

## ASSIGNMENT - 2

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### 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 :

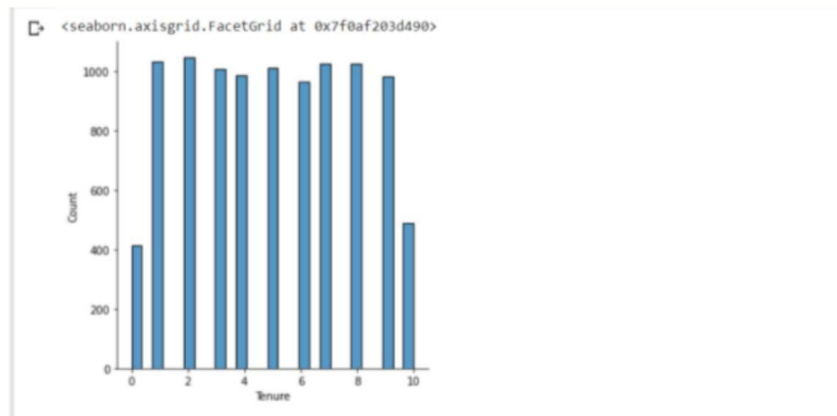
#### 3. Visualizations

### 3.1 Univariate Analysis

#### **Solution**

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

Output:

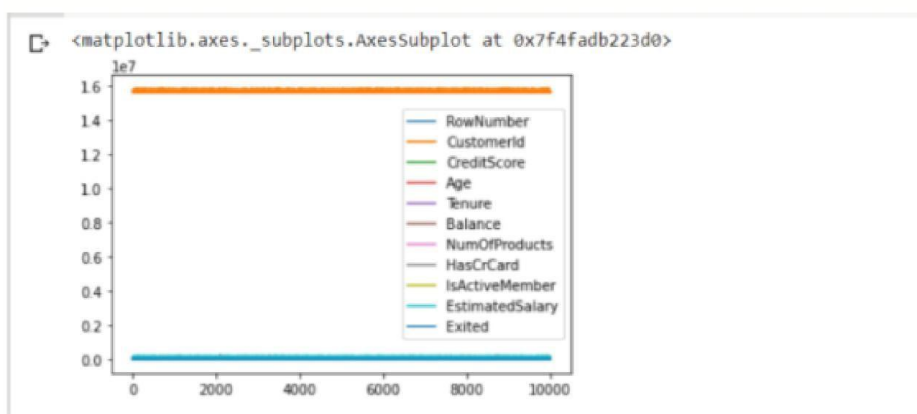


### 3.2 Bi-Variate Analysis

#### **Solution:**

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

Output:

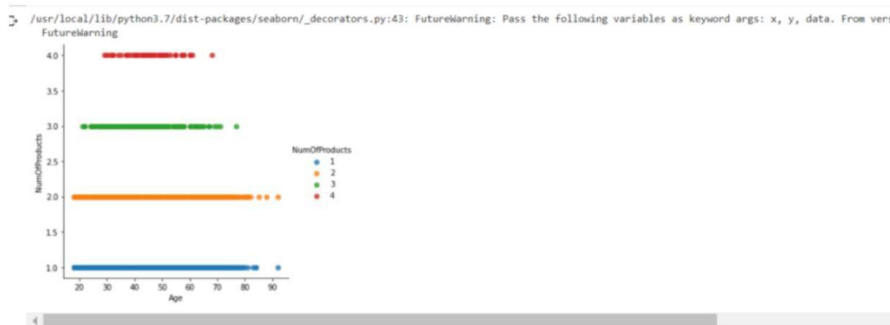


### 3.3 Multi - Variate Analysis

#### **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	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000
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	0.000000	0.000000	11.580000	0.000000
25%	2500.75000	1.562853e+07	584.000000	32.000000	3.000000	0.000000	1.000000	0.000000	0.000000	51002.110000	0.000000
50%	5000.50000	1.569074e+07	652.000000	37.000000	5.000000	97198.540000	1.000000	1.000000	1.000000	100193.915000	0.000000
75%	7500.25000	1.575323e+07	718.000000	44.000000	7.000000	127644.240000	2.000000	1.000000	1.000000	149388.247500	0.000000
max	10000.00000	1.581569e+07	850.000000	92.000000	10.000000	250898.090000	4.000000	1.000000	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
0	1	1	...	0	0	0	0	0	0	0	0	0	0
0	0	1	...	0	0	0	0	0	0	0	0	0	0
1	1	0	...	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	1	...	0	0	0	0	0	0	0	0	0	0

### Question-8:

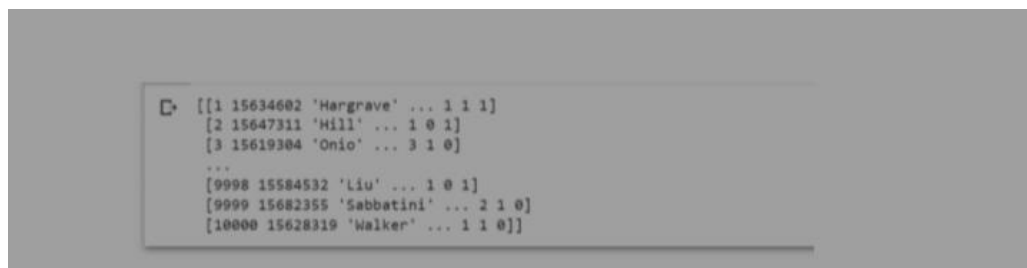
8. Split the data into dependent and independent variables

8.1 Split the data into independent variables.

#### Solution:

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

Output:



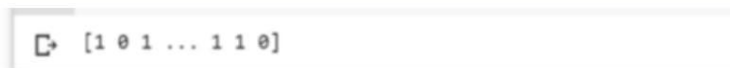
```
[[1 15634602 'Hargrave' ... 1 1 1]  
 [2 15647311 'Hill' ... 1 0 1]  
 [3 15619304 'Onio' ... 3 1 0]  
 ...  
 [9998 15584532 'Liu' ... 1 0 1]  
 [9999 15682355 'Sabbatini' ... 2 1 0]  
 [10000 15628319 'Walker' ... 1 1 0]]
```

8.2 Split the data into Dependent variables.

#### Solution:

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

Output:



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

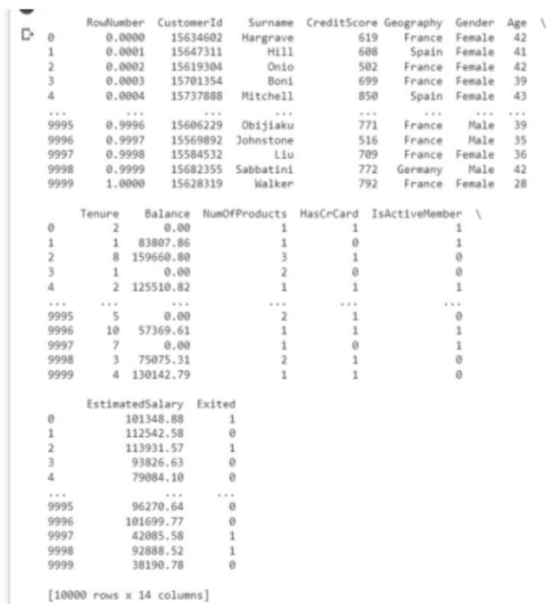
### Question-9 :

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)
```