Assignment -2

Assignment Date	17 September 2022
Team ID	PNT2022TMID38853
Project Name	Virtual Eye-lifeguard for swimming pools to detect active drowning
Student Name	Meera Vishalini K
Student Roll Number	421219104009
Maximum Marks	2 Marks

IMPORT LIBRARIES

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

LOADING THE DATASET

df = pd.read_csv('Churn_Modelling.csv', encoding='latin-1') df

RowNumber CustomerId Surname CreditScore Geography 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]

VISUALIZATIONS

```
#visualization of categorical features  fig, ax = plt.subplots(3, 2,
figsize = (15, 12)) plt.title("Visualization")
sns.countplot('Geography', hue = 'Exited', data = df, ax = ax[0] [0],palette='spring')
sns.countplot('Gender', hue = 'Exited', data = df, ax = ax[0] [1],palette='spring')
sns.countplot('Tenure', hue = 'Exited', data = df, ax = ax[1] [0],palette='spring')
sns.countplot('NumOfProducts', hue = 'Exited', data = df, ax = ax[1] [1],palette='spring')
sns.countplot('HasCrCard', hue = 'Exited', data = df, ax = ax[2] [0],palette='spring')
sns.countplot('IsActiveMember', hue = 'Exited', data = df, ax = ax[2] [1],palette='spring')

ax[0][0].set_title('Count Plot of Geography',color='red',fontsize=15) ax[0][1].set_title('Count Plot of Gender',color='red',fontsize=15) ax[1][0].set_title('Count Plot of Tenure',color='red',fontsize=15) ax[1][1].set_title('Count Plot of NumOfProducts',color='red',fontsize=15) ax[2][0].set_title('Count Plot of HasCrCard',color='red',fontsize=15) ax[2][1].set_title('Count Plot of IsActiveMember',color='red',fontsize=15)

plt.tight_layout() plt.show()
```

/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation. FutureWarning
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation. FutureWarning
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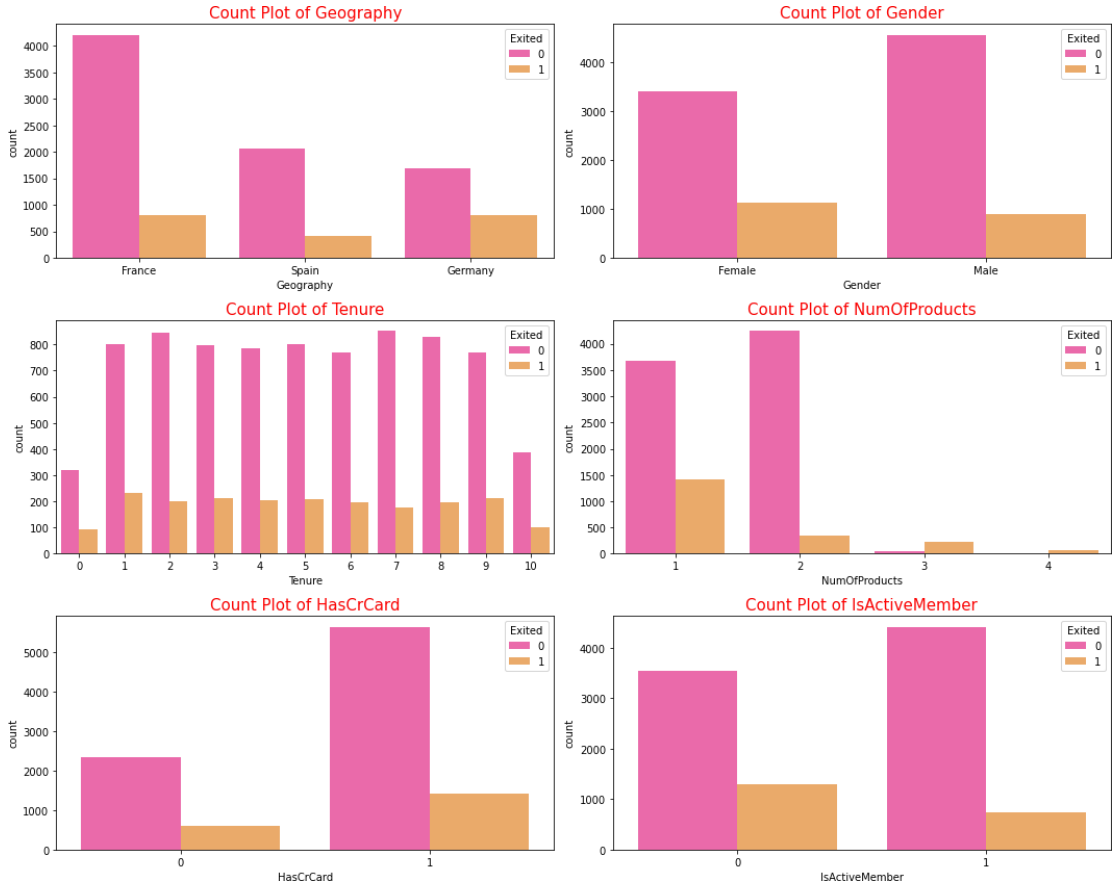
  FutureWarning



DESCRIPTIVE STATISTICS

df.dtypes

RowNumber int64

CustomerId int64

Surname object

CreditScore int64

Geography object

Gender object

Age int64

Tenure int64

Balance float64

NumOfProducts int64

HasCrCard int64

IsActiveMember int64 EstimatedSalary

float64 Exited int64

dtype: object

```
df_num = df[['RowNumber','Tenure','CustomerId','CreditScore','Age','NumOfProduc
ts','HasCrCard','IsActiveMember','Exited']]
df_cat = df[['Surname','Geography','Gender']] df_num.head()
```

RowNumber Tenure CustomerId CreditScore Age NumOfProducts HasCrCard \
0 1 2 15634602 619 42 1
1
1 2 1 15647311 608 41 1
0
2 3 8 15619304 502 42 3
1
3 4 1 15701354 699 39 2
0 4 5 2 15737888 850 43 1
1

IsActiveMember Exited

0 1 1

1 1 0

2 0 1

3 0 0 4 1 0

df_cat.head()

Surname Geography Gender

0 Hargrave France Female

1 Hill Spain Female

2 Onio France Female

3 Boni France Female 4 Mitchell Spain Female

df_num.describe()

RowNumber Tenure CustomerId CreditScore

Age \

count 10000.00000 10000.000000 1.000000e+04 10000.000000

10000.000000

mean 5000.50000 5.012800 1.569094e+07 650.528800

38.921800

std 2886.89568 2.892174 7.193619e+04 96.653299

10.487806

min 1.00000 0.000000 1.556570e+07 350.000000

18.000000

25%	2500.75000	3.000000	1.562853e+07	584.000000
32.000000				
50%	5000.50000	5.000000	1.569074e+07	652.000000
37.000000				
75%	7500.25000	7.000000	1.575323e+07	718.000000
44.000000				
max	10000.00000	10.000000	1.581569e+07	850.000000
92.000000				

	NumOfProducts	HasCrCard	IsActiveMember	Exited
count	10000.000000	10000.00000	10000.000000	10000.000000
mean	1.530200	0.70550	0.515100	0.203700
std	0.581654	0.45584	0.499797	0.402769
min	1.000000	0.00000	0.000000	0.000000
25%	1.000000	0.00000	0.000000	0.000000
50%	1.000000	1.00000	1.000000	0.000000
75%	2.000000	1.00000	1.000000	0.000000
max	4.000000	1.00000	1.000000	1.000000

df_cat.describe(exclude = ['int64','float64']) Surname Geography Gender

count 10000 10000 10000 unique

2932 3 2 top Smith France Male

HANDLEfreq THE MISSING32 VALUES5014 5457

print("Column Missing values") print(" .....") df.isnull().sum()

Column Missing values

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

print(f"Our target variable is Exited. We can observe that it has only two possible variables: {df['Exited'].unique().tolist()}")

Our target variable is Exited. We can observe that it has only two possible variables: [1, 0]

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

new_names = {
        'CreditScore': 'credit_score', 'Geography':
        'country', 'Gender': 'gender',
        'Age': 'age',
        'Tenure': 'tenure', 'Balance':
        'balance',
        'NumOfProducts': 'number_products', 'HasCrCard':
        'owns_credit_card', 'IsActiveMember': 'is_active_member',
        'EstimatedSalary': 'estimated_salary', 'Exited': 'exited'
}

df.rename(columns=new_names, inplace=True) df.head()
```

	credit_score	country	gender	age	tenure	balance	number_products	\
0	619	France	Female	42	2	0.00	1	
1	608	Spain	Female	41	1	83807.86	1	
2	502	France	Female	42	8	159660.80	3	
3	699	France	Female	39	1	0.00	2	
4	850	Spain	Female	43	2	125510.82	1	

	owns_credit_card	is_active_member	estimated_salary	exited	0	1
	1		101348.88	1		
1	0	1	112542.58	0		
2	1	0	113931.57	1		
3	0	0	93826.63	0		
4	1	1	79084.10	0		

REPLACE OUTLIERS

```
def     detect_outlier(df): outlier =
  [] threshold = 3 mean =
  np.mean(df) std = np.std(df) for
  i in df:
          z_score = (i - mean)/std
  if np.abs(z_score)>threshold:
       outlier.append(i)
  return outlier
  CreditScore_list = df['CreditScore'].tolist() Balance_list = df['Balance'].tolist()
  EstimatedSalary_list          =          df_cat['EstimatedSalary'].tolist()          CreditScore_outlier
       = detect_outlier(CreditScore_list) CreditScore_outlier
```

Output-[359, 350, 350, 358, 351, 350, 350, 350]
Balance_outlier = detect_outlier(Balance_list) Balance_outlier
EstimatedSalary_outlier = detect_outlier(EstimatedSalary_list)

EstimatedSalary_outlier print("Shape of Data before removing outliers: {}".format(df.shape))

Shape of Data before removing outliers: (10000, 11)

ENCODING

 # Encoding Categorical variables into numerical variables # One Hot Encoding x

= pd.get_dummies(x) x.head() x.shape

(10000, 13)

SPLIT THE DATA INTO DEPENDENT AND INDEPENDENT VARIALBLES

 # splitting the dataset into x(independent variables) and y(dependent variables)

```
x = df.iloc[:,0:10]
y = df.iloc[:,10]

print(x.shape) print(y.shape)

print(x.columns) #print(y)
```

```
(10000, 10)
(10000,)
Index(['credit_score', 'country', 'gender', 'age', 'tenure', 'balance',
       'number_products', 'owns_credit_card', 'is_active_member', 'estimated_salary'],
      dtype='object')
```

SCALE THE INDEPENDENT VARIABLES

```
from sklearn.preprocessing import StandardScaler sc = StandardScaler() x_train
= pd.DataFrame(x_train) x_train.head()
```

	credit_score	country	gender	age	tenure	balance	number_products
2967	579	Germany	Female	39	5	117833.30	3
700	750	France	Female	32	5	0.00	2
3481	729	Spain	Female	34	9	53299.96	2
1621	689	Spain	Male	38	5	75075.14	1
800	605	France	Male	52	7	0.00	2

	owns_credit_card	is_active_member	estimated_salary
2967	0	0	5831.00
700	1	0	95611.47
3481	1	1	42855.97
1621	1	1	8651.92
800	1	1	173952.50

SPLIT THE DATA INTO TRAINING AND TESTING

```
# splitting the data into training and testing set

from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size = 0.25, random_state = 0)

print(x_train.shape)
print(y_train.shape)
print(x_test.shape)
print(y_test.shape)
```

```
(7500, 10)
(7500,)
(2500, 10)
(2500,)
```