Code Way Internship Task 3

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Task Name :- Develop a model to predict customer churn

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

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

```
df.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

Next steps: Generate code with df View recommended plots

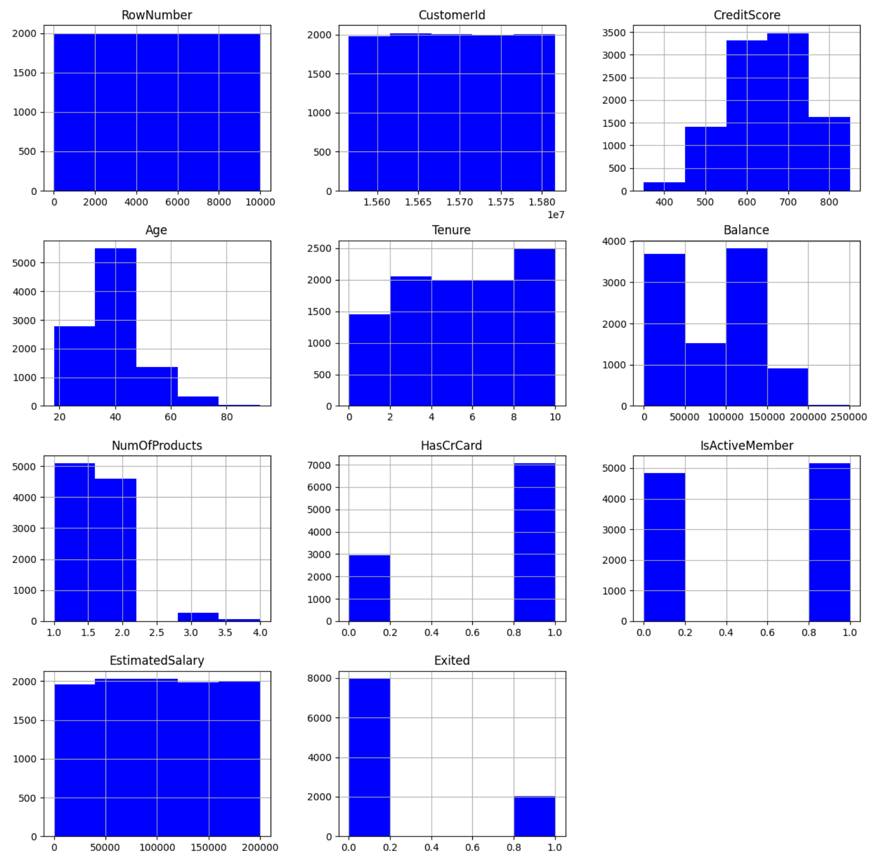
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 14 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   RowNumber        10000 non-null  int64  
 1   CustomerId       10000 non-null  int64  
 2   Surname          10000 non-null  object 
 3   CreditScore      10000 non-null  int64  
 4   Geography        10000 non-null  object 
 5   Gender           10000 non-null  object 
 6   Age              10000 non-null  int64  
 7   Tenure           10000 non-null  int64  
 8   Balance          10000 non-null  float64
 9   NumOfProducts    10000 non-null  int64  
 10  HasCrCard        10000 non-null  int64  
 11  IsActiveMember   10000 non-null  int64  
 12  EstimatedSalary  10000 non-null  float64
 13  Exited           10000 non-null  int64  
dtypes: float64(2), int64(9), object(3)
memory usage: 1.1+ MB
```

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

```
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
```

```
df.hist(bins=5,figsize=(15,15), color='blue')
plt.show()
```



```
df.columns
```

```
     Index(['RowNumber', 'CustomerId', 'Surname', 'CreditScore', 'Geography',
            'Gender', 'Age', 'Tenure', 'Balance', 'NumOfProducts', 'HasCrCard',
            'IsActiveMember', 'EstimatedSalary', 'Exited'],
           dtype='object')
```

```
df.head()
```

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Bal
0	1	15634602	Hargrave	619	France	Female	42	2	
1	2	15647311	Hill	608	Spain	Female	41	1	838
2	3	15619304	Onio	502	France	Female	42	8	1596
3	4	15701354	Boni	699	France	Female	39	1	
4	5	15737888	Mitchell	850	Spain	Female	43	2	12551

Next steps: Generate code with df View recommended plots

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

```
df.head()
```

	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	I
0	619	France	Female	42	2	0.00	1	1	
1	608	Spain	Female	41	1	83807.86	1	0	
2	502	France	Female	42	8	159660.80	3	1	
3	699	France	Female	39	1	0.00	2	0	
4	850	Spain	Female	43	2	125510.82	1	1	

Next steps: Generate code with df View recommended plots

```
from sklearn.preprocessing import LabelEncoder
lr=LabelEncoder()
df['Geography']=lr.fit_transform(df['Geography'])
df['Gender']=lr.fit_transform(df['Gender'])
```

```
df.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

Next steps: Generate code with df View recommended plots

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 11 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   CreditScore      10000 non-null  int64  
 1   Geography        10000 non-null  int64  
 2   Gender           10000 non-null  int64  
 3   Age              10000 non-null  int64  
 4   Tenure           10000 non-null  int64  
 5   Balance          10000 non-null  float64
 6   NumOfProducts    10000 non-null  int64  
 7   HasCrCard        10000 non-null  int64  
 8   IsActiveMember   10000 non-null  int64  
 9   EstimatedSalary  10000 non-null  float64
 10  Exited           10000 non-null  int64  
dtypes: float64(2), int64(9)
memory usage: 859.5 KB
```

```
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score, classification_report,confusion_matrix
```

```
x = df.drop('Exited', axis=1)
y = df['Exited']
```

```
x.head()
```

	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	I
0	619	0	0	42	2	0.00	1	1	
1	608	2	0	41	1	83807.86	1	0	
2	502	0	0	42	8	159660.80	3	1	
3	699	0	0	39	1	0.00	2	0	
4	850	2	0	43	2	125510.82	1	1	

Next steps: Generate code with x View recommended plots

```
y.head()
```

```
0    1
1    0
2    1
3    0
4    0
Name: Exited, dtype: int64
```

```
x_train, x_test, y_train, y_test = train_test_split(x,y, test_size=0.2,random_state=123)
print('x_train', x_train.shape)
print('x_test', x_test.shape)
print('y_train', y_train.shape)
print('y_test', y_test.shape)
```

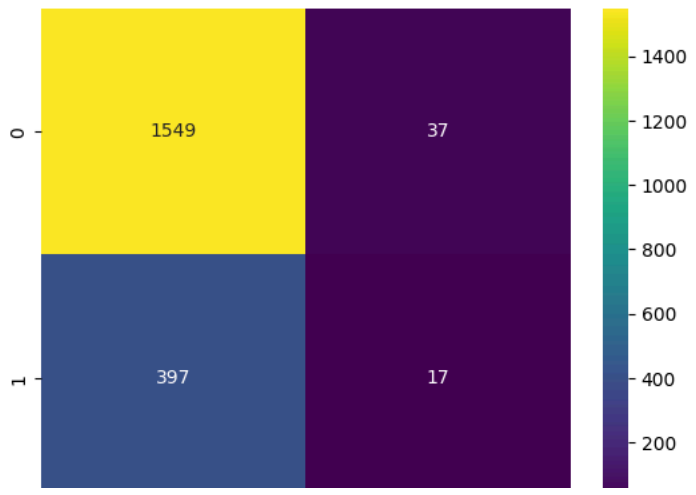
```
x_train (8000, 10)
x_test (2000, 10)
y_train (8000,)
y_test (2000,)
```

```
lr= LogisticRegression()
lr.fit(x_train,y_train)
y_pred = lr.predict(x_test)
accuracy = accuracy_score(y_test,y_pred)
class_report = classification_report(y_test,y_pred)
conf_matrix = confusion_matrix(y_test,y_pred)
```

```
print(f'The accuracy score of churn prediction is : {accuracy : .2f}%\n ')
print(f'The classification report of churn prediction is \n: {class_report}')
print(f'The confusion matrix of churn prediction is:\n{conf_matrix}')
```

```
The accuracy score of churn prediction is :  0.78%

The classification report of churn prediction is
:               precision    recall  f1-score   support

           0       0.80      0.98      0.88      1586
           1       0.31      0.04      0.07       414

    accuracy                           0.78      2000
   macro avg       0.56      0.51      0.47      2000
weighted avg       0.70      0.78      0.71      2000

The confusion matrix of churn prediction is:
[[1549   37]
 [ 397   17]]
```

```
sns.heatmap(conf_matrix, annot=True, cmap='viridis', fmt='g')
plt.show()
```



0
1
1549
37
397
17
1400
1200
1000
800
600
400
200