Bank Customer Churn Prediction

Initialization

Dependencies

In [1]:
```python
import pandas as pd
```

In [2]:
```python
data = pd.read_csv("Bank Customer Churn Prediction.csv")
```

In [3]:
```python
data.head()
```

Out[3]:

	customer_id	credit_score	country	gender	age	tenure	balance	products_number	credit_card
0	15634602	619	France	Female	42	2	0.00	1	1
1	15647311	608	Spain	Female	41	1	83807.86	1	0
2	15619304	502	France	Female	42	8	159660.80	3	1
3	15701354	699	France	Female	39	1	0.00	2	0
4	15737888	850	Spain	Female	43	2	125510.82	1	1

Data Info

In [4]:
```python
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 12 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   customer_id       10000 non-null  int64  
 1   credit_score      10000 non-null  int64  
 2   country           10000 non-null  object 
 3   gender            10000 non-null  object 
 4   age               10000 non-null  int64  
 5   tenure            10000 non-null  int64  
 6   balance           10000 non-null  float64
 7   products_number   10000 non-null  int64  
 8   credit_card       10000 non-null  int64  
 9   active_member     10000 non-null  int64  
 10  estimated_salary  10000 non-null  float64
 11  churn             10000 non-null  int64  
dtypes: float64(2), int64(8), object(2)
memory usage: 937.6+ KB
```

In [5]:
```python
data.describe()
```

Out[5]:

	customer_id	credit_score	age	tenure	balance	products_number	cre
count	1.000000e+04	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	100(
mean	1.569094e+07	650.528800	38.921800	5.012800	76485.889288	1.530200	
std	7.193619e+04	96.653299	10.487806	2.892174	62397.405202	0.581654	
min	1.556570e+07	350.000000	18.000000	0.000000	0.000000	1.000000	
25%	1.562853e+07	584.000000	32.000000	3.000000	0.000000	1.000000	
50%	1.569074e+07	652.000000	37.000000	5.000000	97198.540000	1.000000	
75%	1.575323e+07	718.000000	44.000000	7.000000	127644.240000	2.000000	
max	1.581569e+07	850.000000	92.000000	10.000000	250898.090000	4.000000	

Columns

In [6]:
```
data.columns
```

Out[6]:
```
Index(['customer_id', 'credit_score', 'country', 'gender', 'age', 'tenure',
       'balance', 'products_number', 'credit_card', 'active_member',
       'estimated_salary', 'churn'],
      dtype='object')
```

EDA

1. How many total countries are there

In [7]:
```
data['country'].unique()
```

Out[7]:
```
array(['France', 'Spain', 'Germany'], dtype=object)
```

2. Plot all the countries on a geographic graph

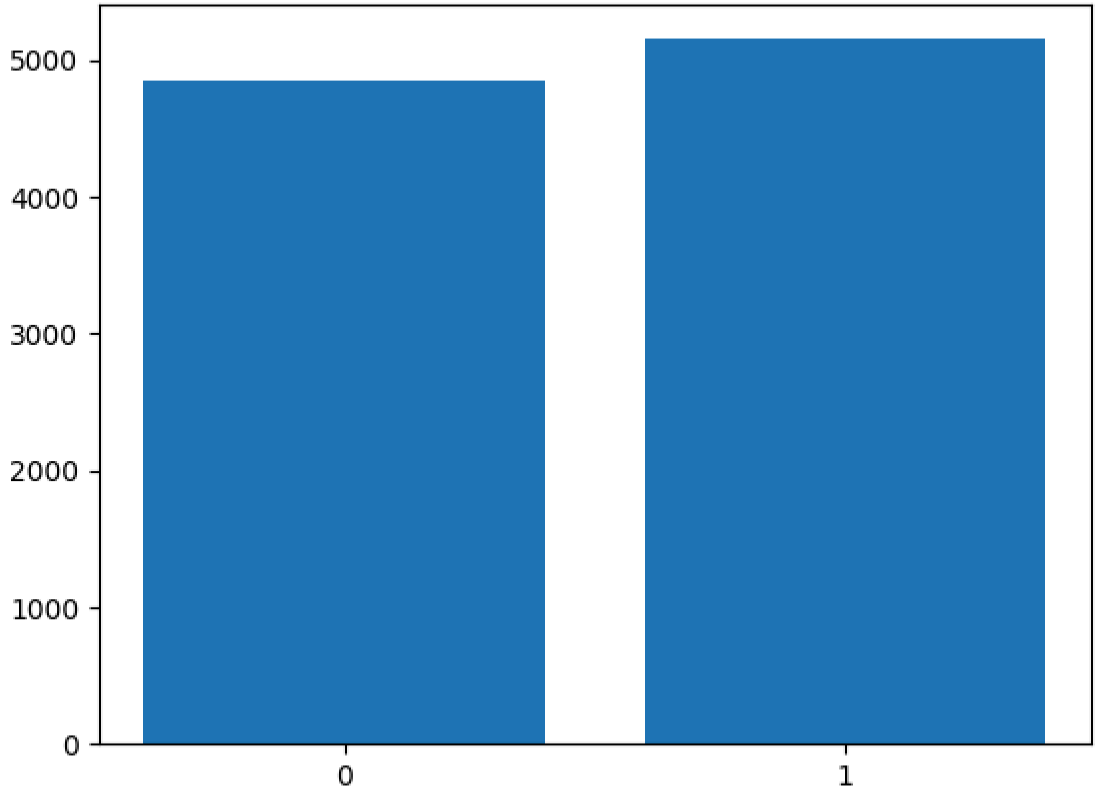
In [8]:
```
country = {'Country': data['country'].value_counts().index,
           'Value': data['country'].value_counts().values}
```

In [9]:
```
import plotly.express as px

fig = px.choropleth(country,
                    locations="Country",
                    locationmode="country names",
                    color="Value",
                    hover_name="Country",
                    title="Country Values on a World Map",)
fig.show()
```

3. How many accounts are active and how many are inactive

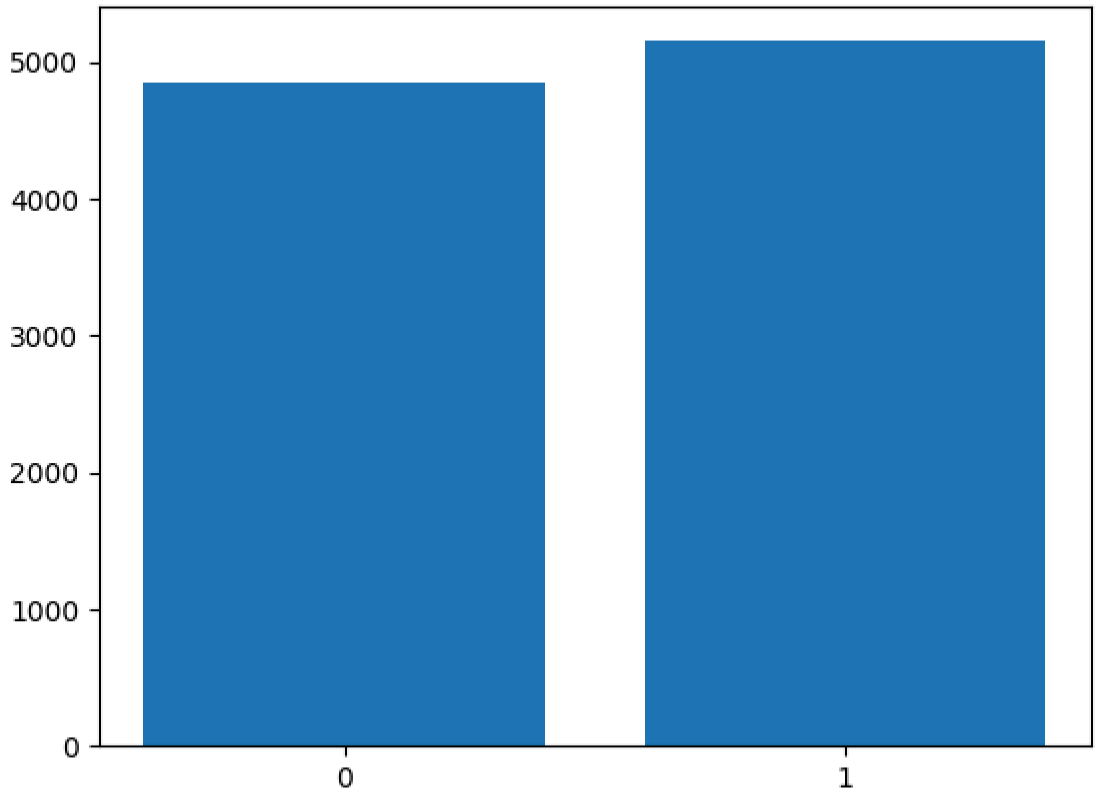
In [10]:
```
import matplotlib.pyplot as plt

activeMembers = data['active_member'].value_counts()

plt.xticks([0,1])
plt.bar(activeMembers.index,activeMembers.values)
```

```
plt.show()
```



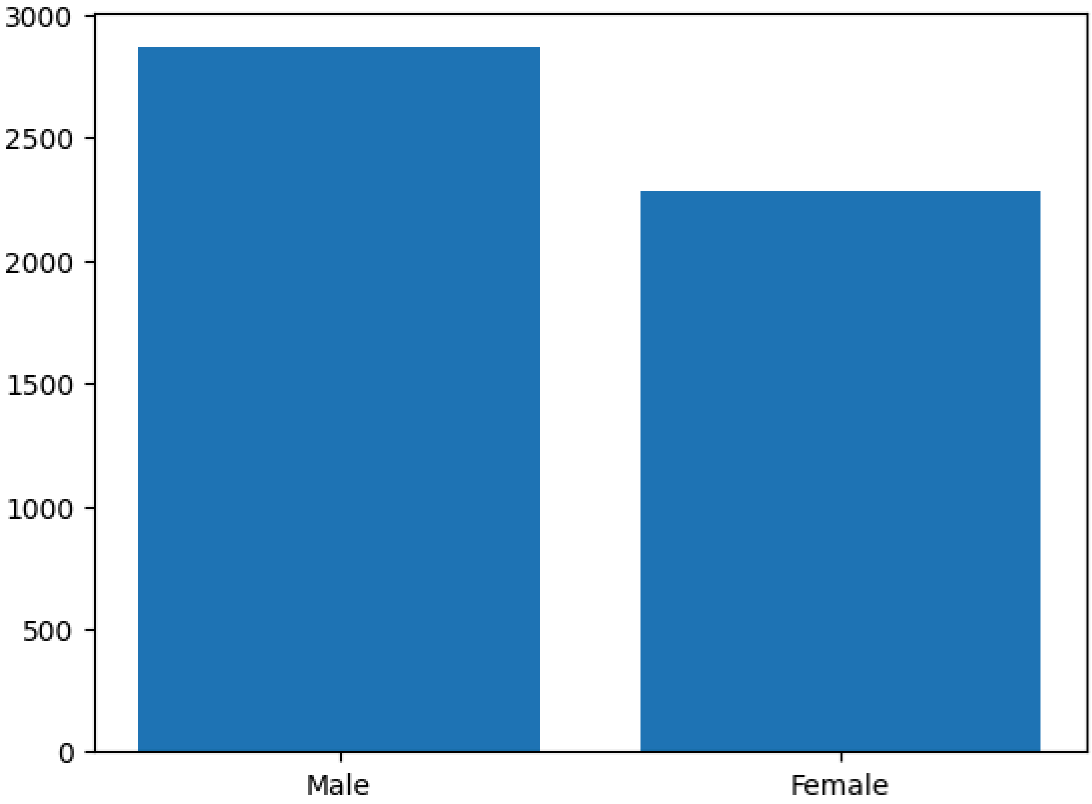
4. How many people does have credit and how many does not

In [11]:
```
activeCreditCards = data['active_member'].value_counts()

plt.xticks([0,1])
plt.bar(activeCreditCards.index,activeCreditCards.values)

plt.show()
```



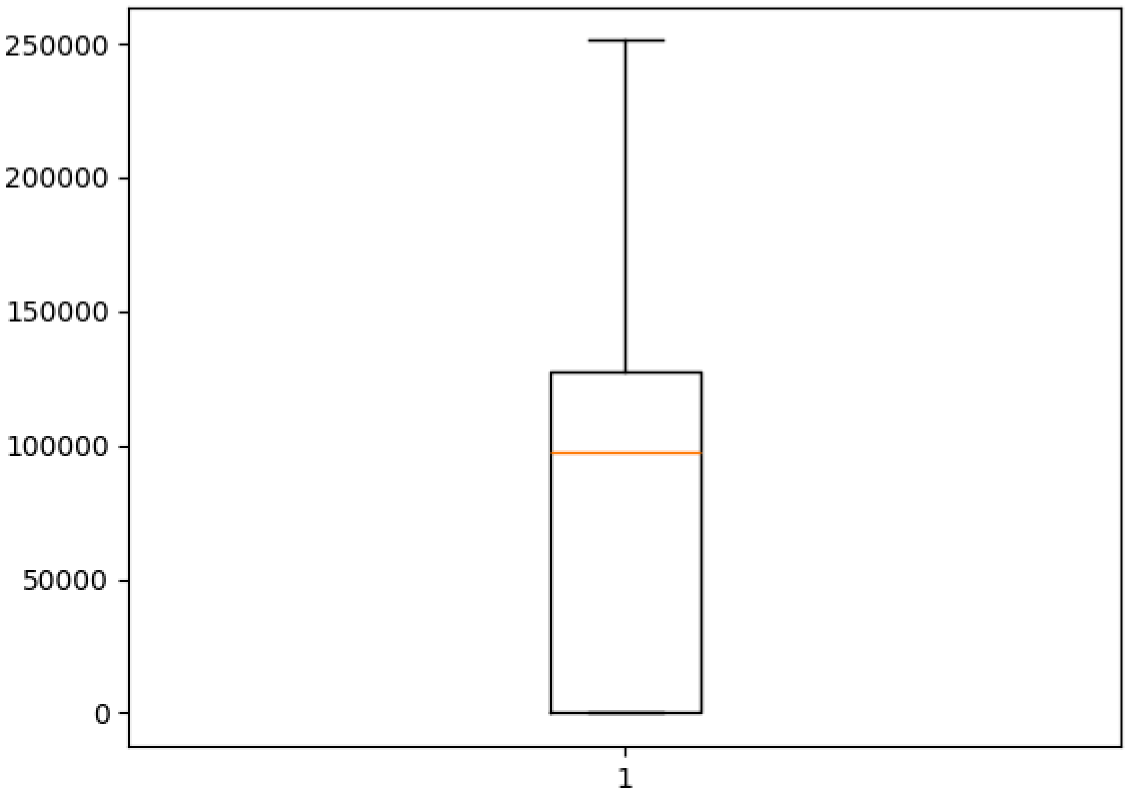
5. How many people are male and female with active accounts

In [12]:
```python
genderBasedData = data[data['active_member'] == 1]['gender'].value_counts()

plt.bar(genderBasedData.index,genderBasedData.values)
plt.show()
```

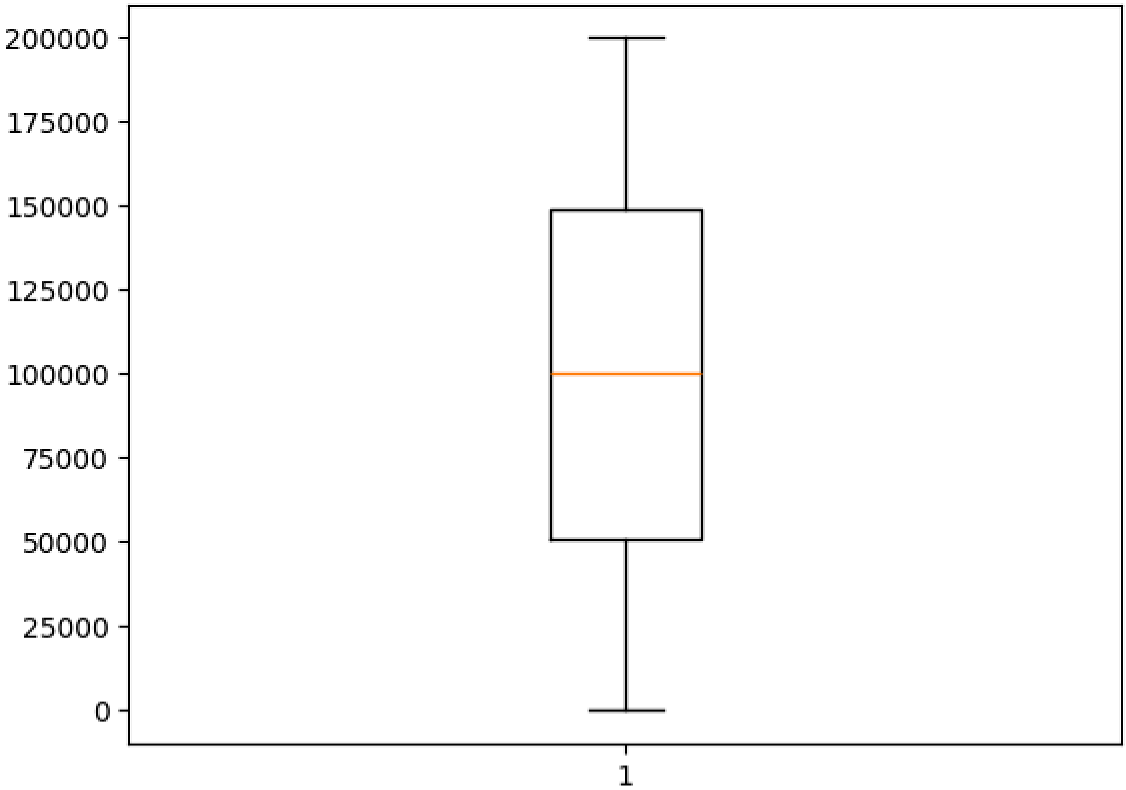


6. Make box plot for balance and estimated salary

In [13]:
```python
plt.boxplot(data['balance'])
plt.show()
```



In [14]:
```python
plt.boxplot(data['estimated_salary'])
plt.show()
```



It confirms that their are no outliers

Feature Engineering

1. Convert gender value into 0 and 1

In [15]:
```
data['gender'] = data['gender'].apply(lambda x: 1 if x == 'Male' else 0)
data.head()
```

Out[15]:

	customer_id	credit_score	country	gender	age	tenure	balance	products_number	credit_card
0	15634602	619	France	0	42	2	0.00	1	1
1	15647311	608	Spain	0	41	1	83807.86	1	0
2	15619304	502	France	0	42	8	159660.80	3	1
3	15701354	699	France	0	39	1	0.00	2	0
4	15737888	850	Spain	0	43	2	125510.82	1	1

2. Do feature engineering in country section

In [16]:
```
dummies = pd.get_dummies(data['country'],dtype=int)
combinedDf = data.join(dummies)
combinedDf.head()
```

Out[16]:

	customer_id	credit_score	country	gender	age	tenure	balance	products_number	credit_card
0	15634602	619	France	0	42	2	0.00	1	1
1	15647311	608	Spain	0	41	1	83807.86	1	0
2	15619304	502	France	0	42	8	159660.80	3	1
3	15701354	699	France	0	39	1	0.00	2	0
4	15737888	850	Spain	0	43	2	125510.82	1	1

Data Preprocessing

Train and test split

In [17]:
```
from sklearn.model_selection import train_test_split
columnsForPrediction = ['credit_score', 'gender', 'age', 'tenure', 'balance', 'products_numbe
X = combinedDf[columnsForPrediction]
y = combinedDf['churn']

X_train,X_test,y_train,y_test = train_test_split(X,y,random_state=35,shuffle=True)
```

Scaling

In [18]:
```
from sklearn.preprocessing import StandardScaler

scaler = StandardScaler()

scaled_data = scaler.fit_transform(X_train)
scaled_test_data = scaler.transform(X_test)

scaled_data = pd.DataFrame(scaled_data)
scaled_test_data = pd.DataFrame(scaled_test_data)
```

Model Training

In [32]:
```
from sklearn.metrics import accuracy_score, confusion_matrix
from sklearn.ensemble import RandomForestClassifier
```

In [33]:
```
classifier = RandomForestClassifier(random_state=42)
classifier.fit(X_train, y_train)
y_pred = classifier.predict(X_test)
```

In [34]:
```
accuracy = accuracy_score(y_test, y_pred)
print(f'Accuracy: {accuracy * 100:.2f}%')

conf_matrix = confusion_matrix(y_test, y_pred)
conf_matrix
```

```
Accuracy: 85.44%
```

Out[34]:
```
array([[1915,   79],
       [ 285,  221]])
```