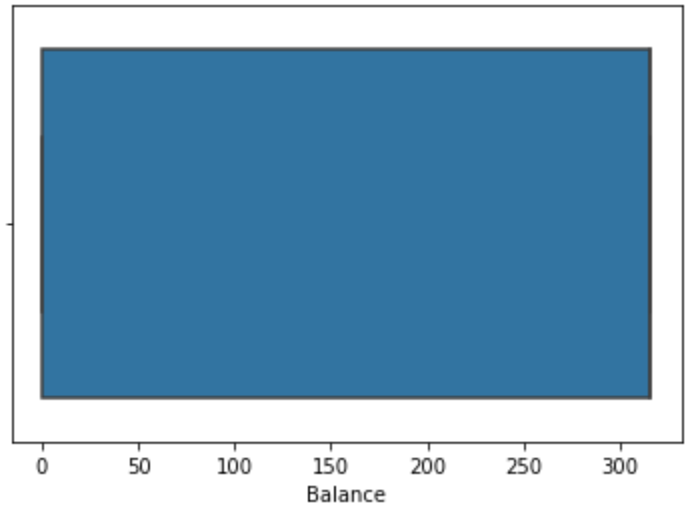
	RowNumber	CustomerId	CreditScore	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMe
0.25	2500.75	15628528.25	584.0	32.0	3.0	0.00	1.0	0.0	
0.75	7500.25	15753233.75	718.0	44.0	7.0	127644.24	2.0	1.0	

In [37]:
```
iqr=qnt.loc[0.25]-qnt.loc[0.75]
iqr
```

Out[37]:
```
RowNumber           -4999.5000
CustomerId        -124705.5000
CreditScore          -134.0000
Age                   -12.0000
Tenure                 -4.0000
Balance          -127644.2400
NumOfProducts         -1.0000
HasCrCard             -1.0000
IsActiveMember        -1.0000
EstimatedSalary   -98386.1375
Exited                 0.0000
dtype: float64
```

In [39]:
```
data['Age']=np.where(data['Age']>87,40,data['Age'])
data['Balance']=np.where(data['Balance']>618,316,data['Balance'])
sns.boxplot(data['Balance'])
```

Out[39]: <AxesSubplot:xlabel='Balance'>



In [40]:
```
data.head(2)
```

Out[40]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProduct
0	1	15634602	Hargrave	619	France	Female	42	2	0.0	
1	2	15647311	Hill	608	Spain	Female	41	1	316.0	

In [41]:
```
data['Gender'].replace({'Female':0,'Male':1},inplace=True)
data.head(10)
```

Out[41]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProduct
0	1	15634602	Hargrave	619	France	0	42	2	0.0	
1	2	15647311	Hill	608	Spain	0	41	1	316.0	
2	3	15619304	Onio	502	France	0	42	8	316.0	
3	4	15701354	Boni	699	France	0	39	1	0.0	
4	5	15737888	Mitchell	850	Spain	0	43	2	316.0	
5	6	15574012	Chu	645	Spain	1	44	8	316.0	
6	7	15592531	Bartlett	822	France	1	50	7	0.0	
7	8	15656148	Obinna	376	Germany	0	29	4	316.0	
8	9	15792365	He	501	France	1	44	4	316.0	
9	10	15592389	H?	684	France	1	27	2	316.0	

In [42]:
```
data['HasCrCard'].replace({1:'YES',0:'NO'},inplace=True)
data.head(10)
```

Out[42]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProduct
0	1	15634602	Hargrave	619	France	0	42	2	0.0	
1	2	15647311	Hill	608	Spain	0	41	1	316.0	
2	3	15619304	Onio	502	France	0	42	8	316.0	
3	4	15701354	Boni	699	France	0	39	1	0.0	
4	5	15737888	Mitchell	850	Spain	0	43	2	316.0	
5	6	15574012	Chu	645	Spain	1	44	8	316.0	
6	7	15592531	Bartlett	822	France	1	50	7	0.0	
7	8	15656148	Obinna	376	Germany	0	29	4	316.0	
8	9	15792365	He	501	France	1	44	4	316.0	
9	10	15592389	H?	684	France	1	27	2	316.0	

In [43]:
```
from sklearn.preprocessing import OneHotEncoder
oe_style=OneHotEncoder()
oe_results=oe_style.fit_transform(data[['Age']])
pd.DataFrame(oe_results.toarray(),
columns=oe_style.categories_).head()
```

Out[43]:

	18	19	20	21	22	23	24	25	26	27	...	76	77	78	79	80	81	82	83	84	85
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

5 rows × 68 columns

In [44]:
```
y=data['Age']
from sklearn.preprocessing import LabelEncoder
le=LabelEncoder()
data['Age']=le.fit_transform(data['Age'])
data.head(10)
```

Out[44]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProduct
0	1	15634602	Hargrave	619	France	0	24	2	0.0	
1	2	15647311	Hill	608	Spain	0	23	1	316.0	
2	3	15619304	Onio	502	France	0	24	8	316.0	
3	4	15701354	Boni	699	France	0	21	1	0.0	
4	5	15737888	Mitchell	850	Spain	0	25	2	316.0	
5	6	15574012	Chu	645	Spain	1	26	8	316.0	
6	7	15592531	Bartlett	822	France	1	32	7	0.0	
7	8	15656148	Obinna	376	Germany	0	11	4	316.0	
8	9	15792365	He	501	France	1	26	4	316.0	
9	10	15592389	H?	684	France	1	9	2	316.0	


```
e()
```

Out[45]:
```
array([24, 23, 21, 25, 26, 32, 11,  9, 13,  6, 16,  7, 17, 27, 40, 14, 20,
       28, 18, 15, 22, 33, 43, 31, 19,  1, 48, 38,  8,  3, 37, 57,  4, 12,
       10, 47, 30, 34, 39, 55, 29, 36, 54,  2, 49, 61, 44, 35, 62, 41, 50,
        5, 42, 52, 45, 46,  0, 64, 51, 56, 53, 58, 59, 67, 66, 60, 63, 65],
      dtype=int64)
```

In [46]:
```
x=data.iloc[:,0:13].values
x
```

Out[46]:
```
array([[1, 15634602, 'Hargrave', ..., 'YES', 1, 101348.88],
       [2, 15647311, 'Hill', ..., 'NO', 1, 112542.58],
       [3, 15619304, 'Onio', ..., 'YES', 0, 113931.57],
       ...,
       [9998, 15584532, 'Liu', ..., 'NO', 1, 42085.58],
       [9999, 15682355, 'Sabbatini', ..., 'YES', 0, 92888.52],
       [10000, 15628319, 'Walker', ..., 'YES', 0, 38190.78]], dtype=object)
```

In [47]:
```
y=data.iloc[:,13:14].values
y
```

Out[47]:
```
array([[1],
       [0],
       [1],
       ...,
       [1],
       [1],
       [0]], dtype=int64)
```

In [48]:
```
from sklearn.preprocessing import OneHotEncoder
ohe=OneHotEncoder()
z=ohe.fit_transform(x[:,0:14]).toarray()
z
```

Out[48]:
```
array([[1., 0., 0., ..., 0., 0., 0.],
       [0., 1., 0., ..., 0., 0., 0.],
       [0., 0., 1., ..., 0., 0., 0.],
       ...,
       [0., 0., 0., ..., 0., 0., 0.],
       [0., 0., 0., ..., 0., 0., 0.],
       [0., 0., 0., ..., 0., 0., 0.]])
```

In [ ]:
```
###split
```

In [49]:
```
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,x_test.shape,y_train.shape,y_test.shape
```

Out[49]:
```
((8000, 13), (2000, 13), (8000, 1), (2000, 1))
```

In [50]:
```
x_train
```

Out[50]:
```
array([[7390, 15676909, 'Mishin', ..., 'YES', 0, 163830.64],
       [9276, 15749265, 'Carslaw', ..., 'YES', 1, 57098.0],
       [2996, 15582492, 'Moore', ..., 'YES', 0, 185630.76],
       ...,
       [3265, 15574372, 'Hoolan', ..., 'YES', 0, 181429.87],
       [9846, 15664035, 'Parsons', ..., 'YES', 1, 148750.16],
       [2733, 15592816, 'Udokamma', ..., 'YES', 0, 118855.26]],
      dtype=object)
```

In [51]:
```
x_test
```

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Out[51]:
```
array([[9395, 15615753, 'Upchurch', ..., 'YES', 1, 192852.67],
       [899, 15654700, 'Fallaci', ..., 'YES', 0, 128702.1],
       [2399, 15633877, 'Morrison', ..., 'YES', 1, 75732.25],
       ...,
       [9550, 15772604, 'Chiemezie', ..., 'YES', 0, 141533.19],
       [2741, 15787699, 'Burke', ..., 'YES', 1, 11276.48],
       [6691, 15579223, 'Niu', ..., 'YES', 0, 192950.6]], dtype=object)
```

In [52]:
```
y_train
```

Out[52]:
```
array([[0],
       [0],
       [0],
       ...,
       [0],
       [0],
       [1]], dtype=int64)
```

In [53]:
```
y_test
```

Out[53]:
```
array([[0],
       [1],
       [0],
       ...,
       [0],
       [0],
       [0]], dtype=int64)
```

In [55]:
```
from sklearn.preprocessing import scale
x=data['Balance']
S=scale(x)
S
```

Out[55]:
```
array([-1.32842845,  0.75276918,  0.75276918, ..., -1.32842845,
        0.75276918,  0.75276918])
```

In [ ]:
```
### independent variables
```

In [56]:
```
w=data.drop(data['Age'],axis=0)
w
```

Out[56]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfPr
68	69	15638424	Glauert	661	Germany	0	17	5	316.0	
69	70	15755648	Pisano	675	France	0	3	8	316.0	
70	71	15703793	Konovalova	738	Germany	1	40	2	316.0	
71	72	15620344	McKee	813	France	1	11	6	0.0	
72	73	15812518	Palermo	657	Spain	0	19	0	316.0	
...	...	...	...	...	...	...	...	...	...	
9995	9996	15606229	Obijiaku	771	France	1	21	5	0.0	
9996	9997	15569892	Johnstone	516	France	1	17	10	316.0	
9997	9998	15584532	Liu	709	France	0	18	7	0.0	
9998	9999	15682355	Sabbatini	772	Germany	1	24	3	316.0	
9999	10000	15628319	Walker	792	France	0	10	4	316.0	

9932 rows × 14 columns

```
,-1].values
```

```
y
```

Out[57]:
```
array([1, 0, 1, ..., 1, 1, 0], dtype=int64)
```

In [ ]:
```
```

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