

ASSIGNMENT - 2

Team ID	PNT2022TMID14295
Roll number	771319EC008
Date	09 October 2022

Question-1 :

1 . Importing Required Package

Solution :

```
import pandas as pd
import seaborn as sns
import numpy as np
from matplotlib import pyplot as plt
%matplotlib inline
```

Question-2 :

2. Loading the Dataset

Solution :

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

Output:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	1	15634602	Hargrave	619	France	Female	42	2	0.00	1	1	1	101348.88	1
1	2	15647311	Hill	608	Spain	Female	41	1	83807.86	1	0	1	112542.58	0
2	3	15618304	Onio	502	France	Female	42	8	159660.80	3	1	0	113931.57	1
3	4	15701354	Boni	699	France	Female	39	1	0.00	2	0	0	93826.63	0
4	5	15737888	Mitchell	850	Spain	Female	43	2	125510.82	1	1	1	79084.10	0
...
9995	9996	15606229	Obijaku	771	France	Male	39	5	0.00	2	1	0	96270.64	0
9996	9997	15568892	Johnstone	516	France	Male	35	10	57369.61	1	1	1	101699.77	0
9997	9998	15584532	Liu	709	France	Female	36	7	0.00	1	0	1	42085.58	1
9998	9999	15682355	Sabbatini	772	Germany	Male	42	3	75075.31	2	1	0	92888.52	1
9999	10000	15628319	Walker	792	France	Female	28	4	130142.79	1	1	0	38190.78	0

10000 rows x 14 columns

Question-3 :

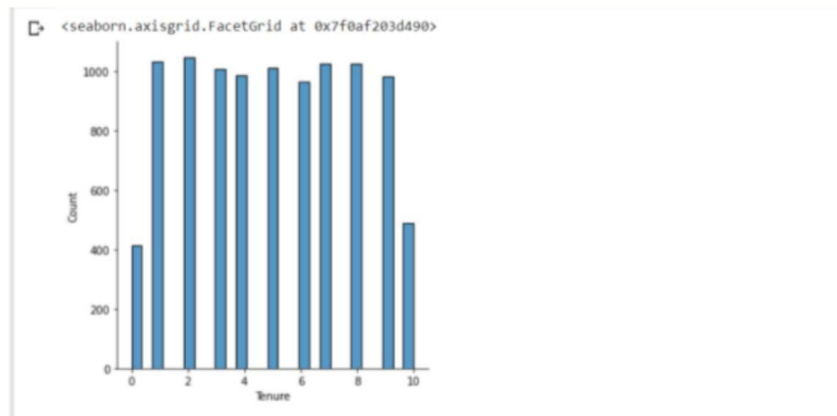
3. Visualizations

3.1 Univariate Analysis

Solution

```
sns.distplot(df.Tenure)
```

Output:

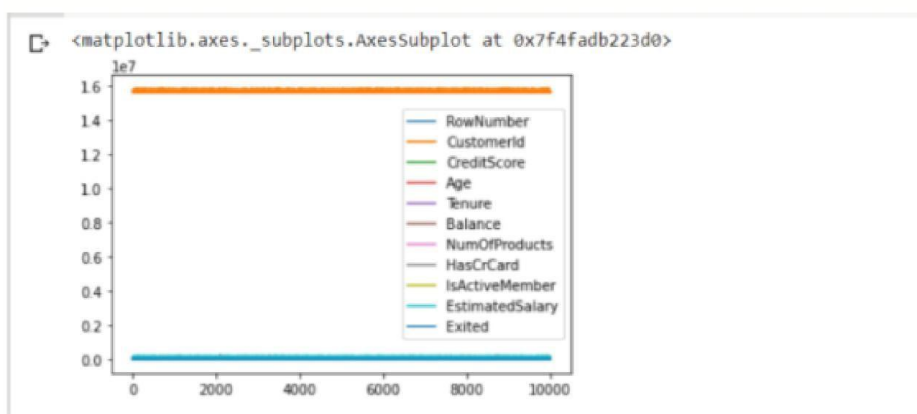


3.2 Bi-Variate Analysis

Solution:

```
df.plot.line()
```

Output:

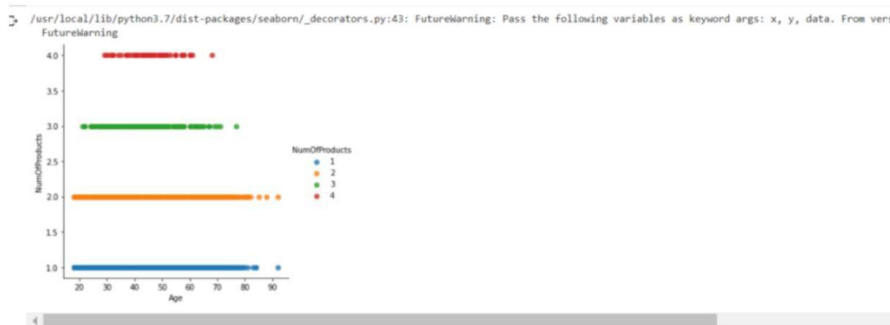


3.3 Multi - Variate Analysis

Solution:

```
sns.lmplot("Age", "NumOfProducts", df, hue="NumOfProducts", fit_reg=False);
```

Output:



Question-4 :

4. Perform descriptive statistics on the dataset.

Solution:

```
df.describe()
```

Output:

	RowNumber	CustomerId	CreditScore	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
count	10000.00000	1.000000e+04	10000.00000	10000.00000	10000.00000	10000.00000	10000.00000	10000.00000	10000.00000	10000.00000	10000.00000
mean	5000.50000	1.569094e+07	650.528800	38.921800	5.012800	76485.889288	1.530200	0.70550	0.515100	100090.239881	0.203700
std	2886.89568	7.193619e+04	96.653299	10.487806	2.892174	62397.405202	0.581654	0.45584	0.499797	57510.492818	0.402769
min	1.00000	1.556570e+07	350.000000	18.000000	0.000000	0.000000	1.000000	0.00000	0.000000	11.580000	0.000000
25%	2500.75000	1.562853e+07	584.000000	32.000000	3.000000	0.000000	1.000000	0.00000	0.000000	51002.110000	0.000000
50%	5000.50000	1.569074e+07	652.000000	37.000000	5.000000	97198.540000	1.000000	1.00000	1.000000	100193.915000	0.000000
75%	7500.25000	1.575323e+07	718.000000	44.000000	7.000000	127644.240000	2.000000	1.00000	1.000000	149388.247500	0.000000
max	10000.00000	1.581569e+07	850.000000	92.000000	10.000000	250898.090000	4.000000	1.00000	1.000000	199992.480000	1.000000

Question-5 :

5. Handle the Missing values.

Solution

```
data = pd.read_csv("Churn_Modelling.csv")
pd.isnull(data["Gender"])
```

Output:

```

0      False
1      False
2      False
3      False
4      False
...
9995   False
9996   False
9997   False
9998   False
9999   False
Name: Gender, Length: 10000, dtype: bool

```

Question-6:

6. Find the outliers and replace the outliers.

Solution:

```

df["Tenure"] = np.where(df["Tenure"] > 10, np.median(df["Tenure"]),
df["Tenure"])

```

Output:

```

0      2
1      1
2      8
3      1
4      2
...
9995   5
9996  10
9997   7
9998   3
9999   4
Name: Tenure, Length: 10000, dtype: object

```

Question-7 :

7. Check for Categorical columns and perform encoding.

Solution

```

get_dummies(df, columns=["Gender", "Age"], prefix=["Age", "Gender"])
).head()

```

Output:

```

>
  RowNumber  CustomerId  Surname  CreditScore  Geography  Tenure  Balance  NumOfProducts  HasCrCard  IsActiveMember  ...  Gender_78
0          1    15634602   Hargrave         619      France         2      0.00             1           1           1  ...           0
1          2    15647311      Hill         608      Spain          1    83807.86             1           0           1  ...           0
2          3    15619304     Onio         502      France         8    159660.80             3           1           0  ...           0
3          4    15701354     Boni         699      France          1      0.00             2           0           0  ...           0
4          5    15737888  Mitchell         850      Spain          2    125510.82             1           1           1  ...           0
5 rows x 84 columns

```

Output:



HasCrCard	IsActiveMember	...	Gender_78	Gender_79	Gender_80	Gender_81	Gender_82	Gender_83	Gender_84	Gender_85	Gender_88	Gender_92
1	1	...	0	0	0	0	0	0	0	0	0	0
0	1	...	0	0	0	0	0	0	0	0	0	0
1	0	...	0	0	0	0	0	0	0	0	0	0
0	0	...	0	0	0	0	0	0	0	0	0	0
1	1	...	0	0	0	0	0	0	0	0	0	0

Question-8:

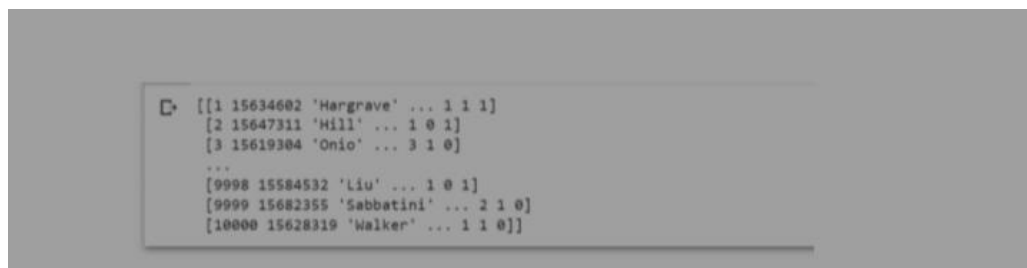
8. Split the data into dependent and independent variables

8.1 Split the data into independent variables.

Solution:

```
X = df.iloc[:, -2].values  
print(X)
```

Output:



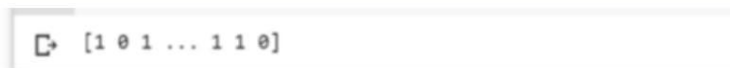
```
[[1 15634602 'Hargrave' ... 1 1 1]  
 [2 15647311 'Hill' ... 1 0 1]  
 [3 15619304 'Onio' ... 3 1 0]  
 ...  
 [9998 15584532 'Liu' ... 1 0 1]  
 [9999 15682355 'Sabbatini' ... 2 1 0]  
 [10000 15628319 'Walker' ... 1 1 0]]
```

8.2 Split the data into Dependent variables.

Solution:

```
Y = df.iloc[:, -1].values  
print(Y)
```

Output:



```
[1 0 1 ... 1 1 0]
```

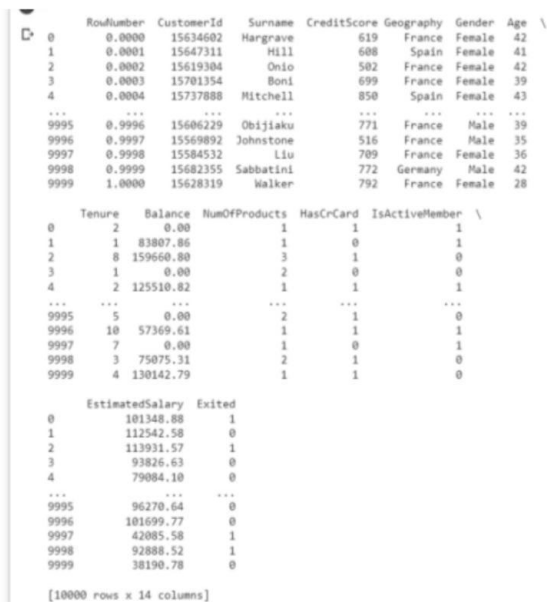
Question-9 :

9. Scale the independent variables

Solution:

```
import pandas as pd
from sklearn.preprocessing import MinMaxScaler
scaler = MinMaxScaler()
df[["RowNumber"]] = scaler.fit_transform(df[["RowNumber"]])
Print(df)
```

Output:



```
RowNumber  CustomerId  Surname  CreditScore  Geography  Gender  Age  \
0          0.0000    15634602  Hargrave        619      France  Female  42  \
1          0.0001    15647311      Hill        608      Spain  Female  41  \
2          0.0002    15619304      Onio        502      France  Female  42  \
3          0.0003    15701354      Boni        699      France  Female  39  \
4          0.0004    15737888  Mitchell        850      Spain  Female  43  \
...      ...      ...      ...      ...      ...      ...  \
9995       0.9996    15606229  Obijaku        771      France   Male  39  \
9996       0.9997    15569892  Johnstone    516      France   Male  35  \
9997       0.9998    15584532      Liu        709      France  Female  36  \
9998       0.9999    15682355  Sabbatini    772  Germany   Male  42  \
9999       1.0000    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]
```

Question-10 :

10. Split the data into training and testing

Solution

```
from sklearn.model_selection import train_test_split
train_size=0.8
X = df.drop(columns = ['Tenure']).copy()
y = df['Tenure']
X_train, X_rem, y_train, y_rem = train_test_split(X,y, train_size=0.8)
test_size = 0.5
X_valid, X_test, y_valid, y_test = train_test_split(X_rem,y_rem, test_size=0.
print(X_train.shape), print(y_train.shape)
print(X_valid.shape), print(y_valid.shape)
print(X_test.shape), print(y_test.shape)
```

Output:

```
❏ (8000, 13)
   (8000,)
   (1000, 13)
   (1000,)
   (1000, 13)
   (1000,)
   (None, None)
```