Library Initialization

In [1]:

```
#Required Libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import LabelEncoder
from sklearn.preprocessing import MinMaxScaler
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
```

In [2]:

```
#Dataset path initialization
df=pd.read_csv('/content/Churn_Modelling.csv')
```

Dataset Summary

In [3]:

```
df.head()
```

Out[3]:

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

In [4]:

```
df.tail()
```

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Out[4]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
9995	9996	15606229	Obijiaku	771	France	Male	39	5	0.00	2	1	0	96270.64	0
9996	9997	15569892	Johnstone	516	France	Male	35	10	57369.61	1	1	1	101699.77	0
9997	9998	15584532	Liu	709	France	Female	36	7	0.00	1	0	1	42085.58	1
9998	9999	15682355	Sabbatini	772	Germany	Male	42	3	75075.31	2	1	0	92888.52	1
9999	10000	15628319	Walker	792	France	Female	28	4	130142.79	1	1	0	38190.78	0

In [5]:

```
df.info
```

Out[5]:

In [6]:

```
df.shape
```

Out[6]:

```
(10000, 14)
```

In [7]:

```
df.isnull().sum()
```

Out[7]:

```
RowNumber          0
CustomerId         0
Surname            0
CreditScore        0
Geography          0
Gender             0
Age                0
Tenure             0
Balance            0
NumOfProducts      0
HasCrCard          0
IsActiveMember     0
```

```
EstimatedSalary    0
Exited             0
dtype: int64
```

In [8]:

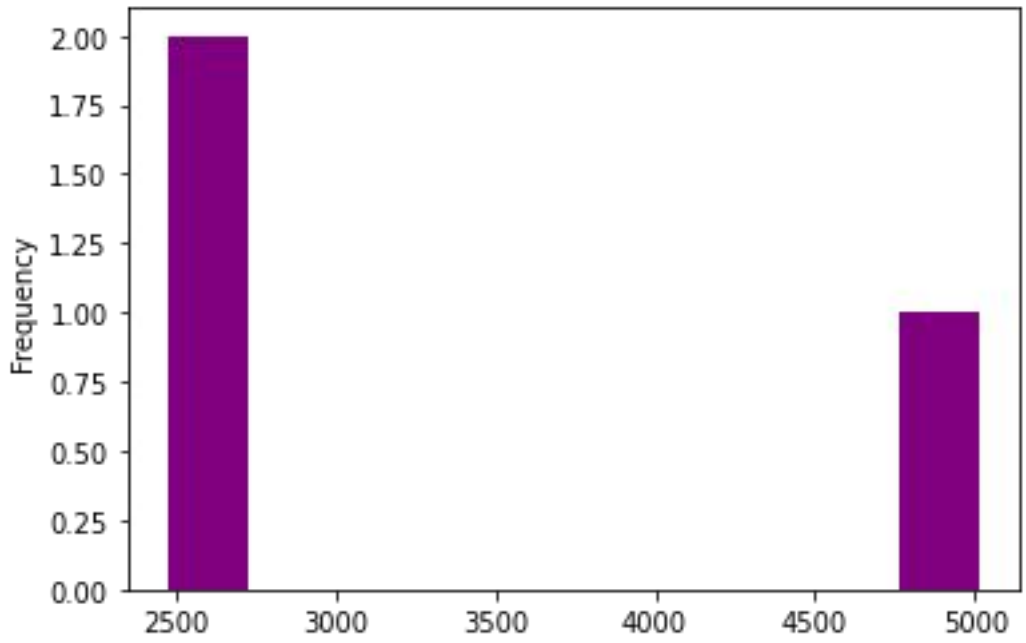
```
df.drop(['RowNumber','CustomerId','Surname'],axis=1, inplace=True)
```

In [13]:

```
#Data visualization
df.Geography.value_counts().plot(kind='hist',color="Purple")
df.Geography.value_counts()
```

Out[13]:

```
France     5014
Germany    2509
Spain      2477
Name: Geography, dtype: int64
```



In [14]:

```
df.Age.describe()
```

Out[14]:

```
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 [15]:

```
df.Age.plot(kind='bar',color="blue")
```

Out[15]:

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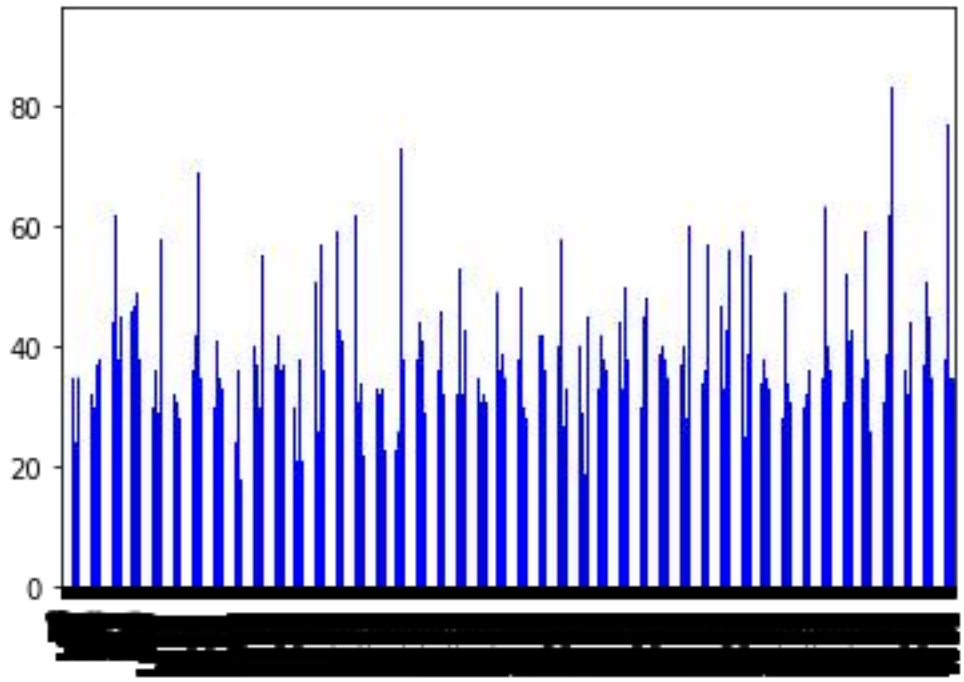
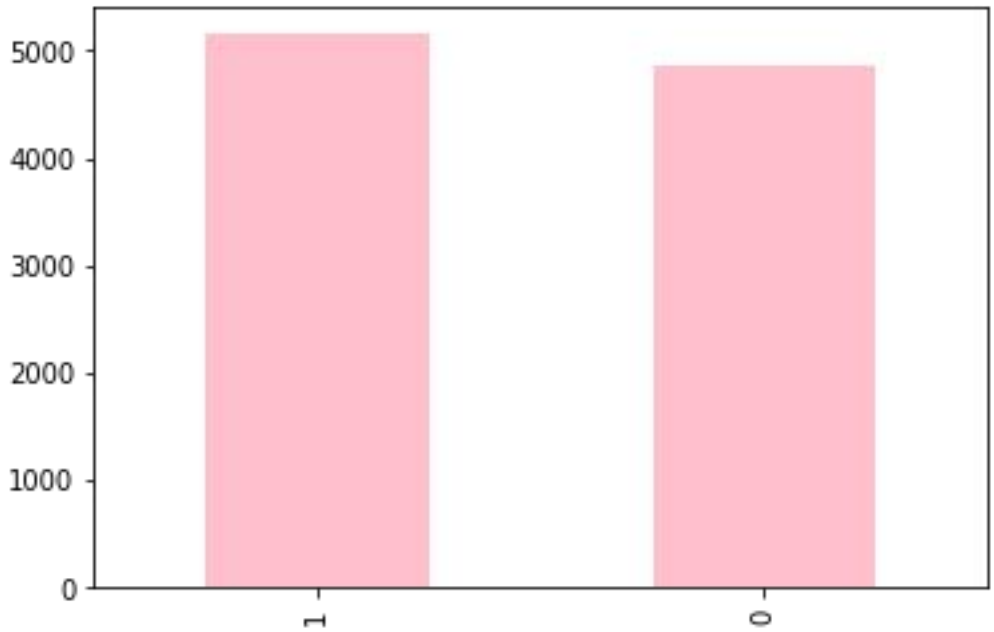


In [17]:

```
df.IsActiveMember.value_counts().plot(kind='bar',color="pink")
df.IsActiveMember.value_counts()
```

Out[17]:

```
1    5151
0    4849
Name: IsActiveMember, dtype: int64
```



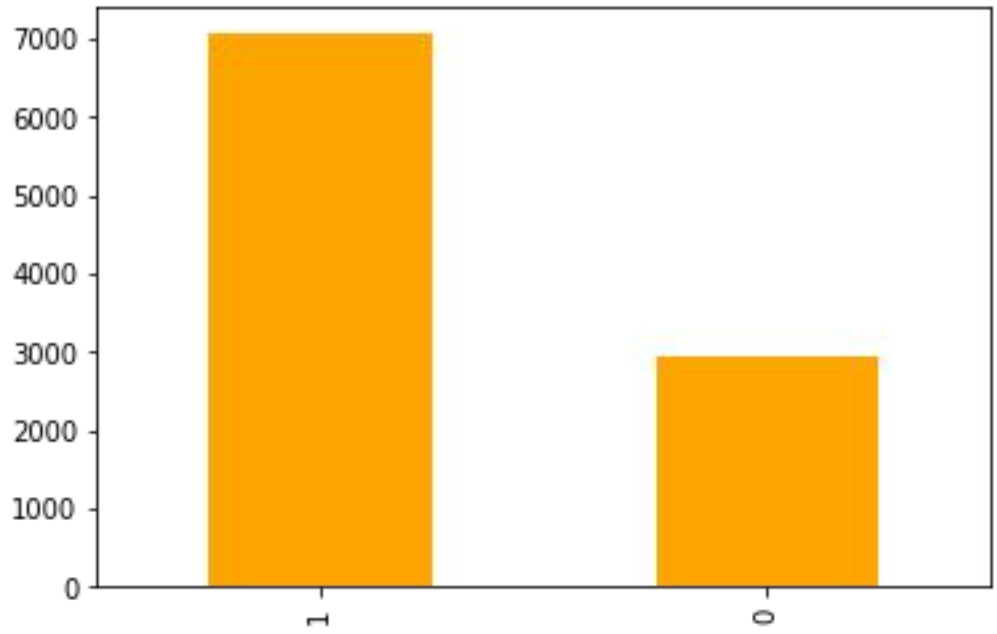
In [18]:

```
df.HasCrCard.value_counts().plot(kind='bar',color="Orange")
df.HasCrCard.value_counts()
```

Out[18]:

```
1    7055
0    2945
Name: HasCrCard, dtype: int64
```

ASSIGMENT 3



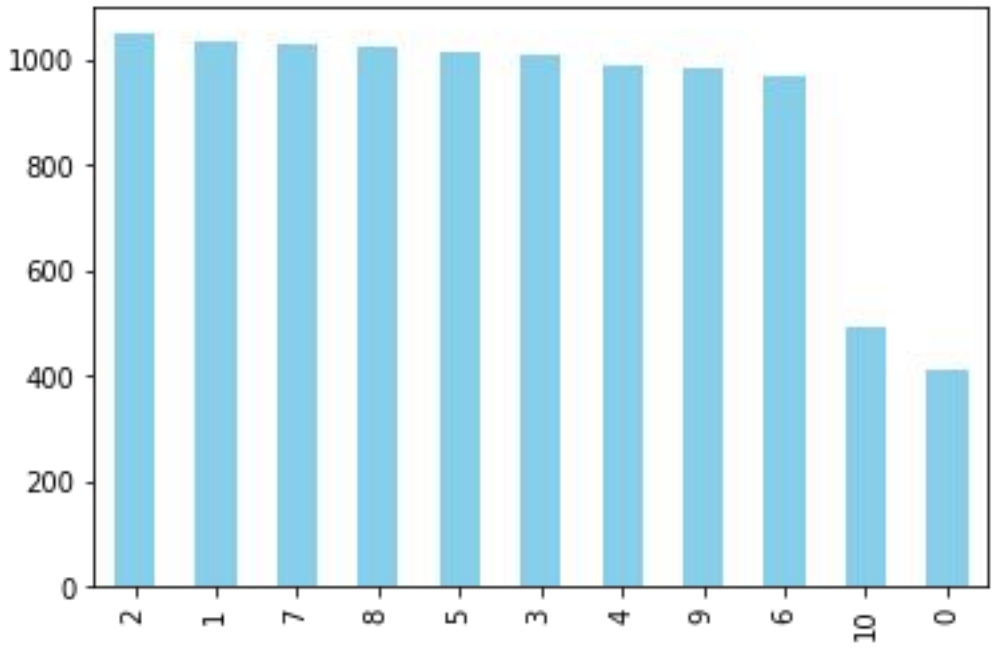
In [19]:

```
df.Tenure.value_counts().plot(kind='bar',color="SkyBlue");
df.Tenure.value_counts()
```

Out[19]:

```
2     1048
1     1035
7     1028
8     1025
5     1012
3     1009
4      989
9      984
6      967
10     490
0      413
Name: Tenure, dtype: int64
```

ASSIGMENT 3

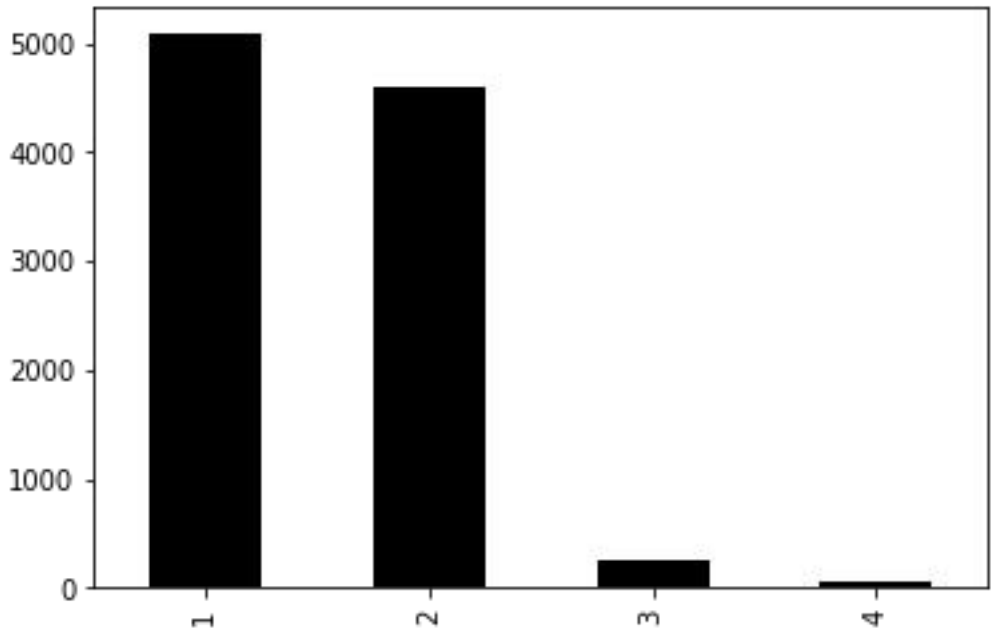


In [20]:

```
df.NumOfProducts.value_counts().plot(kind='bar',color="black");
df.NumOfProducts.value_counts()
```

Out[20]:

```
1    5084
2    4590
3     266
4      60
Name: NumOfProducts, dtype: int64
```



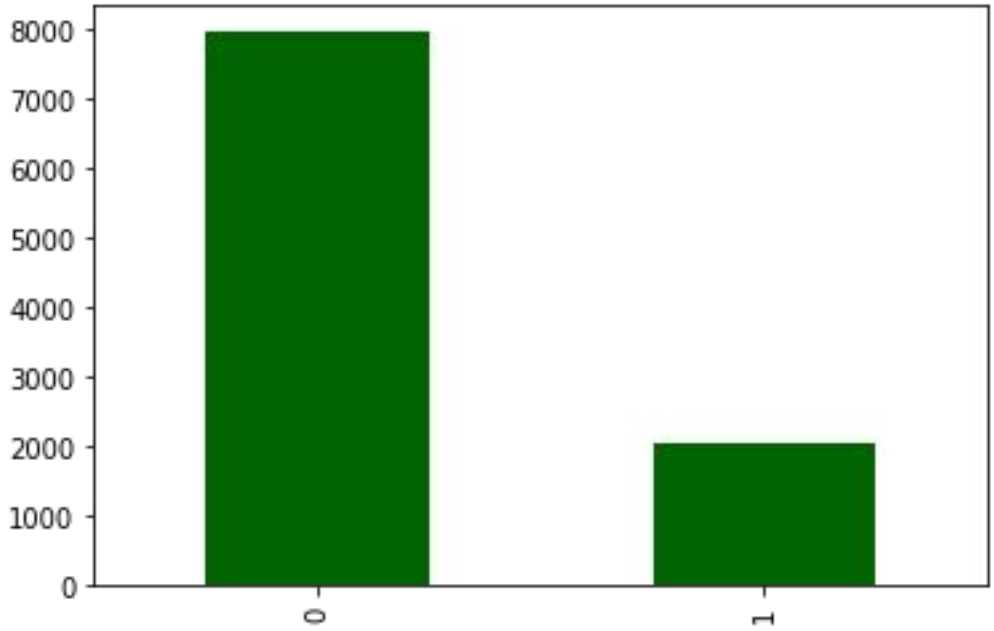
In [21]:

```
df.Exited.value_counts().plot(kind='bar',color="darkgreen");
df.Exited.value_counts()
```

Out[21]:

```
0    7963
1    2037
```

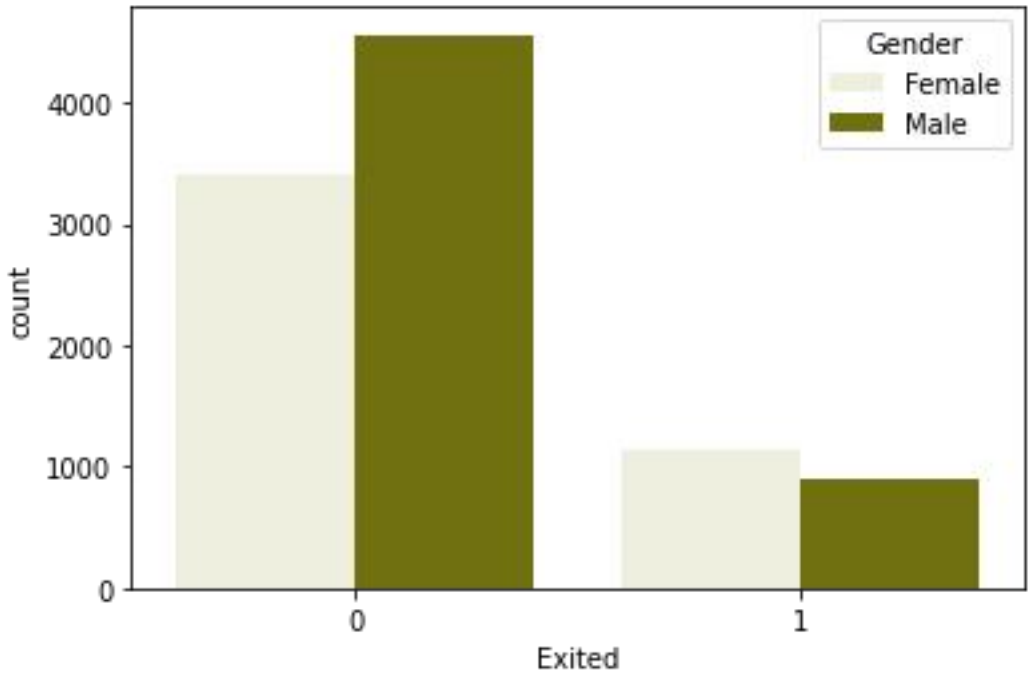
```
Name: Exited, dtype: int64
```



In [23]:

```
sns.countplot(x=df.Exited,hue=df.Gender,color="Olive")
```

Out[23]:

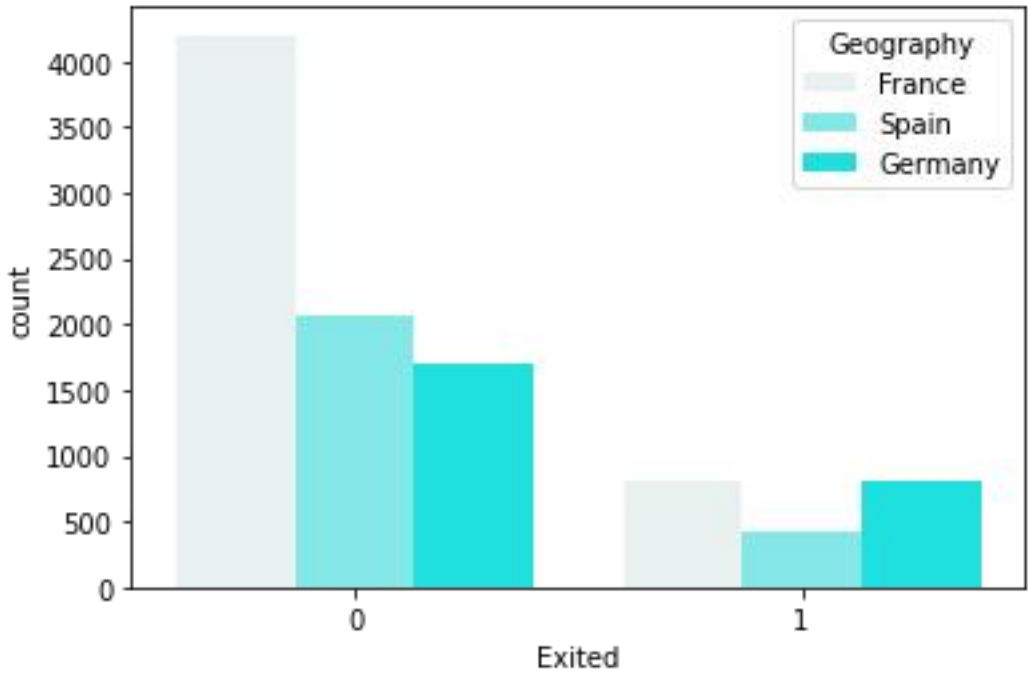


In [24]:

```
sns.countplot(x=df.Exited,hue=df.Geography,color="cyan")
```

Out[24]:

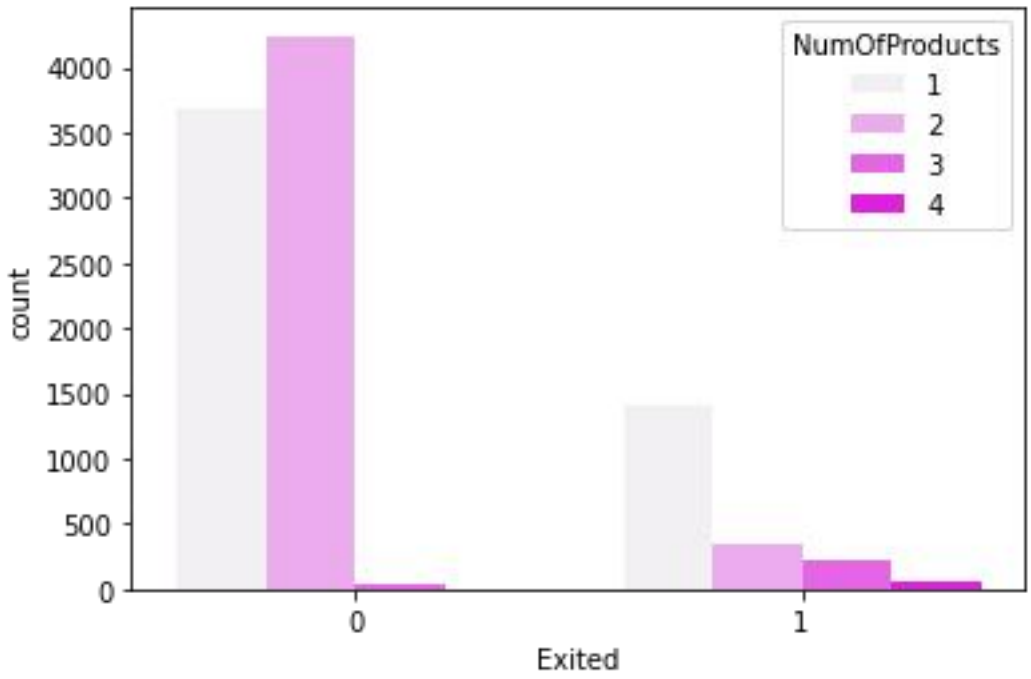
ASSIGMENT 3



In [30]:

```
sns.countplot(x=df.Exited,hue=df.NumOfProducts,color="fuchsia")
```

Out[30]:

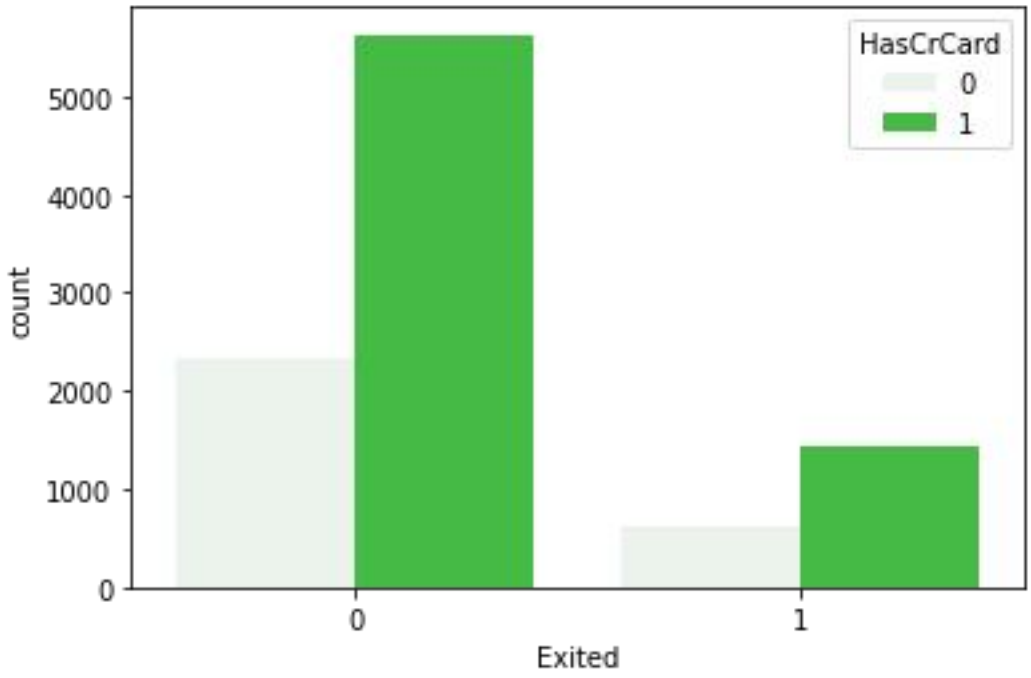


In [32]:

```
sns.countplot(x=df.Exited,hue=df.HasCrCard,color="limegreen")
```

Out[32]:

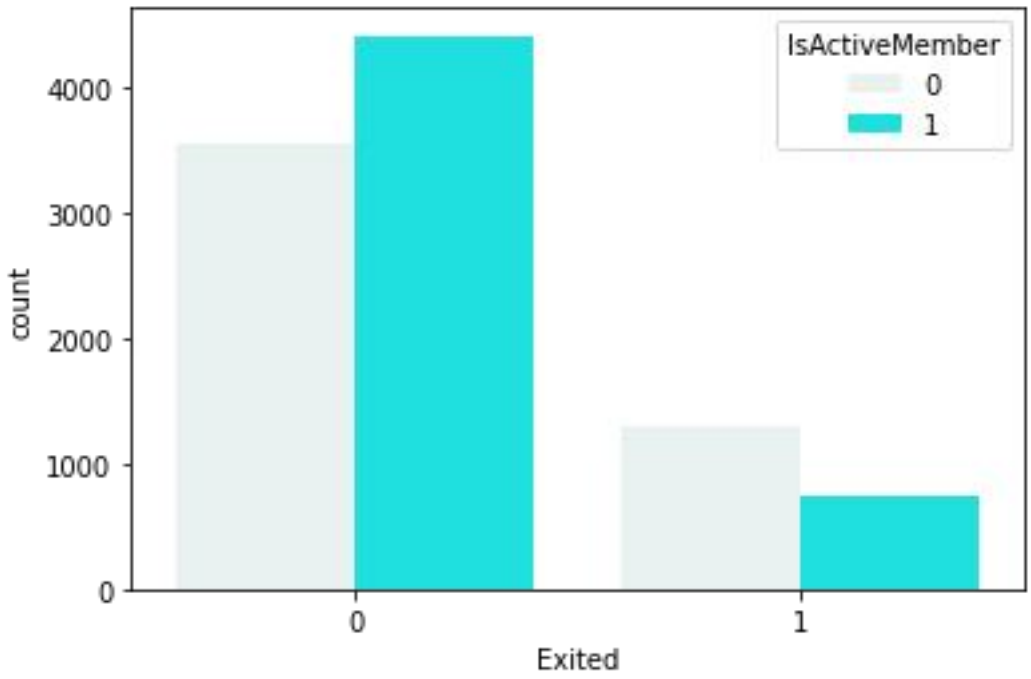
ASSIGMENT 3



In [33]:

```
sns.countplot(x=df.Exited,hue=df.IsActiveMember,color="aqua")
```

Out[33]:

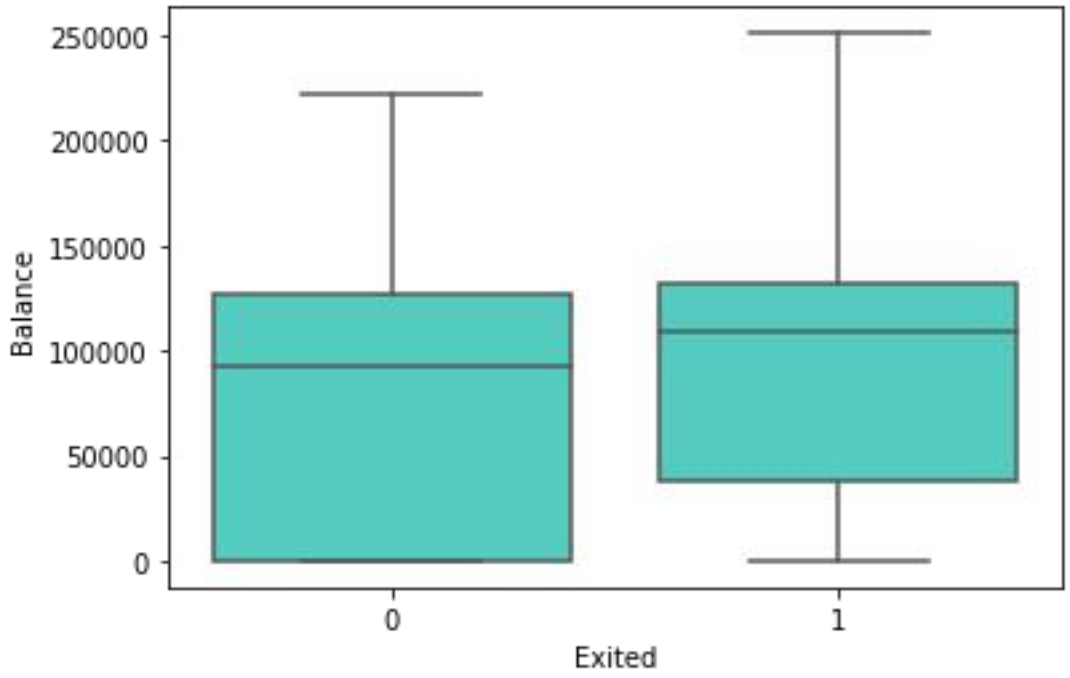


In [36]:

```
sns.boxplot(x=df.Exited,y=df.Balance,color="turquoise")
```

Out[36]:

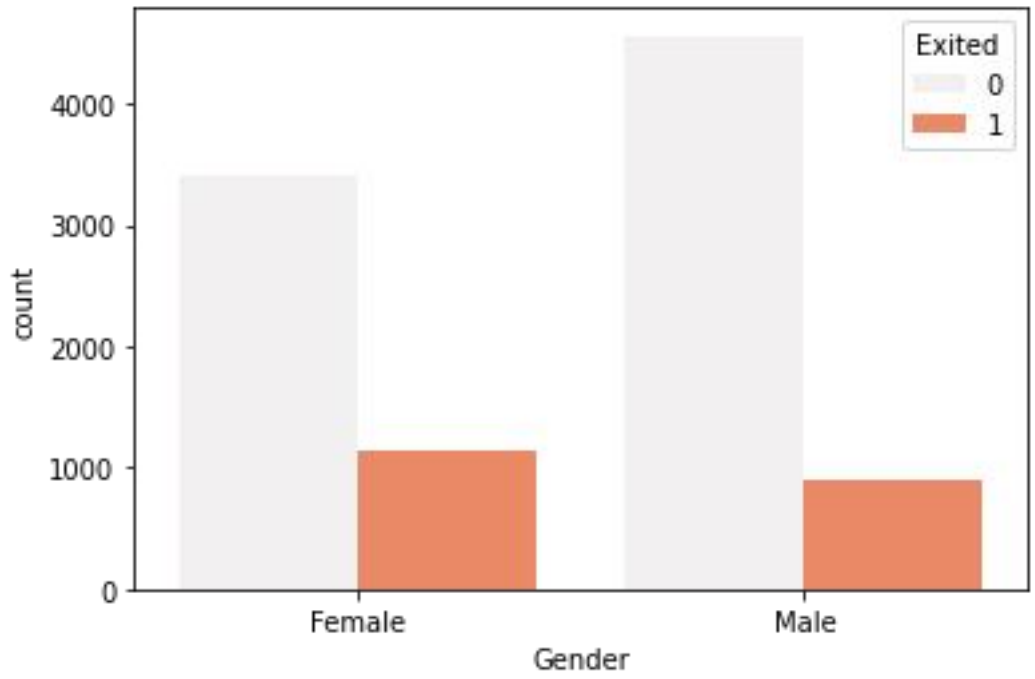
ASSIGMENT 3



In [37]:

```
sns.countplot(x="Gender",hue="Exited",data=df,color="coral")
```

Out[37]:



In [38]:

```
df['Geography']=df['Geography'].map({'France':0,'Spain':1,'Germany':2})
```

In [39]:

```
X=df.iloc[:,:-1].values
y=df.iloc[:,-1].values
```

In [40]:

```
X.shape
```

Out[40]:

```
(10000, 10)
```

In [41]:

```
#Feature Scaling of Data Set
le=LabelEncoder()
X[:,2]=le.fit_transform(X[:,2])
```

In [42]:

```
print(X)
```

```
[[619 0 0 ... 1 1 101348.88]
 [608 1 0 ... 0 1 112542.58]
 [502 0 0 ... 1 0 113931.57]
 ...
 [709 0 0 ... 0 1 42085.58]
 [772 2 1 ... 1 0 92888.52]
 [792 0 0 ... 1 0 38190.78]]
```

In [43]:

```
scalerx = MinMaxScaler()
```

In [44]:

```
X = scalerx.fit_transform(X)
```

In [45]:

```
X_train, X_test, y_train, y_test =train_test_split(X,y,test_size=0.2,
random_state=0)
```

In [46]:

```
stdscaler = StandardScaler()
X_train = stdscaler.fit_transform(X_train)
X_test = stdscaler.transform(X_test)
```