```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

In [ ]:

```
cd /content/drive/MyDrive/Colab Notebooks
```

```
/content/drive/MyDrive/Colab Notebooks
```

In [ ]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
sns.set_style('darkgrid')
sns.set(font_scale=1.3)
ds = pd.read_excel('Churn_Modelling.xlsx')
ds
```

Out[ ]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	1.0	15634602.0	Hargrave	619.0	France	Female	42.0	2.0	0.00	1.0	1.0	1.0	101348.88	1.0
1	2.0	15647311.0	Hill	608.0	Spain	Female	41.0	1.0	83807.86	1.0	0.0	1.0	112542.58	0.0
2	3.0	15619304.0	Onio	502.0	France	Female	42.0	8.0	159660.80	3.0	1.0	0.0	113931.57	1.0
3	4.0	15701354.0	Boni	699.0	France	Female	39.0	1.0	0.00	2.0	0.0	0.0	93826.63	0.0

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
4	5.0	15737888.0	Mitchell	850.0	Spain	Female	43.0	2.0	125510.82	1.0	1.0	1.0	79084.10	0.0
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9995	9996.0	15606229.0	Obijiaku	771.0	France	Male	39.0	5.0	0.00	2.0	1.0	0.0	96270.64	0.0
9996	9997.0	15569892.0	Johnstone	516.0	France	Male	35.0	10.0	57369.61	1.0	1.0	1.0	101699.77	0.0
9997	9998.0	15584532.0	Liu	709.0	France	Female	36.0	7.0	0.00	1.0	0.0	1.0	42085.58	1.0
9998	9999.0	15682355.0	Sabbatini	772.0	Germany	Male	42.0	3.0	75075.31	2.0	1.0	0.0	92888.52	1.0
9999	10000.0	15628319.0	Walker	792.0	France	Female	28.0	4.0	130142.79	1.0	1.0	0.0	38190.78	0.0

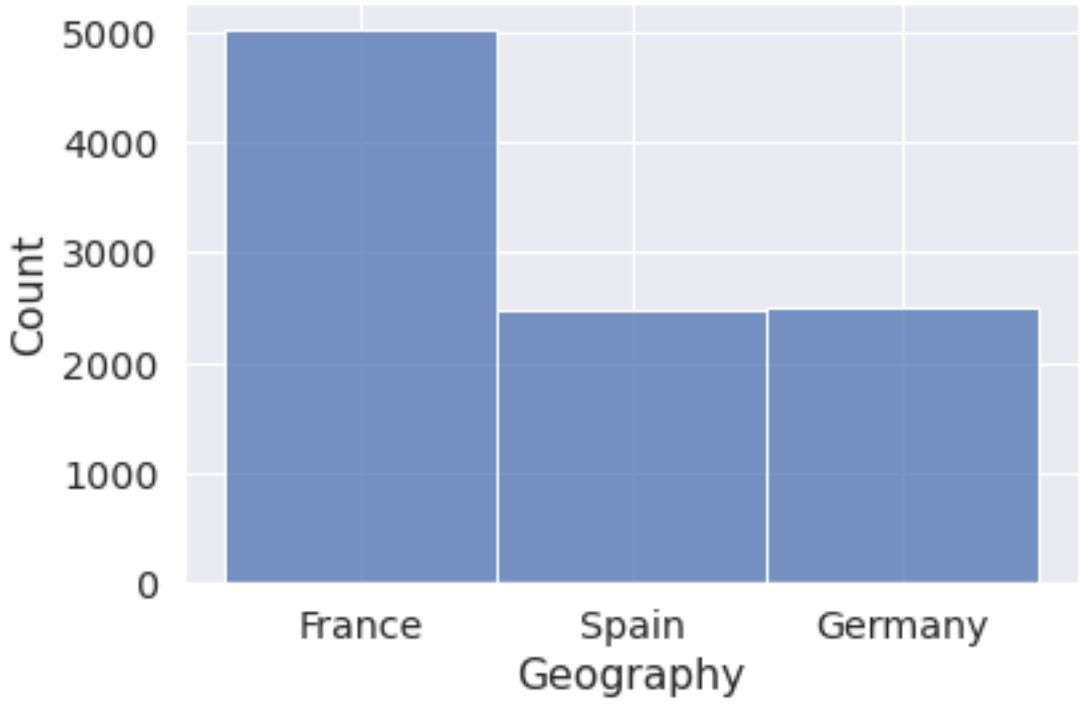
10000 rows × 14 columns

In [ ]:

```
sns.histplot(x='Geography',data=ds)
```

Out[ ]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f133173a450>
```



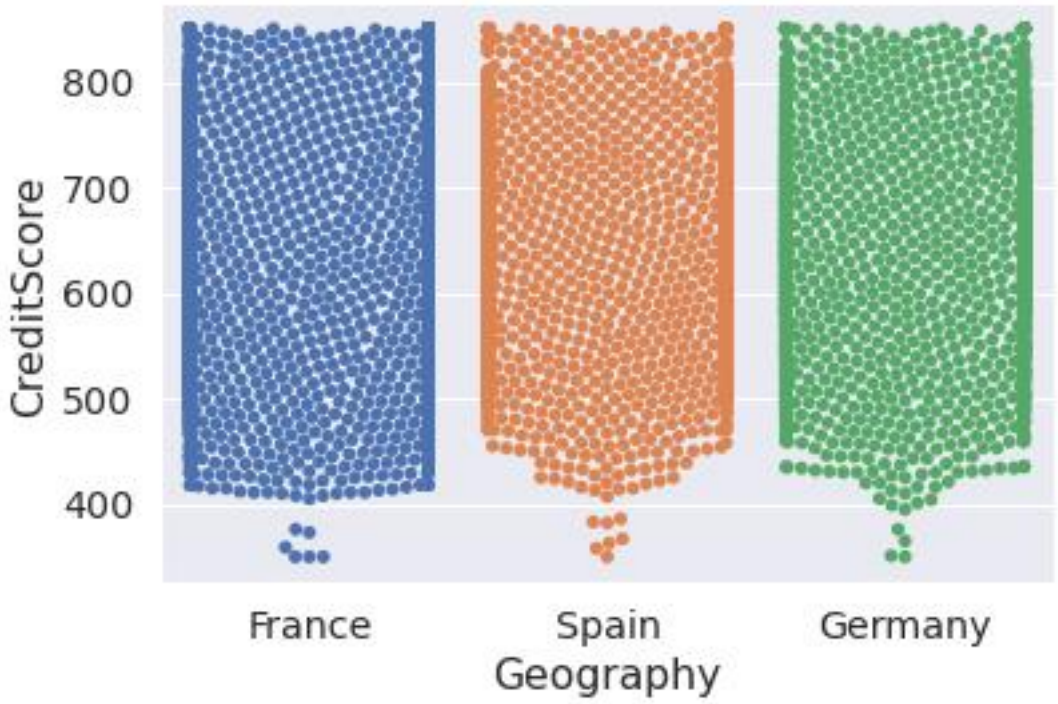
In [ ]:

```
sns.swarmplot(x="Geography", y="CreditScore", data=ds)
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/categorical.py:
1296: UserWarning: 87.5% of the points cannot be placed; you m
ay want to decrease the size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/categorical.py:
1296: UserWarning: 76.0% of the points cannot be placed; you m
ay want to decrease the size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/categorical.py:
1296: UserWarning: 75.9% of the points cannot be placed; you m
ay want to decrease the size of the markers or use stripplot.
  warnings.warn(msg, UserWarning)
```

Out[ ]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f1331755710>
```

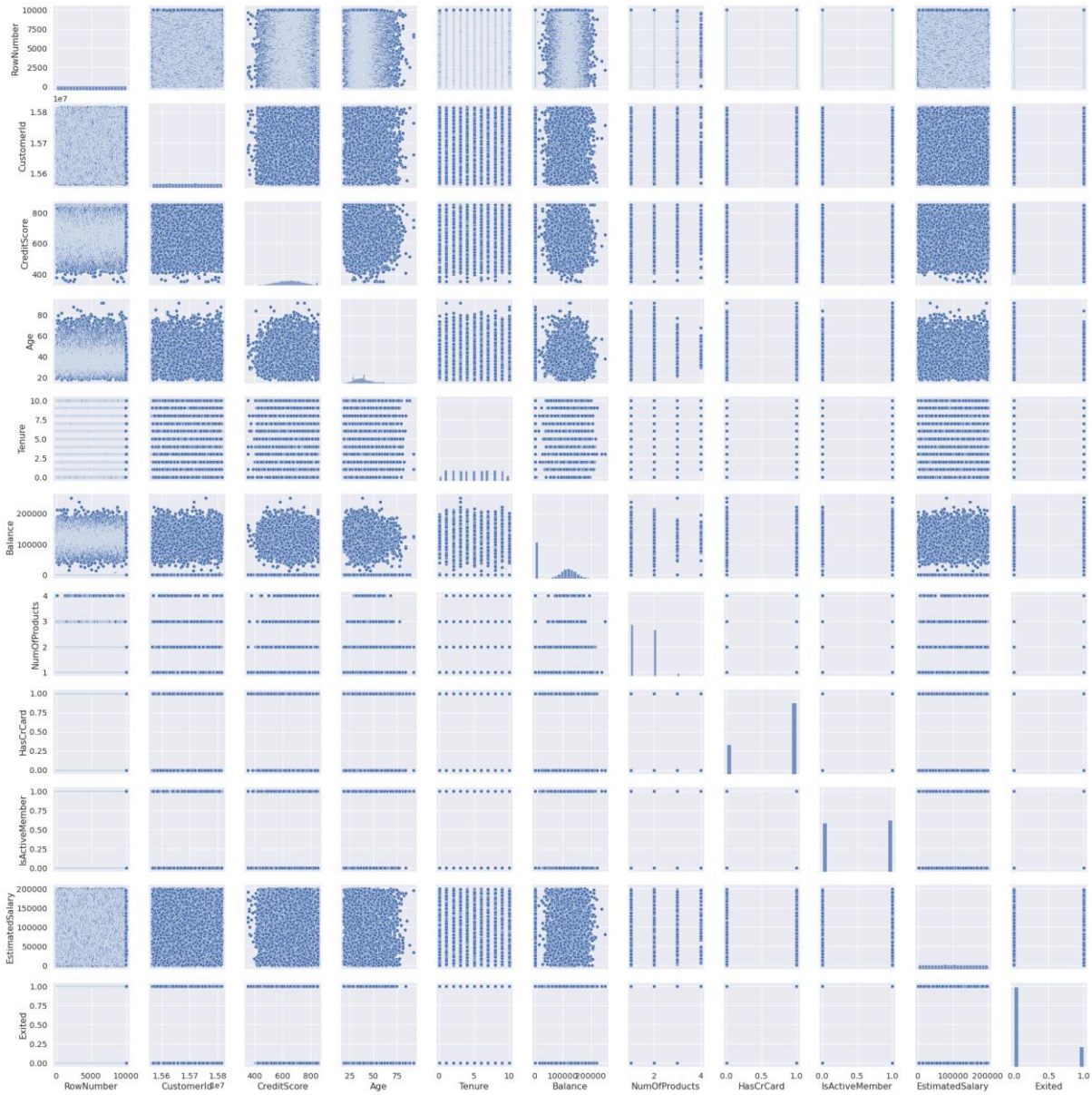


In [ ]:

```
sns.pairplot(ds)
```

Out[ ]:

```
<seaborn.axisgrid.PairGrid at 0x7f133111e9d0>
```



4.

In [ ]:

```
ds.head()
```

Out[ ]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	1.0	15634602.0	Hargrave	619.0	France	Female	42.0	2.0	0.00	1.0	1.0	1.0	101348.88	1.0

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
1	2.0	15647311.0	Hill	608.0	Spain	Female	41.0	1.0	83807.86	1.0	0.0	1.0	112542.58	0.0
2	3.0	15619304.0	Onio	502.0	France	Female	42.0	8.0	159660.80	3.0	1.0	0.0	113931.57	1.0
3	4.0	15701354.0	Boni	699.0	France	Female	39.0	1.0	0.00	2.0	0.0	0.0	93826.63	0.0
4	5.0	15737888.0	Mitchell	850.0	Spain	Female	43.0	2.0	125510.82	1.0	1.0	1.0	79084.10	0.0

In [ ]:

```
ds.describe()
```

Out[ ]:

	RowNumber	CustomerId	CreditScore	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
count	10000.000000	1.000000e+04	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000
mean	5000.500000	1.569094e+07	650.528800	38.921800	5.012800	76485.889288	1.530200	0.70550	0.515100	100090.239881	0.203700

	RowNumber	CustomerId	CreditScore	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
std	2886.89568	7.193619e+04	96.653299	10.487806	2.892174	62397.405202	0.581654	0.45584	0.499797	57510.492818	0.402769
min	1.00000	1.556570e+07	350.000000	18.000000	0.000000	0.000000	1.000000	0.00000	0.000000	11.580000	0.000000
25%	2500.75000	1.562853e+07	584.000000	32.000000	3.000000	0.000000	1.000000	0.00000	0.000000	51002.110000	0.000000
50%	5000.50000	1.569074e+07	652.000000	37.000000	5.000000	97198.540000	1.000000	1.00000	1.000000	100193.915000	0.000000
75%	7500.25000	1.575323e+07	718.000000	44.000000	7.000000	127644.240000	2.000000	1.00000	1.000000	149388.247500	0.000000
max	10000.00000	1.581569e+07	850.000000	92.000000	10.000000	250898.090000	4.000000	1.00000	1.000000	199992.480000	1.000000

In [ ]:

```
ds.dtypes
```

Out[ ]:

```
RowNumber           float64
CustomerId          float64
Surname              object
CreditScore         float64
Geography            object
Gender               object
Age                 float64
Tenure              float64
Balance             float64
NumOfProducts       float64
HasCrCard           float64
IsActiveMember      float64
```

```
EstimatedSalary    float64
Exited             float64
dtype: object
```

In [ ]:

```
ds.skew()
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:1
: FutureWarning: Dropping of nuisance columns in DataFrame red
uctions (with 'numeric_only=None') is deprecated; in a future
version this will raise TypeError.  Select only valid columns
before calling the reduction.
  """Entry point for launching an IPython kernel.
```

Out[ ]:

```
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
```

5.

In [ ]:

```
ds.isnull().any()
```

Out[ ]:

```
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.

In [ ]:

```
ds['CreditScore'].describe()
```

Out[ ]:

```
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
```

In [ ]:

```
ds['Age'].describe()
```

Out[ ]:

```
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
```

In [ ]:

```
ds['Balance'].describe()
```

Out[ ]:

```
count     10000.000000
mean      76485.889288
std       62397.405202
min           0.000000
25%           0.000000
50%       97198.540000
75%      127644.240000
max      250898.090000
Name: Balance, dtype: float64
```

In [ ]:

```
l=['Balance','Age','CreditScore']
for i in l:
  a=ds[i].quantile(0.1)
  b=ds[i].quantile(0.9)
ds=ds[(ds[i]<b)& (ds[i]>a)]
```

In [ ]:

```
ds['CreditScore'].describe()
```

Out[ ]:

```
count    7995.000000
mean      650.995497
std        66.328034
min       522.000000
25%       599.000000
50%       652.000000
75%       704.000000
```

```
max       777.000000
Name: CreditScore, dtype: float64
```

In [ ]:

```
ds['Balance'].describe()
```

Out[ ]:

```
count      7995.000000
mean      76183.940614
std       62412.914155
min           0.000000
25%           0.000000
50%       96858.350000
75%      127530.095000
max      250898.090000
Name: Balance, dtype: float64
```

In [ ]:

```
ds['Age'].describe()
```

Out[ ]:

```
count    7995.000000
mean       38.881301
std        10.465870
min        18.000000
25%        32.000000
50%        37.000000
75%        44.000000
max        92.000000
Name: Age, dtype: float64
```

7.

In [ ]:

```
from sklearn.preprocessing import LabelEncoder
encoder=LabelEncoder()
for i in ds:
 if ds[i].dtype=='object':
  ds[i]=encoder.fit_transform(ds[i])
ds.head()
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:5
: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFr
ame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.or
g/pandas-docs/stable/user_guide/indexing.html#returning-a-view
-versus-a-copy
  """
```

Out[ ]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	1.0	15634602.0	1011	619.0	0	0	42.0	2.0	0.00	1.0	1.0	1.0	101348.88	1.0
1	2.0	15647311.0	1060	608.0	2	0	41.0	1.0	83807.86	1.0	0.0	1.0	112542.58	0.0
3	4.0	15701354.0	264	699.0	0	0	39.0	1.0	0.00	2.0	0.0	0.0	93826.63	0.0
5	6.0	15574012.0	492	645.0	2	1	44.0	8.0	113755.78	2.0	1.0	0.0	149756.71	1.0
9	10.0	15592389.0	978	684.0	0	1	27.0	2.0	134603.88	1.0	1.0	1.0	71725.73	0.0

8.

In [ ]:

```
ds.shape
(3354, 14)
x = ds.iloc[:,:13]
y = ds.iloc[:,13]
x.head()
```

Out[ ]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary
0	1.0	15634602.0	1011	619.0	0	0	42.0	2.0	0.00	1.0	1.0	1.0	101348.88
1	2.0	15647311.0	1060	608.0	2	0	41.0	1.0	83807.86	1.0	0.0	1.0	112542.58
3	4.0	15701354.0	264	699.0	0	0	39.0	1.0	0.00	2.0	0.0	0.0	93826.63
5	6.0	15574012.0	492	645.0	2	1	44.0	8.0	113755.78	2.0	1.0	0.0	149756.71
9	10.0	15592389.0	978	684.0	0	1	27.0	2.0	134603.88	1.0	1.0	1.0	71725.73

In [ ]:

```
y.head()
```

Out[ ]:

```
0    1.0
1    0.0
3    0.0
5    1.0
9    0.0
Name: Exited, dtype: float64
```

9.

In [ ]:

```
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
x = sc.fit_transform(x)
```

10.

In [ ]:

```
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
```

Out[ ]:

```
(6396, 13)
```

In [ ]:

```
y_train.shape
```

Out[ ]:

```
(6396,)
```

In [ ]:

```
x_test.shape
```

Out[ ]:

```
(1599, 13)
```

In [ ]:

```
y_test.shape
```

Out[ ]:

```
(1599,)
```