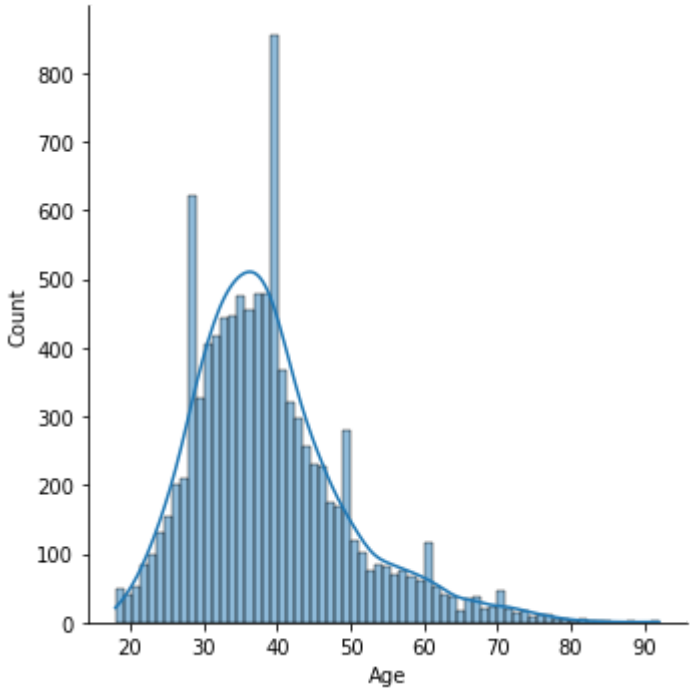
```
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
import tensorflow as tf
import seaborn as sns
from sklearn.compose import ColumnTransformer
from sklearn.pipeline import Pipeline
from sklearn.preprocessing import OneHotEncoder
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split


df = pd.read_csv(r"/content/Churn_Modelling.csv")


df.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

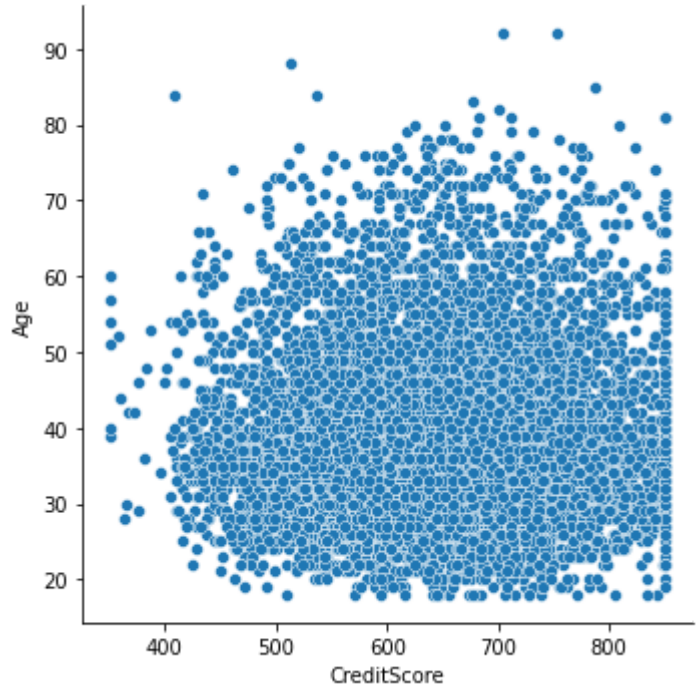
```
sns.displot(df['Age'], kde=True)
```

```
<seaborn.axisgrid.FacetGrid at 0x7f8b5743c290>
```



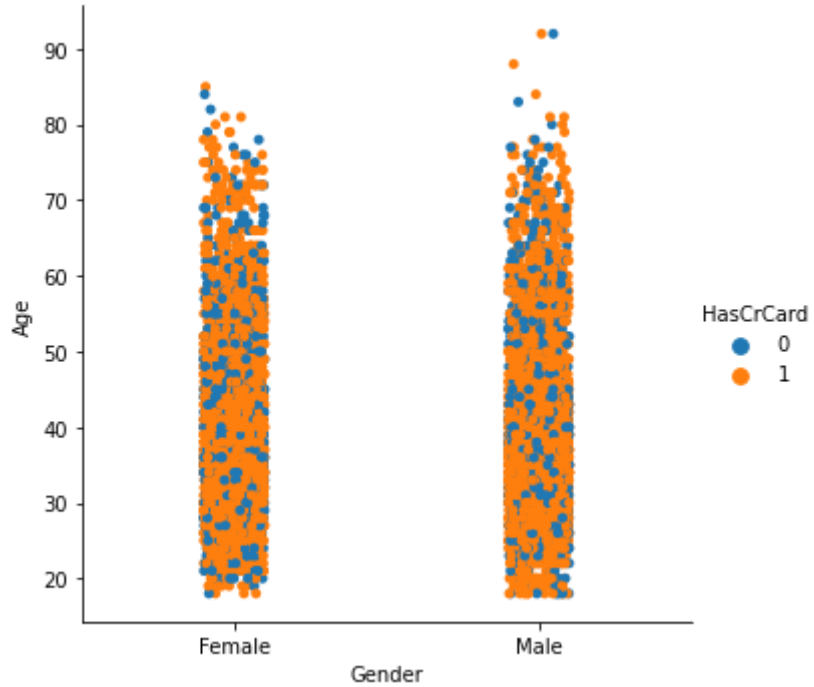
```
sns.relplot(x='CreditScore', y='Age', data=df)
```

```
<seaborn.axisgrid.FacetGrid at 0x7f8b53f0a750>
```



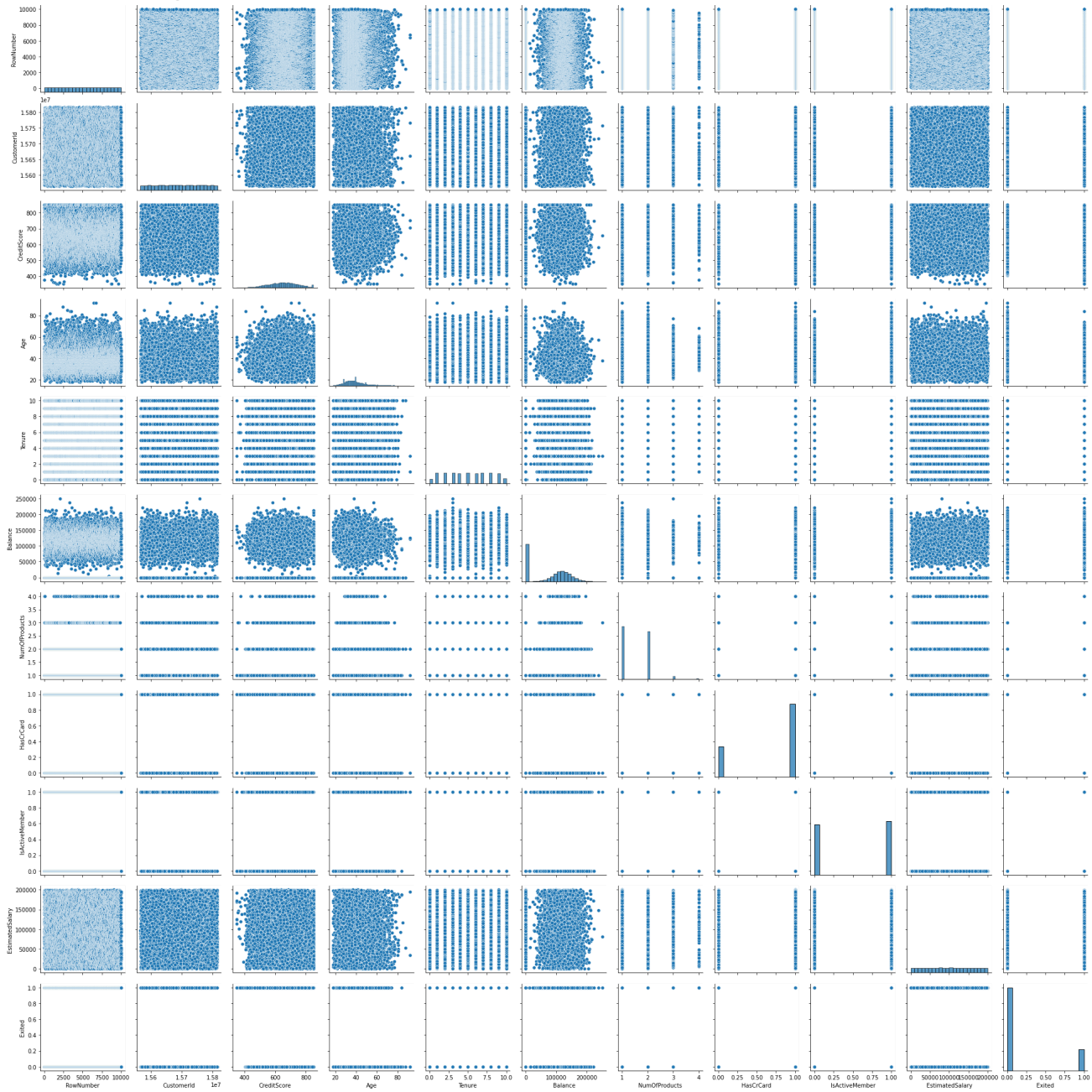

```
sns.catplot(x='Gender', y='Age', hue='HasCrCard', data=df)
```

```
<seaborn.axisgrid.FacetGrid at 0x7f8b53a56e50>
```



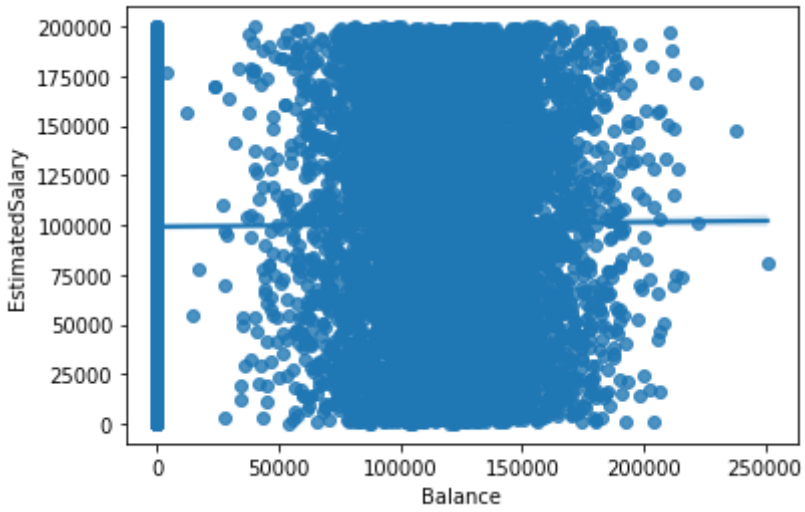

```
sns.pairplot(df)
```

```
<seaborn.axisgrid.PairGrid at 0x7f8b520c9cd0>
```



```
sns.regplot(x='Balance', y='EstimatedSalary', data=df)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8b520d2050>
```




```
df.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(

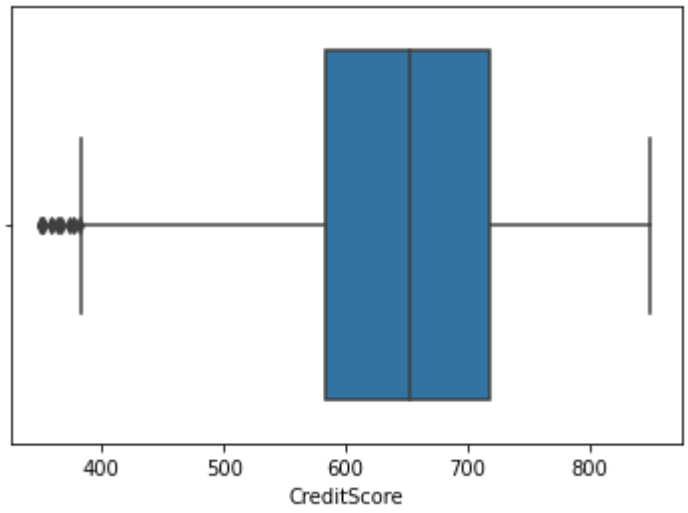
```
df.isnull().sum()
```

```
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
```

```
sns.boxplot(x='CreditScore',data=df)
```

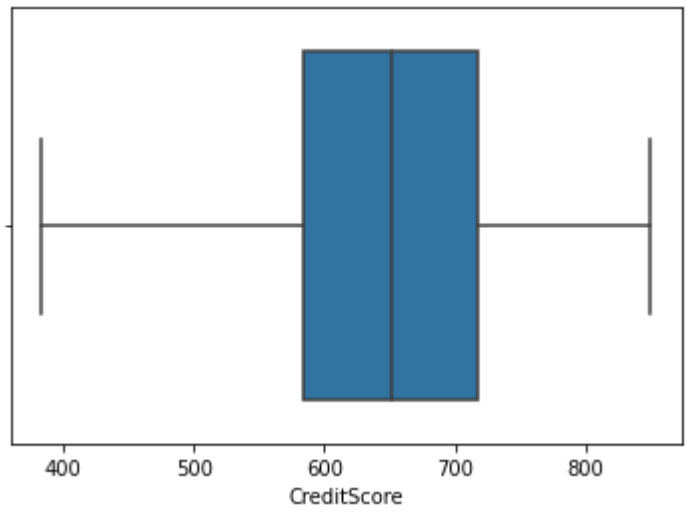
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8b4f072dd0>
```




```
Q1 = df['CreditScore'].quantile(0.25)
Q3 = df['CreditScore'].quantile(0.75)
IQR = Q3 - Q1
whisker_width = 1.5
lower_whisker = Q1 - (whisker_width*IQR)
upper_whisker = Q3 + (whisker_width*IQR)
df['CreditScore']=np.where(df['CreditScore']>upper_whisker,upper_whisker,np.where(df['Cred
```

```
sns.boxplot(x='CreditScore',data=df)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8b4efbd4d0>
```




```
df['Geography'].unique()
ct= ColumnTransformer([('oh', OneHotEncoder(), [4])], remainder="passthrough")
```

```
x=df.iloc[:,0:12].values
y=df.iloc[:,12:14].values
x[0:5,:]
```

```
array([[1, 15634602, 'Hargrave', 619.0, 'France', 'Female', 42, 2, 0.0,
        1, 1, 1],
       [2, 15647311, 'Hill', 608.0, 'Spain', 'Female', 41, 1, 83807.86,
        1, 0, 1],
       [3, 15619304, 'Onio', 502.0, 'France', 'Female', 42, 8, 159660.8,
        3, 1, 0],
       [4, 15701354, 'Boni', 699.0, 'France', 'Female', 39, 1, 0.0, 2, 0,
        0],
       [5, 15737888, 'Mitchell', 850.0, 'Spain', 'Female', 43, 2,
        125510.82, 1, 1, 1]], dtype=object)
```

```
x=ct.fit_transform(x)
#INDEPENDENT VARIABLES
x[0:5,:]
```

```
array([[1.0, 0.0, 0.0, 1, 15634602, 'Hargrave', 619.0, 'Female', 42, 2,
        0.0, 1, 1, 1],
       [0.0, 0.0, 1.0, 2, 15647311, 'Hill', 608.0, 'Female', 41, 1,
        83807.86, 1, 0, 1],
       [1.0, 0.0, 0.0, 3, 15619304, 'Onio', 502.0, 'Female', 42, 8,
        159660.8, 3, 1, 0],
       [1.0, 0.0, 0.0, 4, 15701354, 'Boni', 699.0, 'Female', 39, 1, 0.0,
        2, 0, 0],
       [0.0, 0.0, 1.0, 5, 15737888, 'Mitchell', 850.0, 'Female', 43, 2,
        125510.82, 1, 1, 1]], dtype=object)
```

```
#DEPENDENT VARIABLES
y[0:5,:]
```

```
array([[1.0134888e+05, 1.0000000e+00],
       [1.1254258e+05, 0.0000000e+00],
       [1.1393157e+05, 1.0000000e+00],
       [9.3826630e+04, 0.0000000e+00],
       [7.9084100e+04, 0.0000000e+00]])
```

```
sc= StandardScaler()
x[:,8:12]=sc.fit_transform(x[:,8:12])
x[0:5,:]
```

```
array([[1.0, 0.0, 0.0, 1, 15634602, 'Hargrave', 619.0, 'Female',
        0.29351742289674765, -1.041759679225302, -1.2258476714090163,
        -0.911583494040172, 1, 1],
       [0.0, 0.0, 1.0, 2, 15647311, 'Hill', 608.0, 'Female',
        0.19816383219544578, -1.387537586562431, 0.11735002143511637,
        -0.911583494040172, 0, 1],
       [1.0, 0.0, 0.0, 3, 15619304, 'Onio', 502.0, 'Female',
        0.29351742289674765, 1.0329077647974714, 1.333053345722891,
        2.5270566192762067, 1, 0],
       [1.0, 0.0, 0.0, 4, 15701354, 'Boni', 699.0, 'Female',
        0.007456650792842043, -1.387537586562431, -1.2258476714090163,
        0.8077365626180174, 0, 0],
       [0.0, 0.0, 1.0, 5, 15737888, 'Mitchell', 850.0, 'Female',
```

```
              0.3888710135980495, -1.041759679225302, 0.7857278997960621,
              -0.911583494040172, 1, 1]], dtype=object)
```

```
x_train, x_test, y_train, y_test = train_test_split(x,y,test_size=0.3, random_state=0)
```

```
x_train
```

```
     array([[1.0, 0.0, 0.0, ..., 0.8077365626180174, 1, 1],
            [1.0, 0.0, 0.0, ..., 0.8077365626180174, 1, 0],
            [1.0, 0.0, 0.0, ..., -0.911583494040172, 0, 1],
            ...,
            [1.0, 0.0, 0.0, ..., 0.8077365626180174, 1, 0],
            [0.0, 0.0, 1.0, ..., 0.8077365626180174, 1, 1],
            [0.0, 1.0, 0.0, ..., -0.911583494040172, 1, 0]], dtype=object)
```

```
x_test
```

```
     array([[0.0, 1.0, 0.0, ..., -0.911583494040172, 1, 1],
            [1.0, 0.0, 0.0, ..., -0.911583494040172, 1, 0],
            [0.0, 0.0, 1.0, ..., -0.911583494040172, 1, 1],
            ...,
            [1.0, 0.0, 0.0, ..., 0.8077365626180174, 1, 1],
            [1.0, 0.0, 0.0, ..., -0.911583494040172, 1, 1],
            [0.0, 1.0, 0.0, ..., -0.911583494040172, 1, 1]], dtype=object)
```

```
y_train
```

```
     array([[5.5796830e+04, 1.0000000e+00],
            [1.9823020e+04, 0.0000000e+00],
            [1.3848580e+04, 0.0000000e+00],
            ...,
            [1.8142987e+05, 0.0000000e+00],
            [1.4875016e+05, 0.0000000e+00],
            [1.1885526e+05, 1.0000000e+00]])
```

```
y_test
```

```
     array([[1.9285267e+05, 0.0000000e+00],
            [1.2870210e+05, 1.0000000e+00],
            [7.5732250e+04, 0.0000000e+00],
            ...,
            [1.6740029e+05, 0.0000000e+00],
            [7.0849470e+04, 0.0000000e+00],
            [3.3759410e+04, 1.0000000e+00]])
```

Colab paid products - Cancel contracts here

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