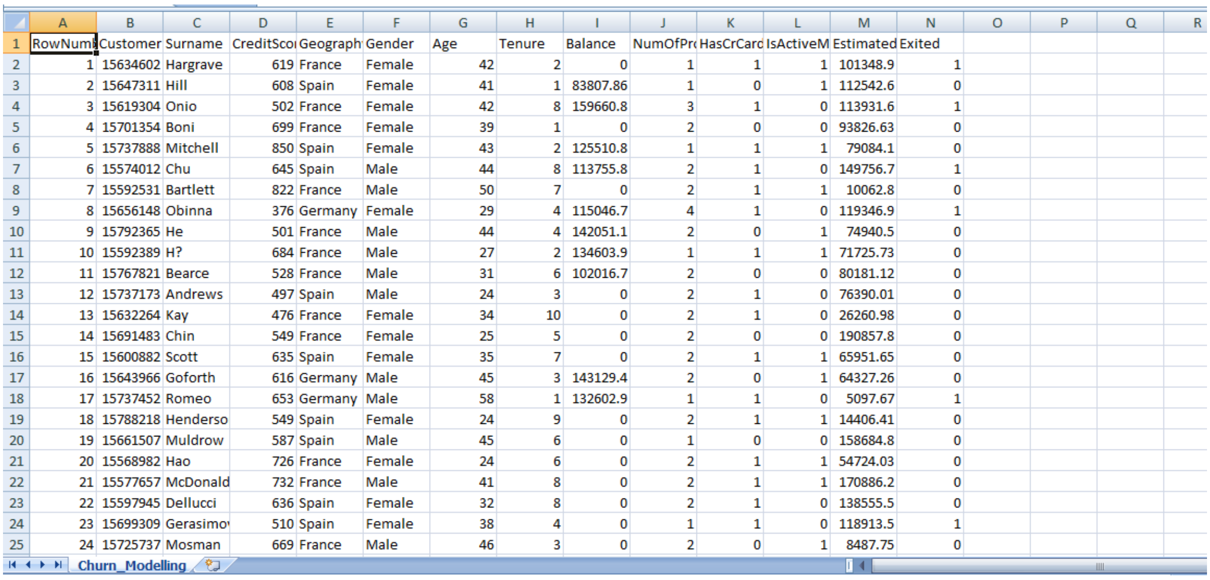
ASSIGNMENT 2

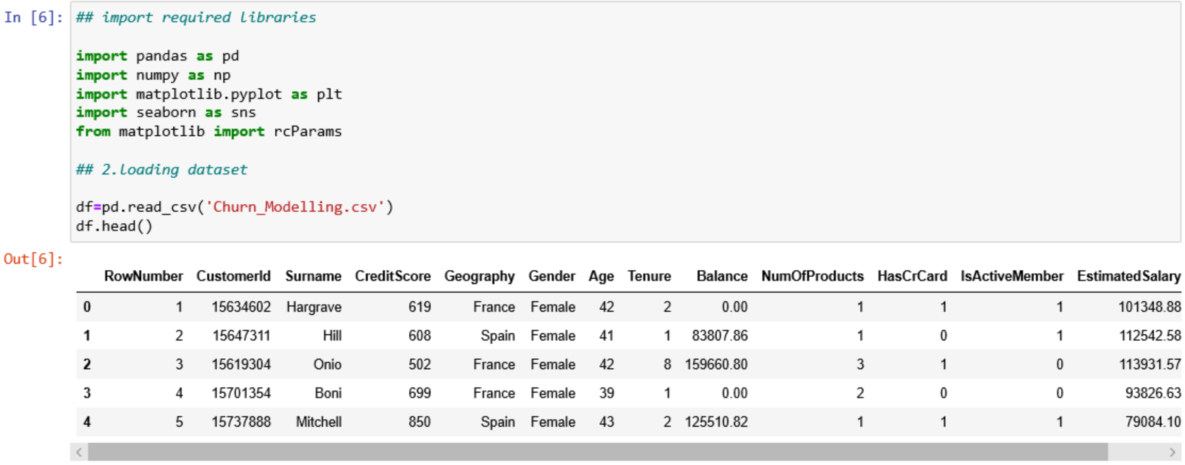
Date	26September 2022
Team ID	PNT2022TMID38667
Project Name	Early Dedection Of Chronic Kidney Deseas Using Machine Learning
Name	Kanimozhi D

1.Download The Dataset



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	RowNumb	Customer	Surname	CreditScoı	Geograph	Gender	Age	Tenure	Balance	NumOfPrı	HasCrCard	IsActiveM	Estimated	Exited
2	1	15634602	Hargrave	619	France	Female	42	2	0	1	1	1	101348.9	1
3	2	15647311	Hill	608	Spain	Female	41	1	83807.86	1	0	1	112542.6	0
4	3	15619304	Onio	502	France	Female	42	8	159660.8	3	1	0	113931.6	1
5	4	15701354	Boni	699	France	Female	39	1	0	2	0	0	93826.63	0
6	5	15737888	Mitchell	850	Spain	Female	43	2	125510.8	1	1	1	79084.1	0
7	6	15574012	Chu	645	Spain	Male	44	8	113755.8	2	1	0	149756.7	1
8	7	15592531	Bartlett	822	France	Male	50	7	0	2	1	1	10062.8	0
9	8	15656148	Obinna	376	Germany	Female	29	4	115046.7	4	1	0	119346.9	1
10	9	15792365	He	501	France	Male	44	4	142051.1	2	0	1	74940.5	0
11	10	15592389	H?	684	France	Male	27	2	134603.9	1	1	1	71725.73	0
12	11	15767821	Bearce	528	France	Male	31	6	102016.7	2	0	0	80181.12	0
13	12	15737173	Andrews	497	Spain	Male	24	3	0	2	1	0	76390.01	0
14	13	15632264	Kay	476	France	Female	34	10	0	2	1	0	26260.98	0
15	14	15691483	Chin	549	France	Female	25	5	0	2	0	0	190857.8	0
16	15	15600882	Scott	635	Spain	Female	35	7	0	2	1	1	65951.65	0
17	16	15643966	Goforth	616	Germany	Male	45	3	143129.4	2	0	1	64327.26	0
18	17	15737452	Romeo	653	Germany	Male	58	1	132602.9	1	1	0	5097.67	1
19	18	15788218	Henderso	549	Spain	Female	24	9	0	2	1	1	14406.41	0
20	19	15661507	Muldrow	587	Spain	Male	45	6	0	1	0	0	158684.8	0
21	20	15568982	Hao	726	France	Female	24	6	0	2	1	1	54724.03	0
22	21	15577657	McDonald	732	France	Male	41	8	0	2	1	1	170886.2	0
23	22	15597945	Dellucci	636	Spain	Female	32	8	0	2	1	0	138555.5	0
24	23	15699309	Gerasimov	510	Spain	Female	38	4	0	1	1	0	118913.5	1
25	24	15725737	Mosman	669	France	Male	46	3	0	2	0	1	8487.75	0

2.Load The Dataset



```
In [6]: ## import required libraries

        import pandas as pd
        import numpy as np
        import matplotlib.pyplot as plt
        import seaborn as sns
        from matplotlib import rcParams

        ## 2.loading dataset

        df=pd.read_csv('Churn_Modelling.csv')
        df.head()
```

Out[6]:

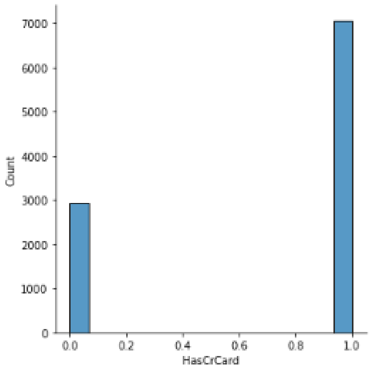
	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary
0	1	15634602	Hargrave	619	France	Female	42	2	0.00	1	1	1	101348.88
1	2	15647311	Hill	608	Spain	Female	41	1	83807.86	1	0	1	112542.58
2	3	15619304	Onio	502	France	Female	42	8	159660.80	3	1	0	113931.57
3	4	15701354	Boni	699	France	Female	39	1	0.00	2	0	0	93826.63
4	5	15737888	Mitchell	850	Spain	Female	43	2	125510.82	1	1	1	79084.10

3.Perform Below Visualization

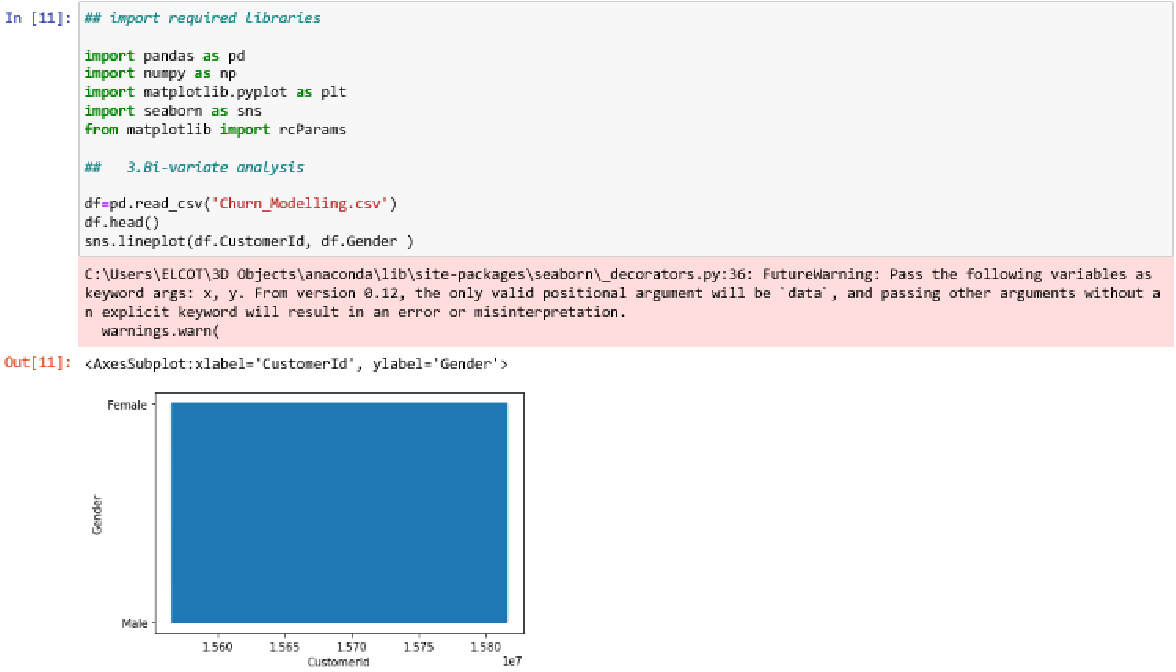
- Univariate Analysis

In [7]:
```
## import required libraries

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from matplotlib import rcParams

## 3.univariate analysis

df=pd.read_csv('Churn_Modelling.csv')
df.head()
sns.displot(df.HasCrCard)
```

Out[7]:
```
<seaborn.axisgrid.FacetGrid at 0x1fb998c0490>
```



- Bi - Variate Analysis

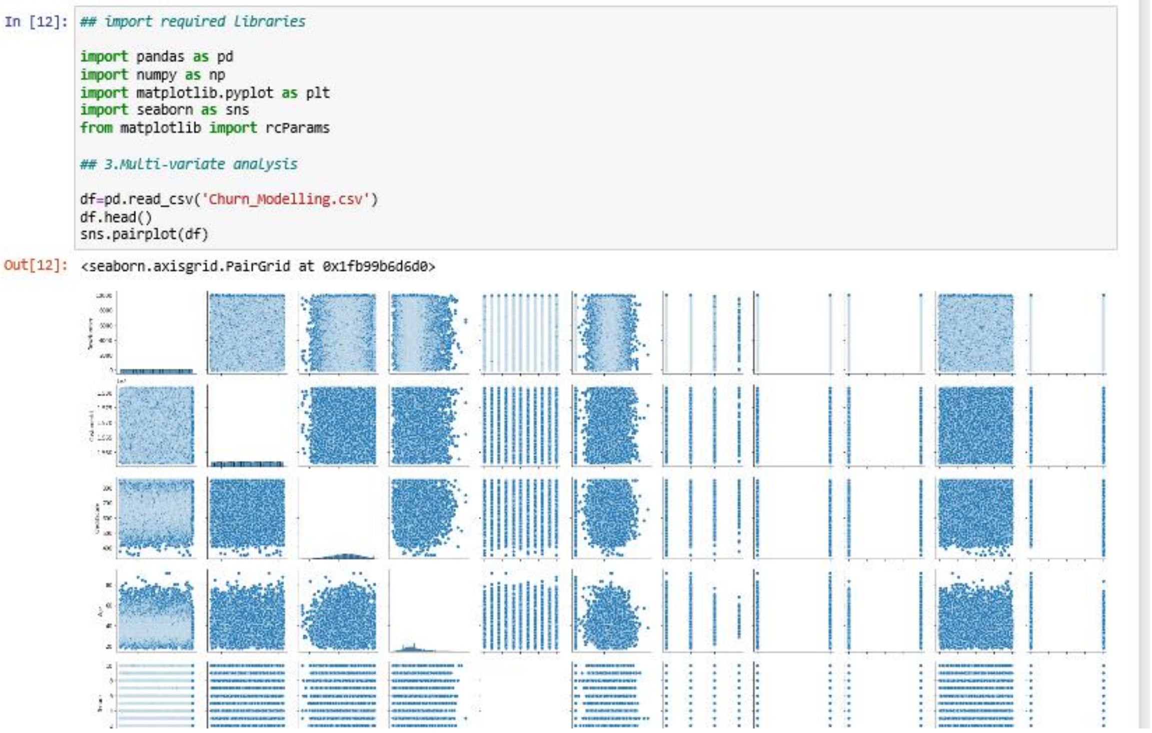


```
In [11]: ## import required libraries

         import pandas as pd
         import numpy as np
         import matplotlib.pyplot as plt
         import seaborn as sns
         from matplotlib import rcParams

         ##   3.Bi-variate analysis

         df=pd.read_csv('Churn_Modelling.csv')
         df.head()
         sns.lineplot(df.CustomerId, df.Gender )
```

```
C:\Users\ELCOT\3D Objects\anaconda\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variables as
keyword args: x, y. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without a
n explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```

```
Out[11]: <AxesSubplot:xlabel='CustomerId', ylabel='Gender'>
```

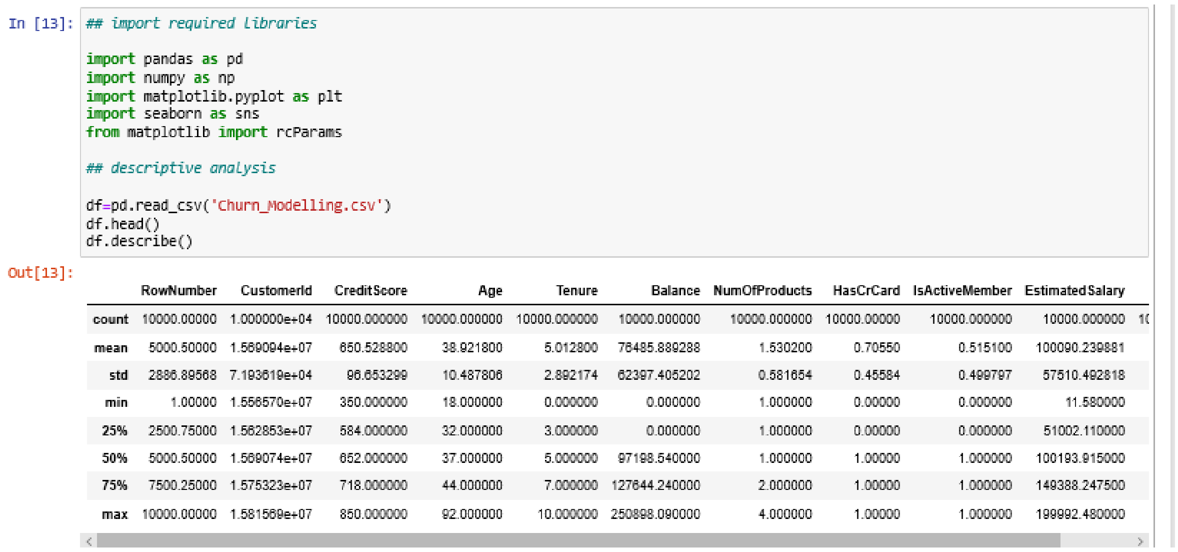
- Multi - Variate Analysis



```
In [12]: ## import required libraries

         import pandas as pd
         import numpy as np
         import matplotlib.pyplot as plt
         import seaborn as sns
         from matplotlib import rcParams

         ## 3.Multi-variate analysis

         df=pd.read_csv('Churn_Modelling.csv')
         df.head()
         sns.pairplot(df)
```

```
Out[12]: <seaborn.axisgrid.PairGrid at 0x1fb99b6d6d0>
```

4. Perform descriptive statistics on the dataset.

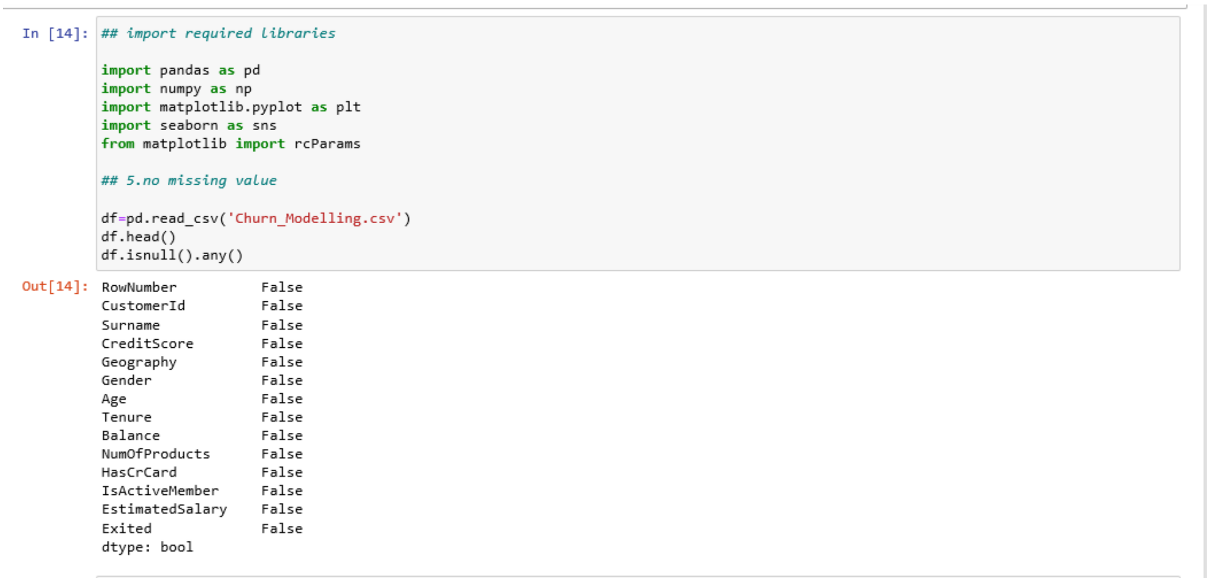


```
In [13]: ## import required libraries

         import pandas as pd
         import numpy as np
         import matplotlib.pyplot as plt
         import seaborn as sns
         from matplotlib import rcParams

         ## descriptive analysis

         df=pd.read_csv('Churn_Modelling.csv')
         df.head()
         df.describe()
```

Out[13]:

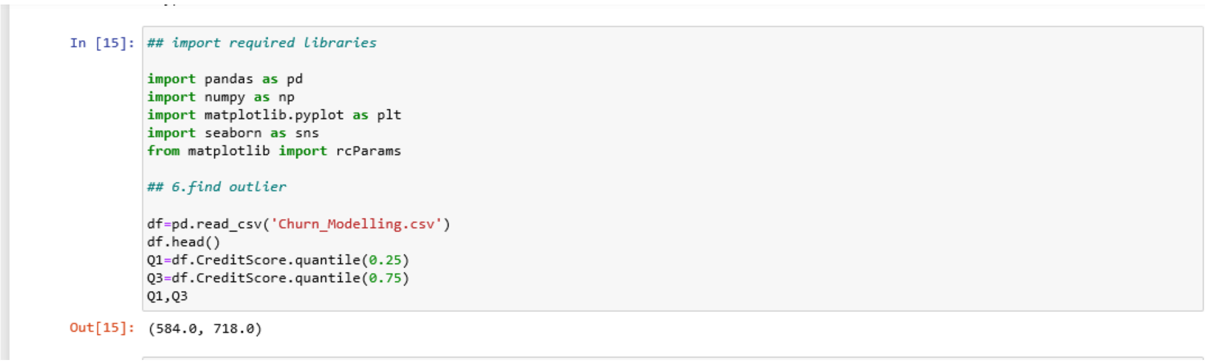
	RowNumber	CustomerId	CreditScore	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary
count	10000.00000	1.000000e+04	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.00000	10000.000000	10000.000000
mean	5000.50000	1.569094e+07	650.528800	38.921800	5.012800	76485.889288	1.530200	0.70550	0.515100	100090.239881
std	2886.89568	7.193619e+04	96.653299	10.487806	2.892174	62397.405202	0.581654	0.45584	0.499797	57510.492818
min	1.00000	1.556570e+07	350.000000	18.000000	0.000000	0.000000	1.000000	0.00000	0.000000	11.580000
25%	2500.75000	1.562853e+07	584.000000	32.000000	3.000000	0.000000	1.000000	0.00000	0.000000	51002.110000
50%	5000.50000	1.569074e+07	652.000000	37.000000	5.000000	97198.540000	1.000000	1.00000	1.000000	100193.915000
75%	7500.25000	1.575323e+07	718.000000	44.000000	7.000000	127644.240000	2.000000	1.00000	1.000000	149388.247500
max	10000.00000	1.581569e+07	850.000000	92.000000	10.000000	250898.090000	4.000000	1.00000	1.000000	199992.480000

5.Handle the Missing values

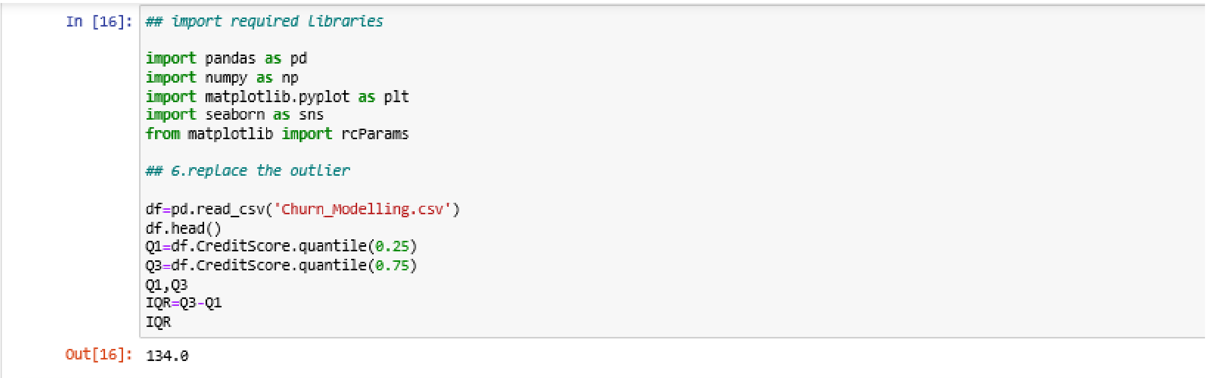


```
In [14]: ## import required libraries

         import pandas as pd
         import numpy as np
         import matplotlib.pyplot as plt
         import seaborn as sns
         from matplotlib import rcParams

         ## 5.no missing value

         df=pd.read_csv('Churn_Modelling.csv')
         df.head()
         df.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
```

6. Find the outliers and replace the outliers

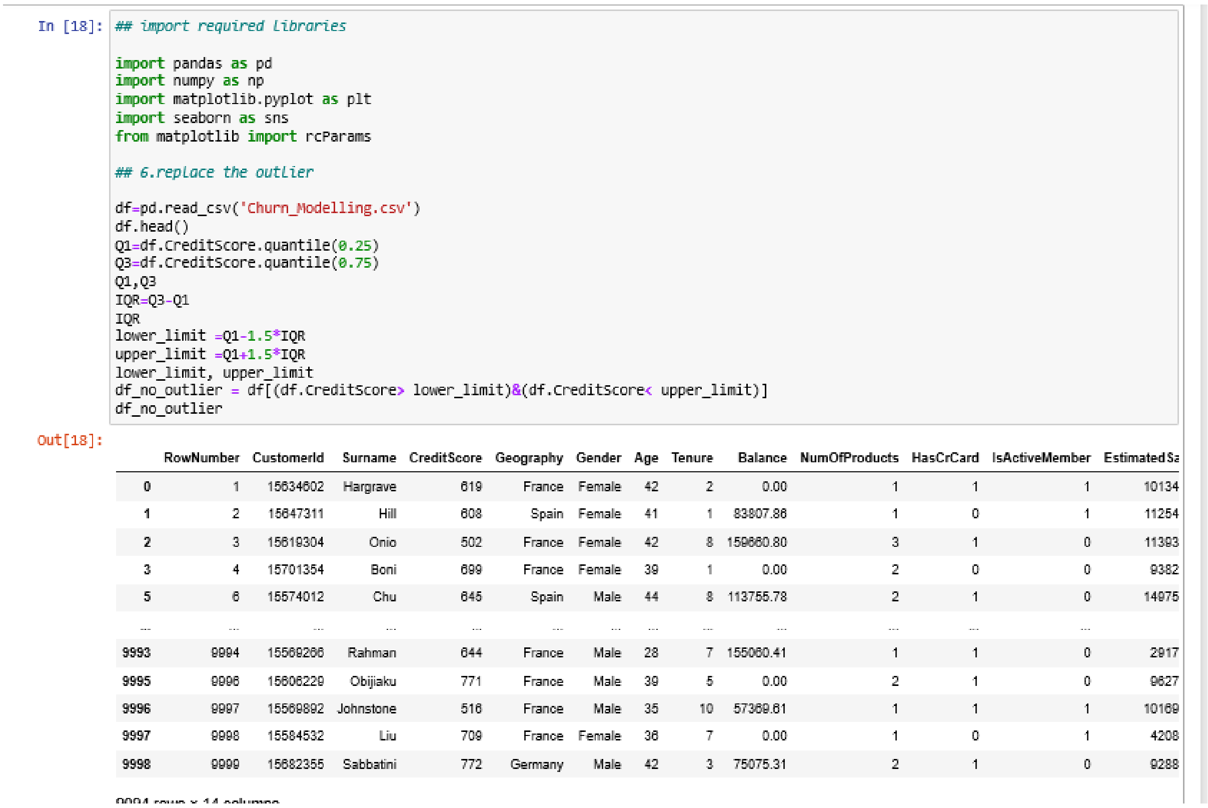


```
In [15]: ## import required libraries

         import pandas as pd
         import numpy as np
         import matplotlib.pyplot as plt
         import seaborn as sns
         from matplotlib import rcParams

         ## 6.find outlier

         df=pd.read_csv('Churn_Modelling.csv')
         df.head()
         Q1=df.CreditScore.quantile(0.25)
         Q3=df.CreditScore.quantile(0.75)
         Q1,Q3

Out[15]: (584.0, 718.0)
```



In [16]:
```
## import required libraries

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from matplotlib import rcParams

## 6.replace the outlier

df=pd.read_csv('Churn_Modelling.csv')
df.head()
Q1=df.CreditScore.quantile(0.25)
Q3=df.CreditScore.quantile(0.75)
Q1,Q3
IQR=Q3-Q1
IQR
```

Out[16]:
```
134.0
```



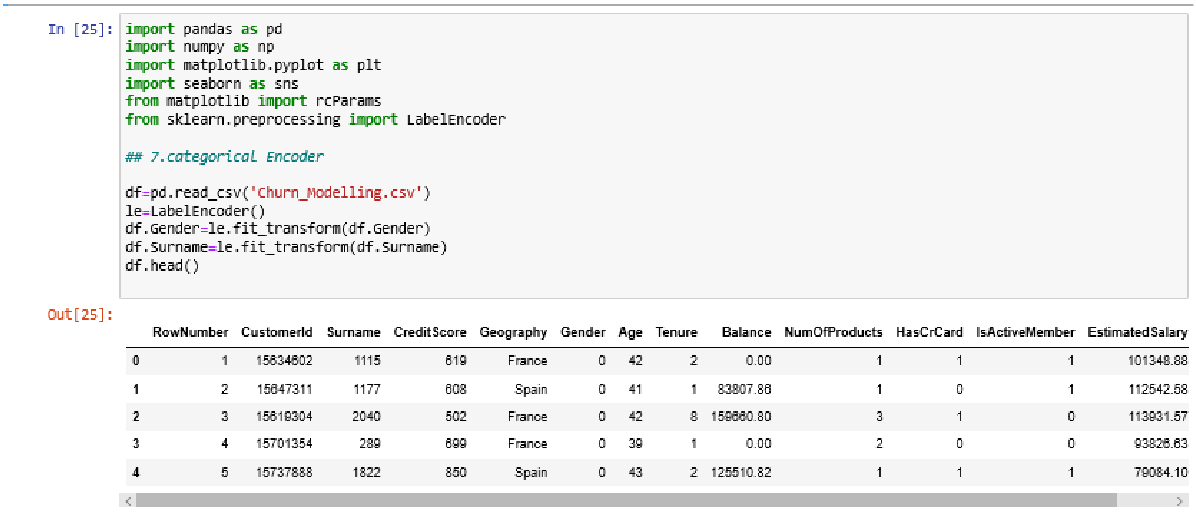
In [18]:
```
## import required libraries

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from matplotlib import rcParams

## 6.replace the outlier

df=pd.read_csv('Churn_Modelling.csv')
df.head()
Q1=df.CreditScore.quantile(0.25)
Q3=df.CreditScore.quantile(0.75)
Q1,Q3
IQR=Q3-Q1
IQR
lower_limit =Q1-1.5*IQR
upper_limit =Q1+1.5*IQR
lower_limit, upper_limit
df_no_outlier = df[(df.CreditScore> lower_limit)&(df.CreditScore< upper_limit)]
df_no_outlier
```

Out[18]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSa
0	1	15634602	Hargrave	619	France	Female	42	2	0.00	1	1	1	10134
1	2	15647311	Hill	608	Spain	Female	41	1	83807.86	1	0	1	11254
2	3	15619304	Onio	502	France	Female	42	8	159660.80	3	1	0	11393
3	4	15701354	Boni	699	France	Female	39	1	0.00	2	0	0	9382
5	6	15574012	Chu	645	Spain	Male	44	8	113755.78	2	1	0	14975
...	...	...	...	...	...	...	...	...	...	...	...	...	
9993	9994	15569266	Rahman	644	France	Male	28	7	155060.41	1	1	0	2917
9995	9996	15606229	Obijiaku	771	France	Male	39	5	0.00	2	1	0	9627
9996	9997	15569892	Johnstone	516	France	Male	35	10	57369.61	1	1	1	10169
9997	9998	15584532	Liu	709	France	Female	36	7	0.00	1	0	1	4208
9998	9999	15682355	Sabbatini	772	Germany	Male	42	3	75075.31	2	1	0	9288

9994 rows × 14 columns

7.Check for Categorical columns and perform encoding.

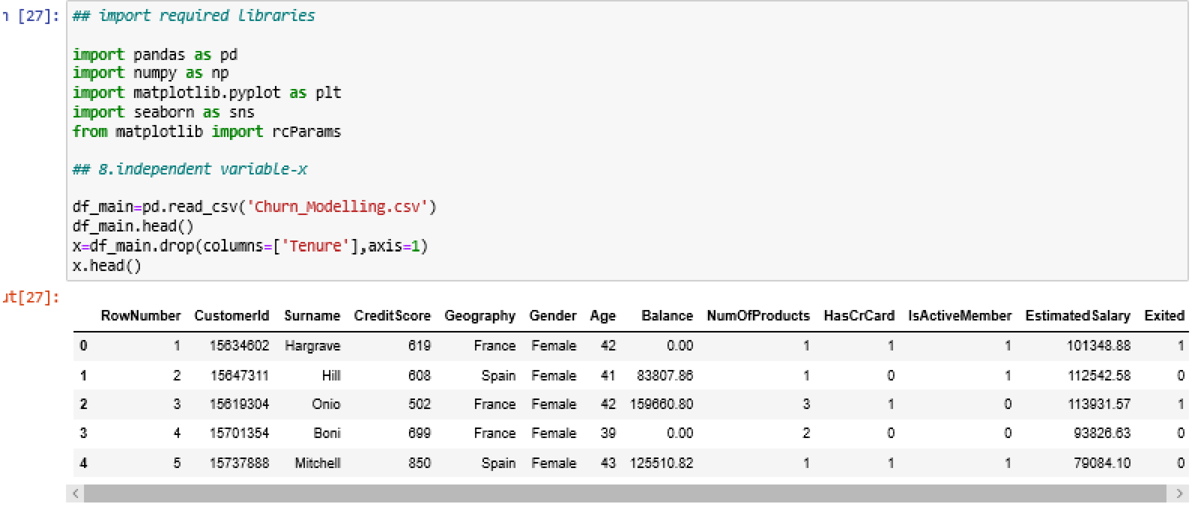


In [25]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from matplotlib import rcParams
from sklearn.preprocessing import LabelEncoder

## 7.categorical Encoder

df=pd.read_csv('Churn_Modelling.csv')
le=LabelEncoder()
df.Gender=le.fit_transform(df.Gender)
df.Surname=le.fit_transform(df.Surname)
df.head()
```

Out[25]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary
0	1	15634602	1115	619	France	0	42	2	0.00	1	1	1	101348.88
1	2	15647311	1177	608	Spain	0	41	1	83807.86	1	0	1	112542.58
2	3	15619304	2040	502	France	0	42	8	159660.80	3	1	0	113931.57
3	4	15701354	289	699	France	0	39	1	0.00	2	0	0	93826.63
4	5	15737888	1822	850	Spain	0	43	2	125510.82	1	1	1	79084.10

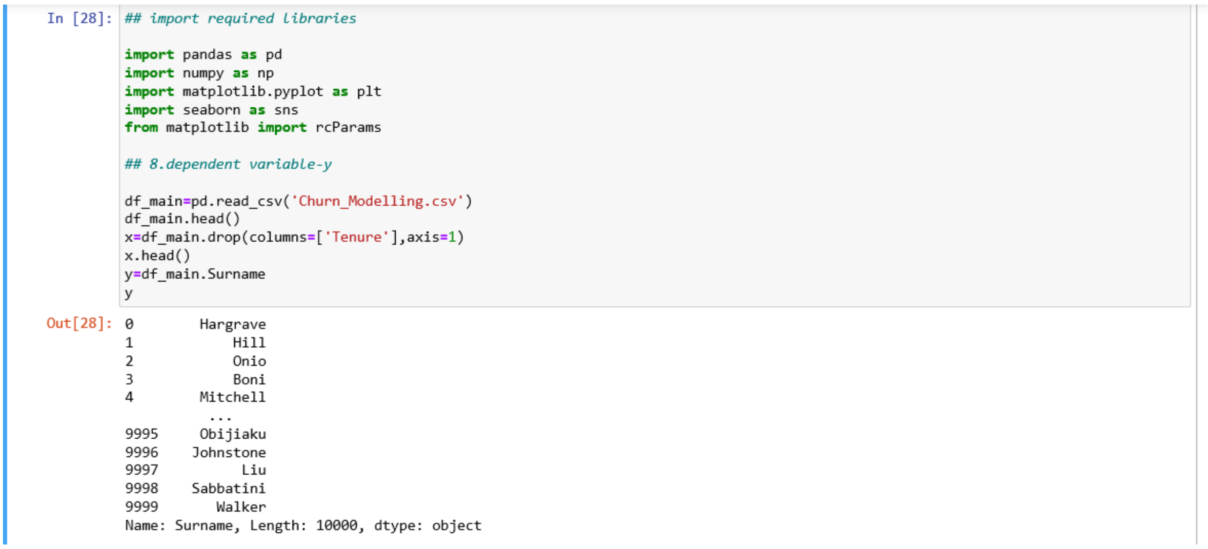
8. Split the data into dependent and independent variables



```
ι [27]: ## import required libraries

        import pandas as pd
        import numpy as np
        import matplotlib.pyplot as plt
        import seaborn as sns
        from matplotlib import rcParams

        ## 8.independent variable-x

        df_main=pd.read_csv('Churn_Modelling.csv')
        df_main.head()
        x=df_main.drop(columns=['Tenure'],axis=1)
        x.head()
```

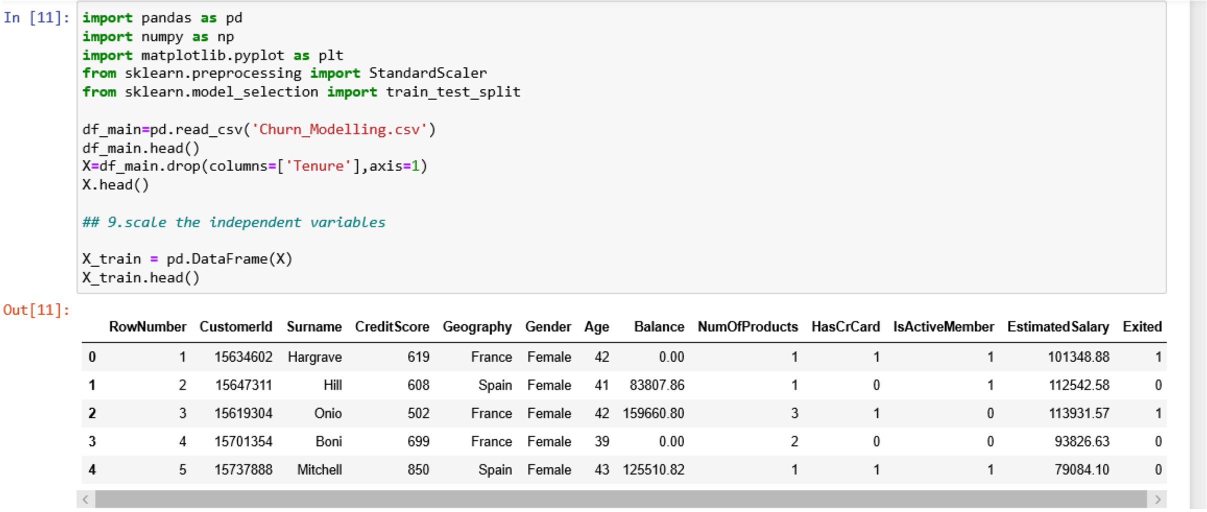
ɪt[27]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	1	15634602	Hargrave	619	France	Female	42	0.00	1	1	1	101348.88	1
1	2	15647311	Hill	608	Spain	Female	41	83807.86	1	0	1	112542.58	0
2	3	15619304	Onio	502	France	Female	42	159660.80	3	1	0	113931.57	1
3	4	15701354	Boni	699	France	Female	39	0.00	2	0	0	93826.63	0
4	5	15737888	Mitchell	850	Spain	Female	43	125510.82	1	1	1	79084.10	0



```
In [28]: ## import required libraries

         import pandas as pd
         import numpy as np
         import matplotlib.pyplot as plt
         import seaborn as sns
         from matplotlib import rcParams

         ## 8.dependent variable-y

         df_main=pd.read_csv('Churn_Modelling.csv')
         df_main.head()
         x=df_main.drop(columns=['Tenure'],axis=1)
         x.head()
         y=df_main.Surname
         y

Out[28]: 0        Hargrave
         1            Hill
         2            Onio
         3            Boni
         4        Mitchell
                   ...
         9995     Obijiaku
         9996    Johnstone
         9997          Liu
         9998    Sabbatini
         9999       Walker
         Name: Surname, Length: 10000, dtype: object
```

9. Scale the independent variables



```
In [11]: import pandas as pd
         import numpy as np
         import matplotlib.pyplot as plt
         from sklearn.preprocessing import StandardScaler
         from sklearn.model_selection import train_test_split

         df_main=pd.read_csv('Churn_Modelling.csv')
         df_main.head()
         X=df_main.drop(columns=['Tenure'],axis=1)
         X.head()

         ## 9.scale the independent variables

         X_train = pd.DataFrame(X)
         X_train.head()
```

Out[11]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	1	15634602	Hargrave	619	France	Female	42	0.00	1	1	1	101348.88	1
1	2	15647311	Hill	608	Spain	Female	41	83807.86	1	0	1	112542.58	0
2	3	15619304	Onio	502	France	Female	42	159660.80	3	1	0	113931.57	1
3	4	15701354	Boni	699	France	Female	39	0.00	2	0	0	93826.63	0
4	5	15737888	Mitchell	850	Spain	Female	43	125510.82	1	1	1	79084.10	0

10. Split the data into training and testing

In [12]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split

## 10.training and testing

y=df_main.CreditScore
y
X_train, X_test, y_train, y_test= train_test_split(X,y,test_size=0.25,random_state=0)
print(' X_train.shape : ',X_train.shape)
print(' y_train.shape : ',y_train.shape)
print(' X_test.shape : ',X_test.shape)
print(' y_test.shape : ',y_test.shape)
```

```
 X_train.shape :  (7500, 13)
 y_train.shape :  (7500,)
 X_test.shape :  (2500, 13)
 y_test.shape :  (2500,)
```