Assignment -2

Assignment Date	17 September 2022
Team ID	PNT2022TMID38850
Project Name	EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRES
Student Name	GOKUL U
Student Roll Number	421219104004
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
/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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passing other arguments without an explicit keyword will result in anerror or misinterpretation.
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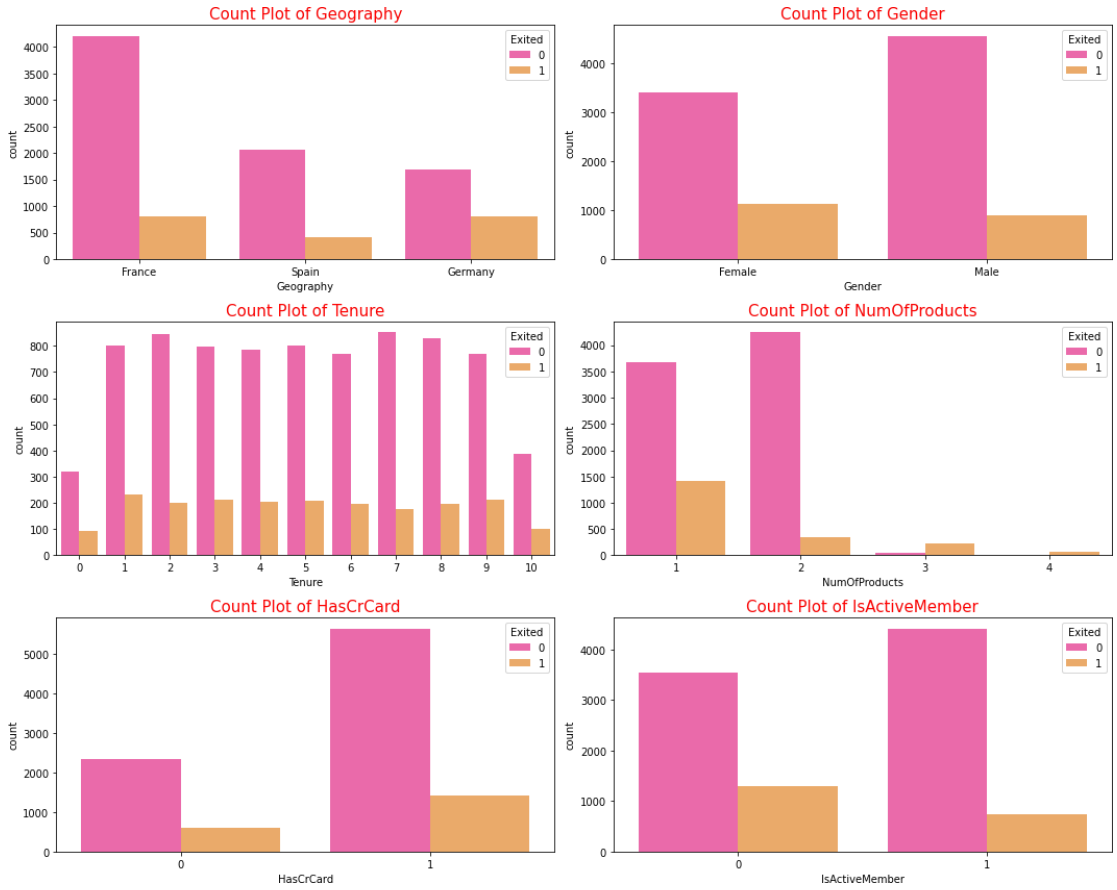
FutureWarning



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','NumOfProduc

```
ts','HasCrCard','IsActiveMember','Exited']]
df_cat = df[['Surname','Geography','Gender']]df_num.head()
```

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