Import Librarys

```
import numpy as np
import tensorflow as  tf
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

Import Data

```
data=pd.read_csv('/content/Churn_Modelling.csv')
data.head()
```

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	Esti
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	

Dropping unimportant features

```
data=data.drop(columns=['RowNumber','CustomerId','Surname'])
data.head()
```

	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	619	France	Female	42	2	0.00	1	1	1	101348.88	1
1	608	Spain	Female	41	1	83807.86	1	0	1	112542.58	0
2	502	France	Female	42	8	159660.80	3	1	0	113931.57	1
3	699	France	Female	39	1	0.00	2	0	0	93826.63	0
4	850	Spain	Female	43	2	125510.82	1	1	1	79084.10	0

One Hot Encoding

```
data['Gender']=data['Gender'].apply(lambda x :  0 if x=='Female' else 1)
data['Gender']=data['Gender'].astype(int)
data.head()
```

	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	619	France	0	42	2	0.00	1	1	1	101348.88	1
1	608	Spain	0	41	1	83807.86	1	0	1	112542.58	0
2	502	France	0	42	8	159660.80	3	1	0	113931.57	1
3	699	France	0	39	1	0.00	2	0	0	93826.63	0
4	850	Spain	0	43	2	125510.82	1	1	1	79084.10	0

```
from sklearn.preprocessing import LabelEncoder

label_encoder = LabelEncoder()
data['Geography']=label_encoder.fit_transform(data['Geography'])
data.head()
```

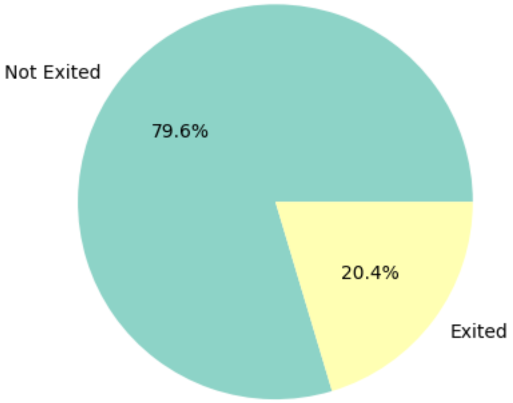
	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	619	0	0	42	2	0.00	1	1	1	101348.88	1
1	608	2	0	41	1	83807.86	1	0	1	112542.58	0
2	502	0	0	42	8	159660.80	3	1	0	113931.57	1
3	699	0	0	39	1	0.00	2	0	0	93826.63	0
4	850	2	0	43	2	125510.82	1	1	1	79084.10	0

Data Analysis

```
value_counts=data['Exited'].value_counts()
plt.pie(value_counts, labels=['Not Exited', 'Exited'], autopct='%1.1f%%', colors=sns.color_palette('Set3'))
```

```
value_counts
```

```
0    7963
1    2037
Name: Exited, dtype: int64
```



```
X=data.drop('Exited',axis=1)
y=data['Exited']
```

Balance Data

```
import numpy as np
from collections import Counter
from imblearn.over_sampling import RandomOverSampler

print("Class distribution before oversampling:", Counter(y))

ros = RandomOverSampler(random_state=42)

X, y = ros.fit_resample(X, y)

print("Class distribution after oversampling:", Counter(y))
```

```
Class distribution before oversampling: Counter({0: 7963, 1: 2037})
Class distribution after oversampling: Counter({1: 7963, 0: 7963})
```

Standardize Data

```
X=np.array(X)
X=(X-X.mean())/X.std()
```

Splitting data into train and test

```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(X,y,test_size=0.20,random_state=30)
```

model evaluation

```
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score, classification_report
```

```
# Random Forests
random_forest_model = RandomForestClassifier()
random_forest_model.fit(x_train, y_train)
random_forest_pred = random_forest_model.predict(x_test)

print("Random Forests:")
print("Accuracy:", accuracy_score(y_test, random_forest_pred))
print("Classification Report:\n", classification_report(y_test, random_forest_pred))
```

```
Random Forests:
Accuracy: 0.9516635279347144
Classification Report:
               precision    recall  f1-score   support

           0       0.98      0.92      0.95      1593
           1       0.93      0.98      0.95      1593

    accuracy                           0.95      3186
   macro avg       0.95      0.95      0.95      3186
weighted avg       0.95      0.95      0.95      3186
```