Assignment -2

Assignment Date	17 September 2022
Team ID	PNT2022TMID38853
Project Name	Virtual Eye-lifeguard for swimming pools to detect active drowning
Student Name	Sadhana B
Student Roll Number	421219104013
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
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`data`, and passing other arguments without an explicit keyword will result in an error or
misinterpretation. FutureWarning
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`data`, and passing other arguments without an explicit keyword will result in an error or
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```
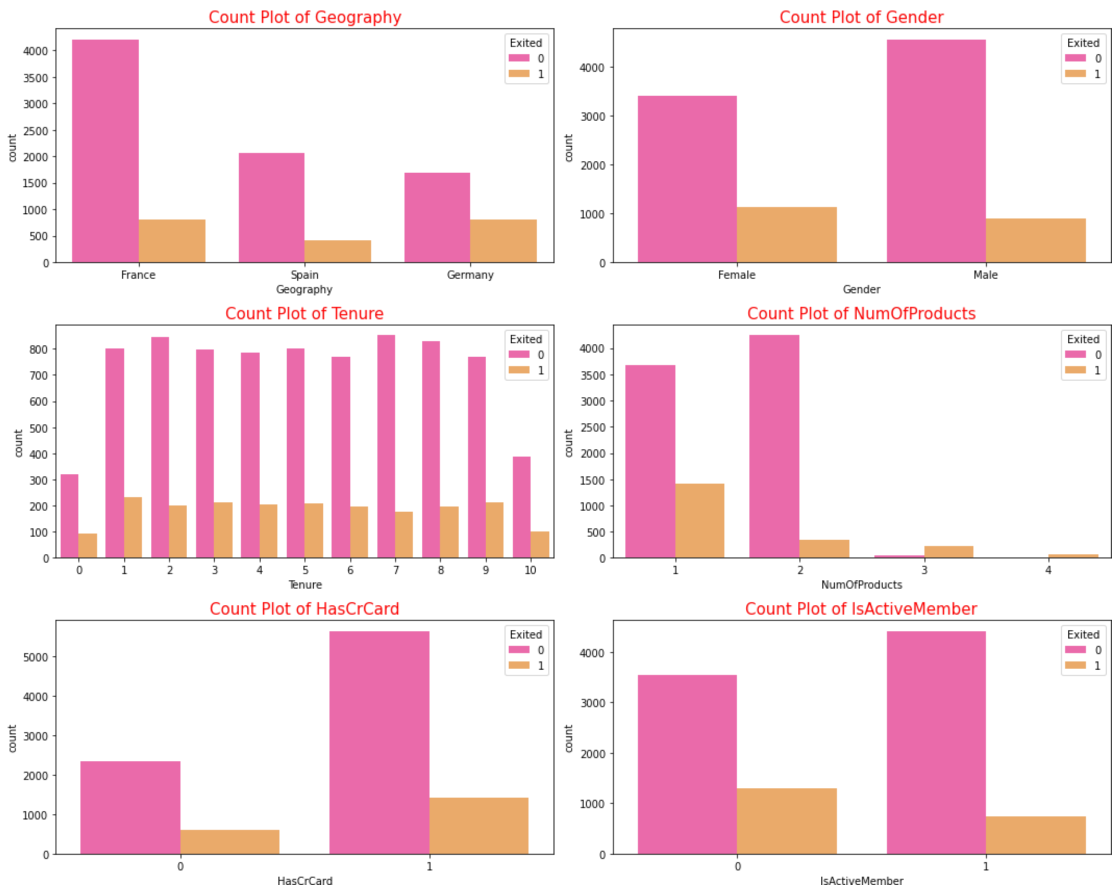

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.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



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
```

HANDLE`freq` THE MISSING`32` VALUES`5014  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,)
```