Importing Libraries

```
import matplotlib.pyplot as plt
import seaborn as sns

import pandas as pd
from sklearn.model_selection import train_test_split
from xgboost import XGBClassifier
from sklearn.metrics import classification_report, accuracy_score
sns.set_style("darkgrid")
```

Loading data

```
data=pd.read_csv('/content/drive/MyDrive/Colab Notebooks/Churn_Modelling.csv')
```

```
data.shape
```

```
(10000, 14)
```

```
data.head()
```

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

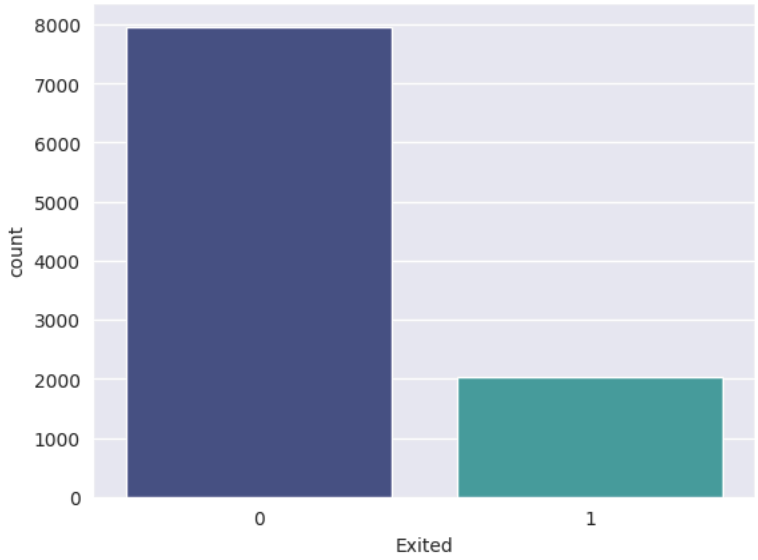
```
data.describe()
```

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

Exploratory Data Analysis

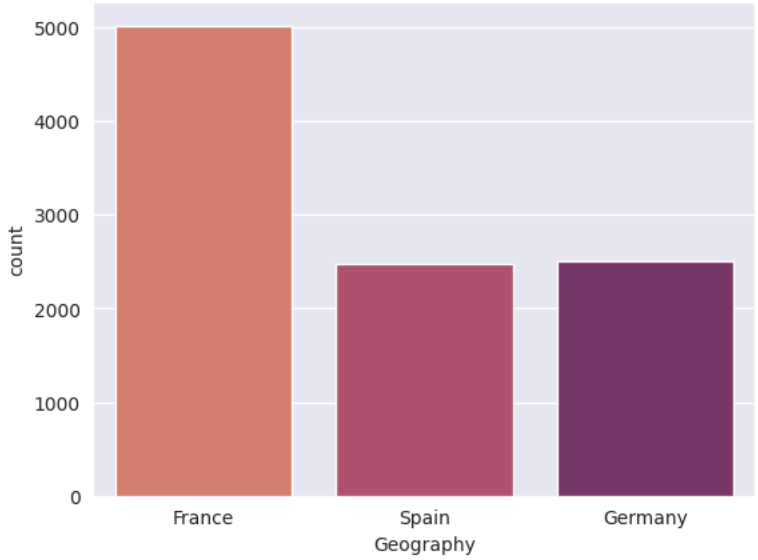
```
sns.countplot(x='Exited', data=data, palette="mako")
```

```
<ipython-input-103-684ffad9fe3f>:1: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14

  sns.countplot(x='Exited', data=data, palette="mako")
<Axes: xlabel='Exited', ylabel='count'>
```



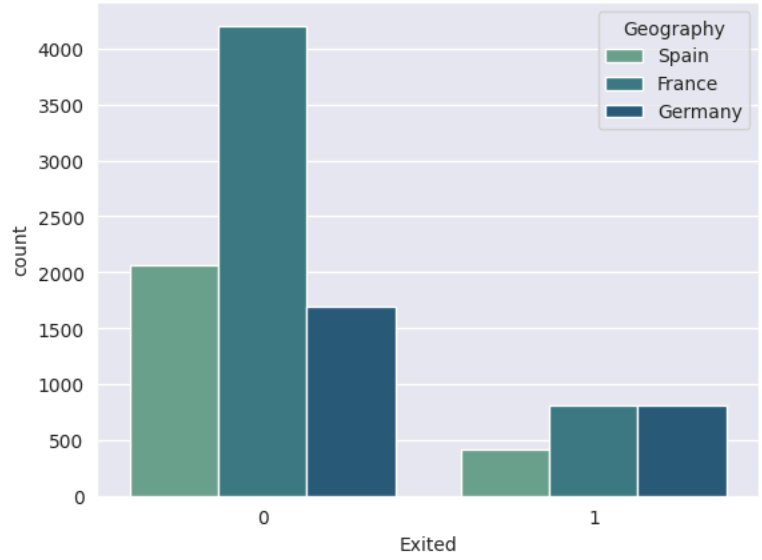

```
sns.countplot(x='Geography', data=data, palette="flare")
```

```
<ipython-input-104-739ddfebb3c8>:1: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14

  sns.countplot(x='Geography', data=data, palette="flare")
<Axes: xlabel='Geography', ylabel='count'>
```



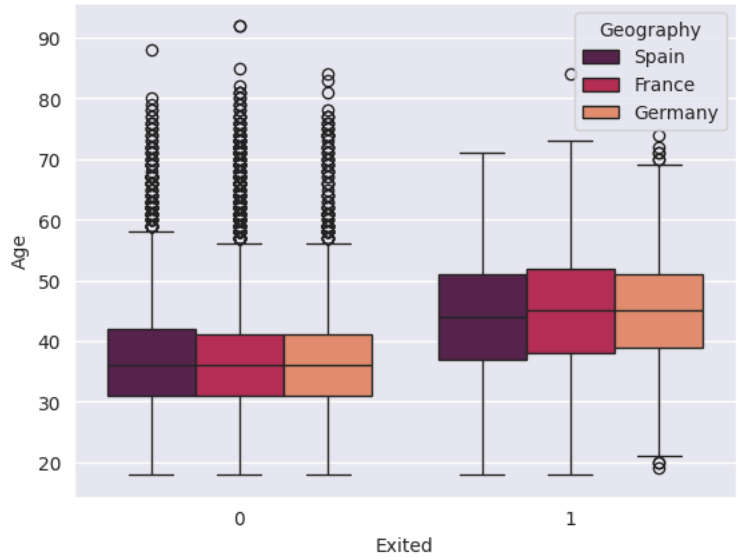

```
sns.countplot(x='Exited', hue='Geography', data=data, palette="crest")
```

```
<Axes: xlabel='Exited', ylabel='count'>
```



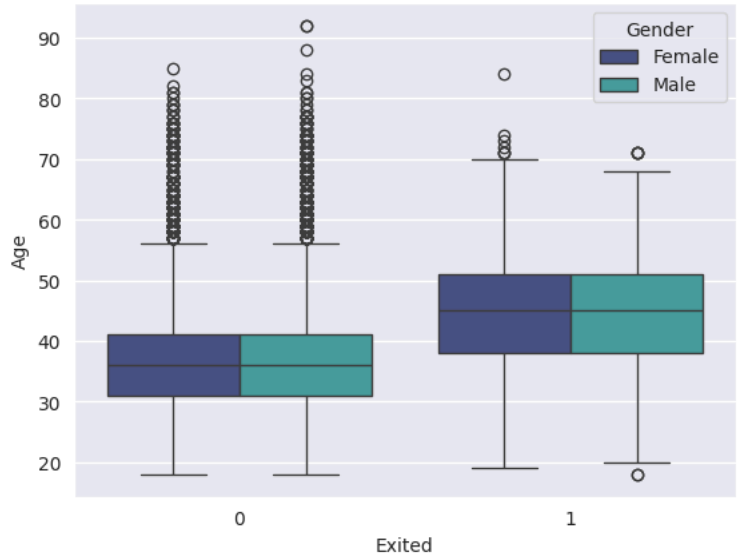

```
sns.boxplot(x='Exited', y= "Age", hue="Geography", data=data, palette="rocket")
```

```
<Axes: xlabel='Exited', ylabel='Age'>
```



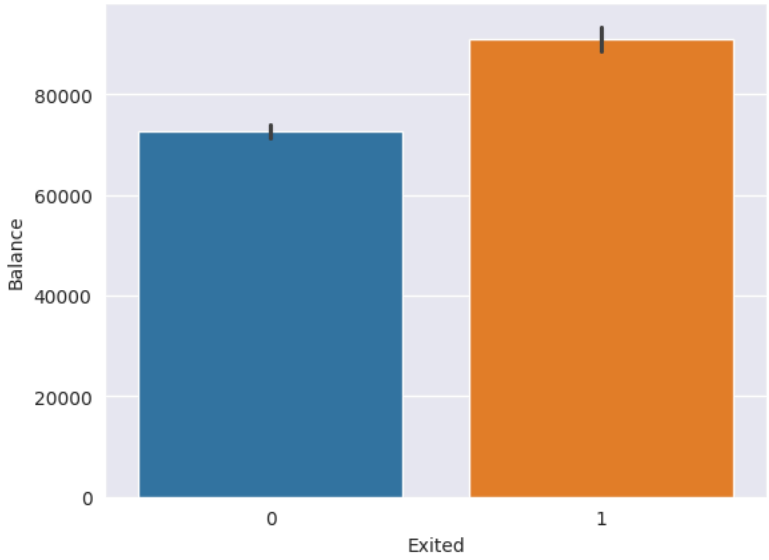

```
sns.boxplot(x='Exited', y= "Age", hue="Gender", data=data, palette="mako")
```

```
<Axes: xlabel='Exited', ylabel='Age'>
```



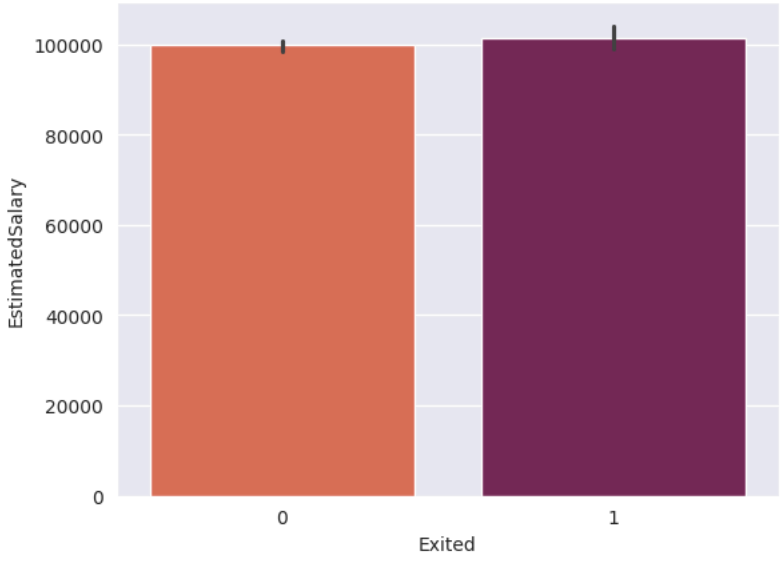
```
sns.barplot(x='Exited', y= "Balance", data=data, palette="tab10")
```

```
<ipython-input-108-5c8604b72f1e>:1: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14

  sns.barplot(x='Exited', y= "Balance", data=data, palette="tab10")
<Axes: xlabel='Exited', ylabel='Balance'>
```



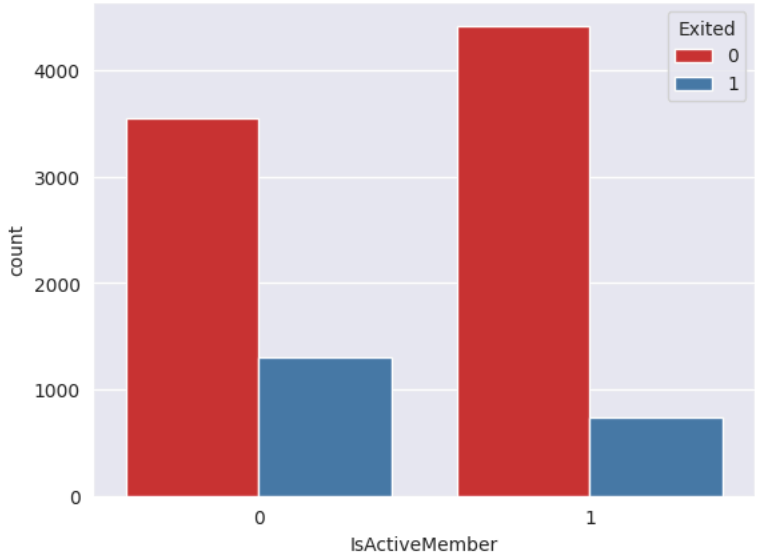

```
sns.barplot(x='Exited', y= "EstimatedSalary", data=data, palette="rocket_r")
```

```
<ipython-input-109-b73d4cb900e8>:1: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14

  sns.barplot(x='Exited', y= "EstimatedSalary", data=data, palette="rocket_r")
<Axes: xlabel='Exited', ylabel='EstimatedSalary'>
```




```
sns.countplot(x='IsActiveMember', hue= "Exited", data=data, palette="Set1")
```

```
<Axes: xlabel='IsActiveMember', ylabel='count'>
```



Data Pre-processing

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

```
features =  data.drop(['Exited'], axis=1)
labels = data['Exited']
```

```
temp_data =  features.drop(['Geography', 'Gender'], axis=1)

Geography = pd.get_dummies(features .Geography).iloc[:,1:]
Gender = pd.get_dummies(features.Gender).iloc[:,1:]
```

```
final_feature_set = pd.concat([temp_data,Geography,Gender], axis=1)
```

```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(final_feature_set, labels, test_size = 0.25, random_state = 42)
```

ALGORITHM TRAINING AND TESTING

```
from xgboost import XGBClassifier
import xgboost as xgb
from xgboost import DMatrix
```

```
model = XGBClassifier(learning_rate =0.1, n_estimators=100 , random_state=42)
model.fit(X_train, y_train)
```

```
XGBClassifier
XGBClassifier(base_score=None, booster=None, callbacks=None,
              colsample_bylevel=None, colsample_bynode=None,
              colsample_bytree=None, device=None, early_stopping_rounds=None,
              enable_categorical=False, eval_metric=None, feature_types=None,
              gamma=None, grow_policy=None, importance_type=None,
              interaction_constraints=None, learning_rate=0.1, max_bin=None,
              max_cat_threshold=None, max_cat_to_onehot=None,
              max_delta_step=None, max_depth=None, max_leaves=None,
              min_child_weight=None, missing=nan, monotone_constraints=None,
              multi_strategy=None, n_estimators=100, n_jobs=None,
              num_parallel_tree=None, random_state=42, ...)
```

```
y_pred = model.predict(X_test)
```

```
print(classification_report(y_test,y_pred ))
print(accuracy_score(y_test, y_pred))
```

```
                   precision    recall  f1-score   support

               0       0.88      0.96      0.92      2003
               1       0.75      0.49      0.60       497

        accuracy                           0.87      2500
       macro avg       0.82      0.73      0.76      2500
    weighted avg       0.86      0.87      0.86      2500

    0.8672
```

FINDING THE BEST FEATURES

```
import numpy as np
feat_importances = pd.Series(model.feature_importances_, index=final_feature_set.columns)
colors=['lightcoral','lightgreen','lightsteelblue','cornflowerblue','teal']
feat_importances.nlargest(5).plot(kind='bar',color=colors)
```