Assignment -2

Assignment Date	17 September 2022
Team ID	PNT2022TMID38850
Project Name	EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRES
Student Name	SHAM S
Student Roll Number	421219104016
Maximum Marks	2 Marks

IMPORT LIBRARIES

```
import numpy as np import
pandas as pd
import matplotlib.pyplot as pltimport 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 anerror or misinterpretation.
FutureWarning
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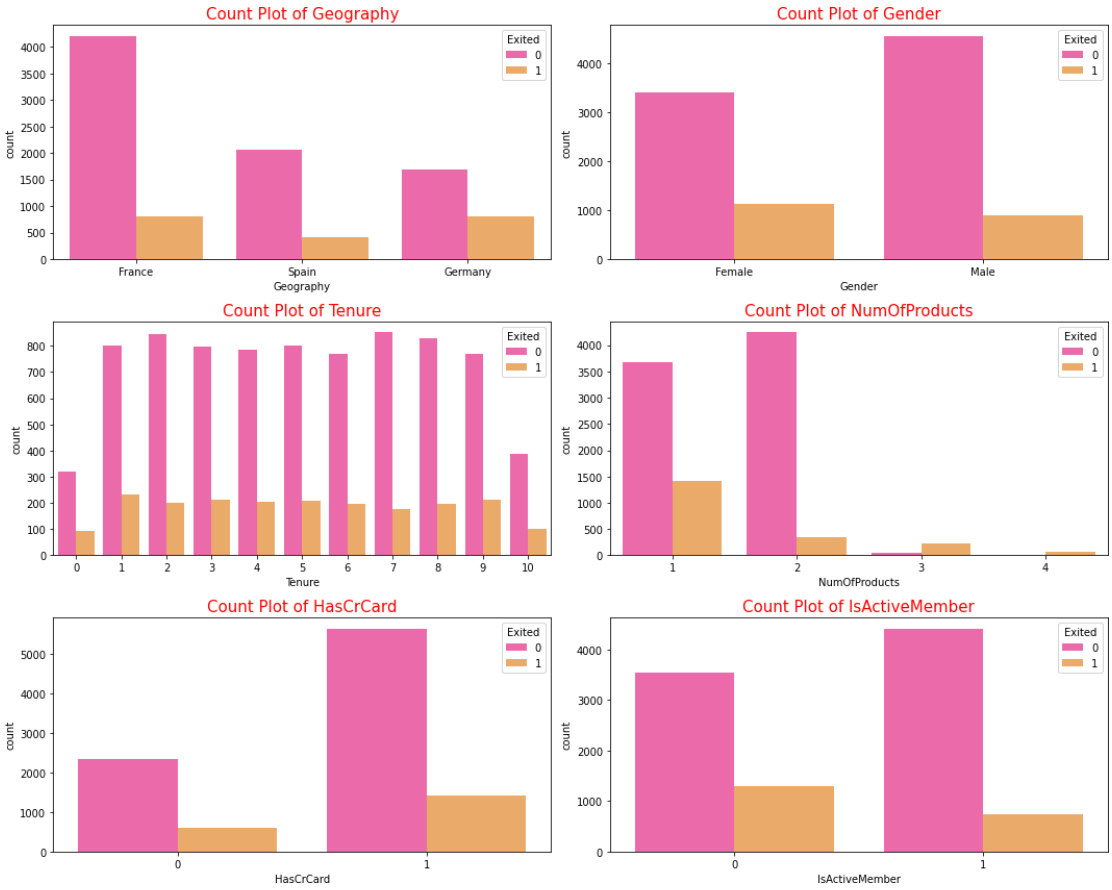
  FutureWarning



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 int64EstimatedSalary float64Exited
int64
dtype: object

```
df_num = df[['RowNumber','Tenure','CustomerId','CreditScore','Age','NumOfProducts','HasCrCard','IsActiveMember','Exited']]
```

df_cat = df[['Surname','Geography','Gender']]df_num.head()

RowNumber Tenure CustomerId CreditScore Age NumOfProductsHasCrCard \

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
```

HfrAeNqDLE THE M32ISS ING V5A01L4UES 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 onlytwo possible variables:
{df['Exited'].unique().tolist()}")
```

Our target variable is Exited. We can observe that it has only twopossible 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	exited0	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(dependentvariables)

```
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 StandardScalersc = 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,)
```