Library Initialization

In [3]:

```
#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 [4]:

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

Dataset Summary

In [5]:

```
df.head()
```

Out[5]:

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

In [6]:

```
df.tail()
```

Out[6]:

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

In [7]:

```
df.info
```

Out[7]:

```
<bound method DataFrame.info of       RowNumber  CustomerId    Surname  CreditScore Geogr
aphy  Gender  Age  \
0             1    15634602   Hargrave          619     France  Female   42
```

```
1              2    15647311       Hill          608     Spain  Female   41
2              3    15619304       Onio          502    France  Female   42
3              4    15701354       Boni          699    France  Female   39
4              5    15737888   Mitchell          850     Spain  Female   43
...          ...         ...        ...          ...       ...     ...  ...
9995        9996    15606229   Obijiaku          771    France    Male   39
9996        9997    15569892  Johnstone          516    France    Male   35
9997        9998    15584532        Liu          709    France  Female   36
9998        9999    15682355  Sabbatini          772   Germany    Male   42
9999       10000    15628319     Walker          792    France  Female   28

      Tenure    Balance  NumOfProducts  HasCrCard  IsActiveMember  \
0          2       0.00              1          1               1
1          1   83807.86              1          0               1
2          8  159660.80              3          1               0
3          1       0.00              2          0               0
4          2  125510.82              1          1               1
...      ...        ...            ...        ...             ...
9995       5       0.00              2          1               0
9996      10   57369.61              1          1               1
9997       7       0.00              1          0               1
9998       3   75075.31              2          1               0
9999       4  130142.79              1          1               0

      EstimatedSalary  Exited
0           101348.88       1
1           112542.58       0
2           113931.57       1
3            93826.63       0
4            79084.10       0
...               ...     ...
9995         96270.64       0
9996        101699.77       0
9997         42085.58       1
9998         92888.52       1
9999         38190.78       0

[10000 rows x 14 columns]>
```

In [8]:

```
df.shape
```

Out[8]:

```
(10000, 14)
```

In [9]:

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

Out[9]:

```
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 [10]:

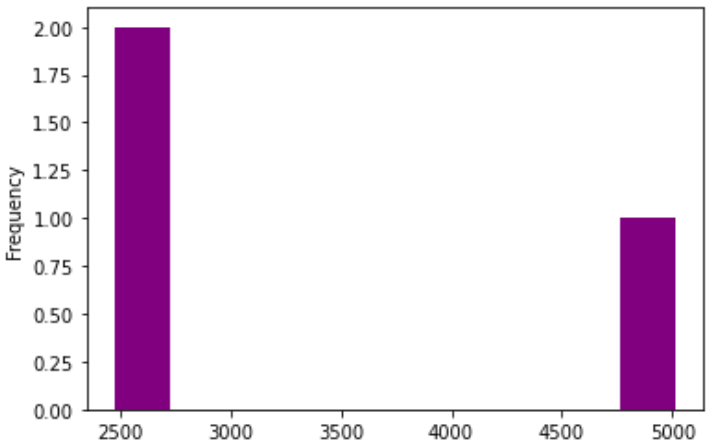
```
df.drop(['RowNumber','CustomerId','Surname'],axis=1, inplace=True)
```

In [11]:

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

Out[11]:

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



In [12]:

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

Out[12]:

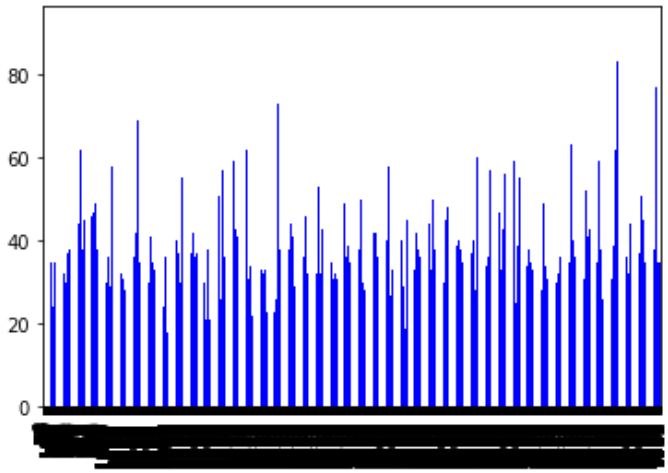
```
count    10000.000000
mean        38.921800
std         10.487806
min         18.000000
25%         32.000000
50%         37.000000
75%         44.000000
max         92.000000
Name: Age, dtype: float64
```

In [13]:

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

Out[13]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f30318d8e50>
```



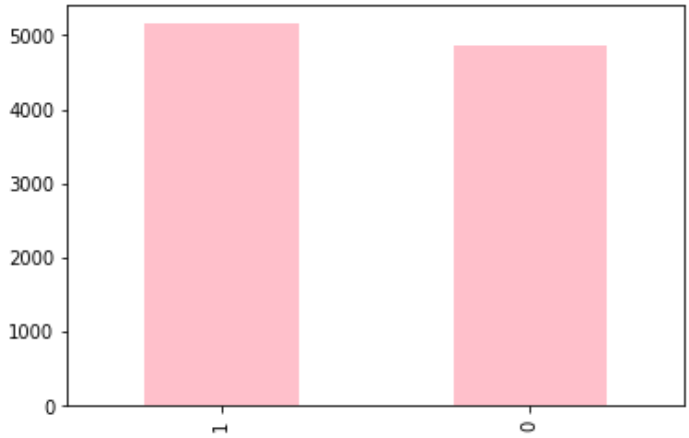
In [14]:

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

```
df.IsActiveMember.value_counts()
```

Out[14]:

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

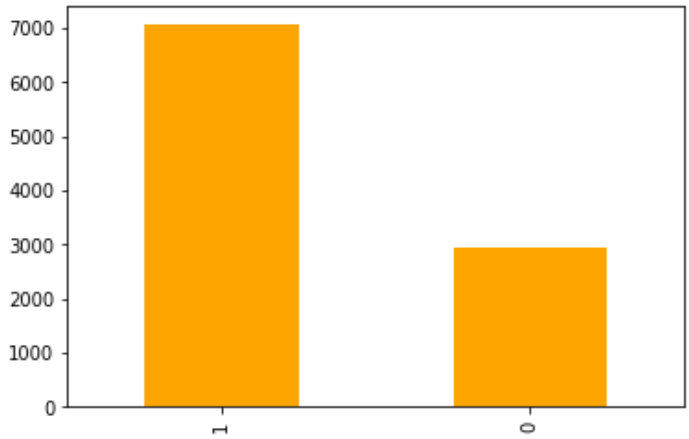


In [15]:

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

Out[15]:

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

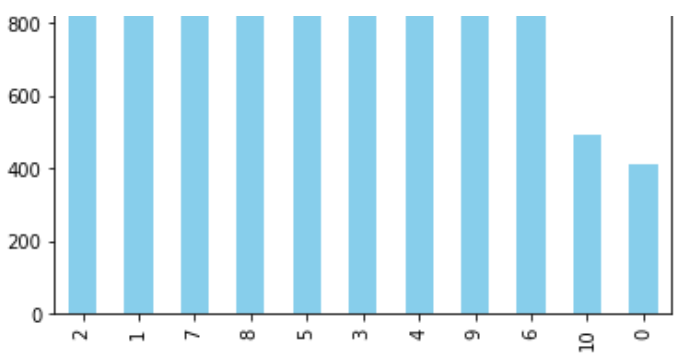


In [16]:

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

Out[16]:

```
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
```

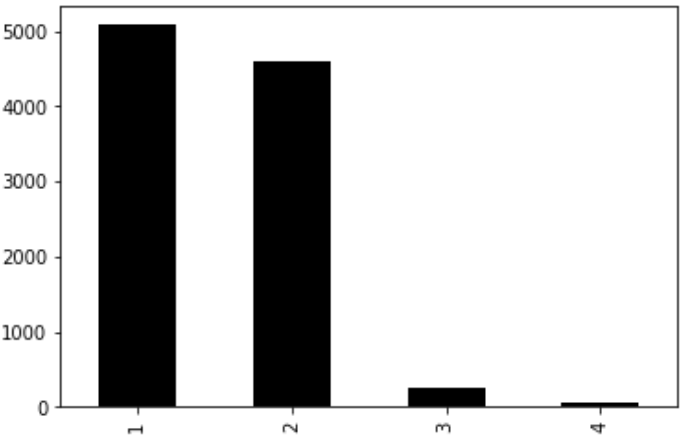


In [17]:

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

Out[17]:

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

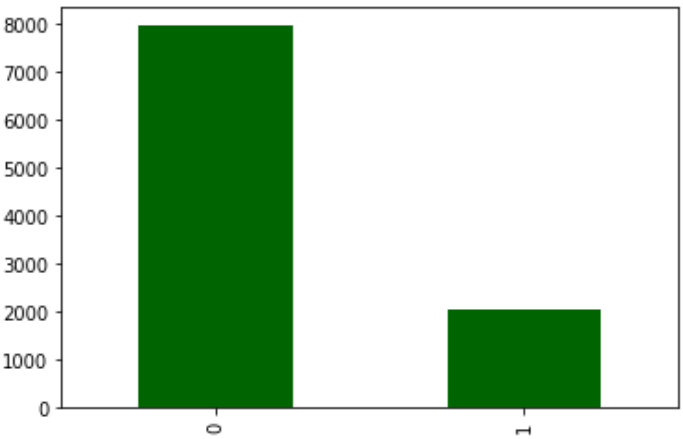


In [18]:

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

Out[18]:

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

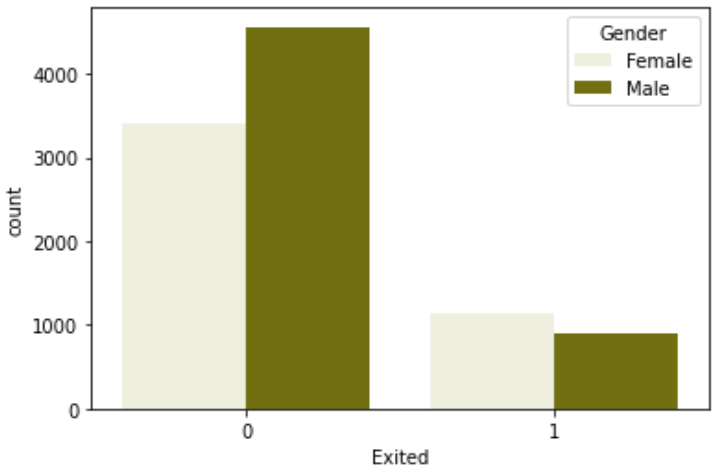


In [19]:

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

Out[19]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f3024224210>
```

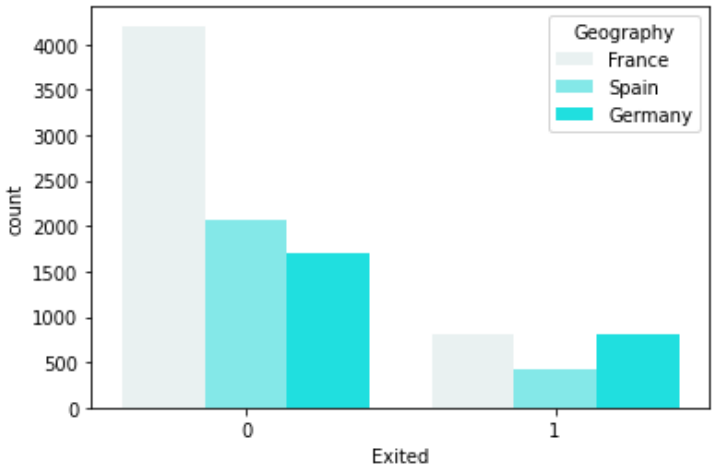


In [20]:

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

Out[20]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f302a367410>
```

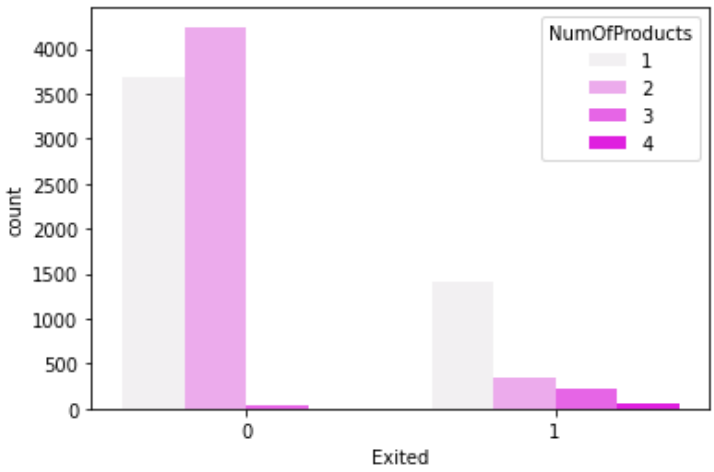


In [21]:

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

Out[21]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f3030dfa9d0>
```

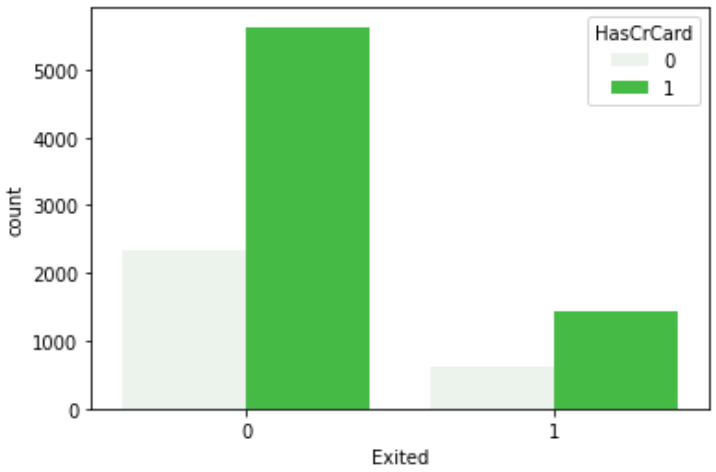


In [22]:

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

Out[22]:

<matplotlib.axes._subplots.AxesSubplot at 0x7f3030772610>

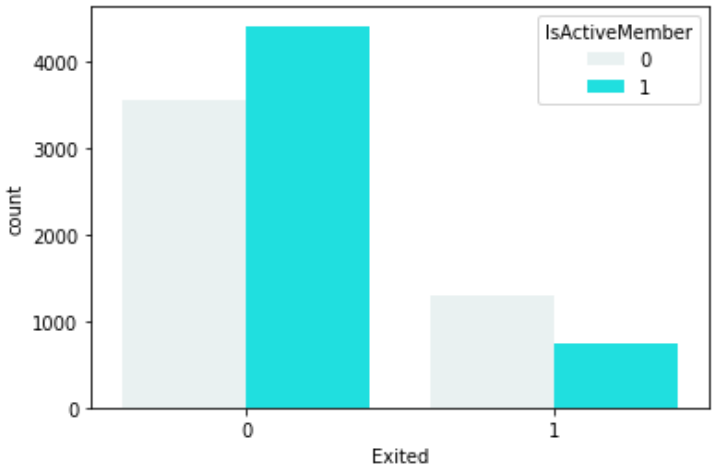


In [23]:

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

Out[23]:

<matplotlib.axes._subplots.AxesSubplot at 0x7f30225f2c50>

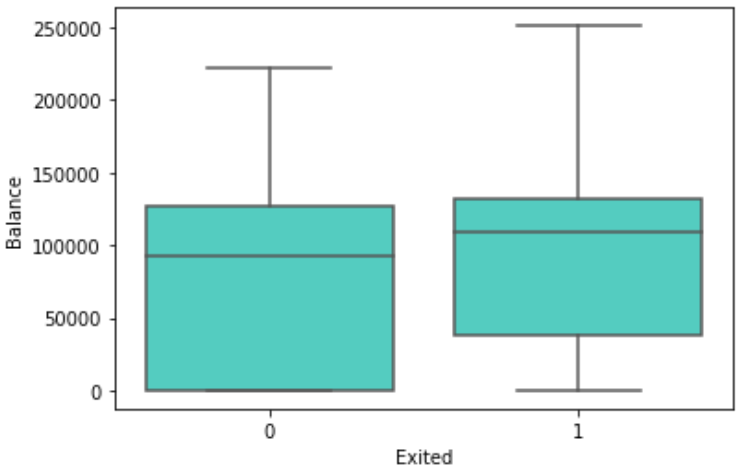


In [24]:

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

Out[24]:

<matplotlib.axes._subplots.AxesSubplot at 0x7f30226f0450>

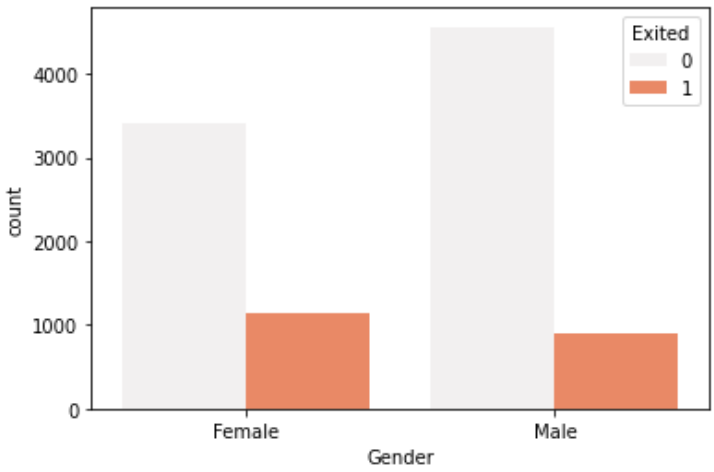


In [25]:

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

Out[25]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f30226e43d0>
```



In [26]:

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

In [27]:

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

In [28]:

```
X.shape
```

Out[28]:

```
(10000, 10)
```

In [29]:

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

In [30]:

```
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 [31]:

```
scalerx = MinMaxScaler()
```

In [32]:

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

In [33]:

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

In [34]:

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