

## ASSIGNMENT -2

### Python Programming

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 :

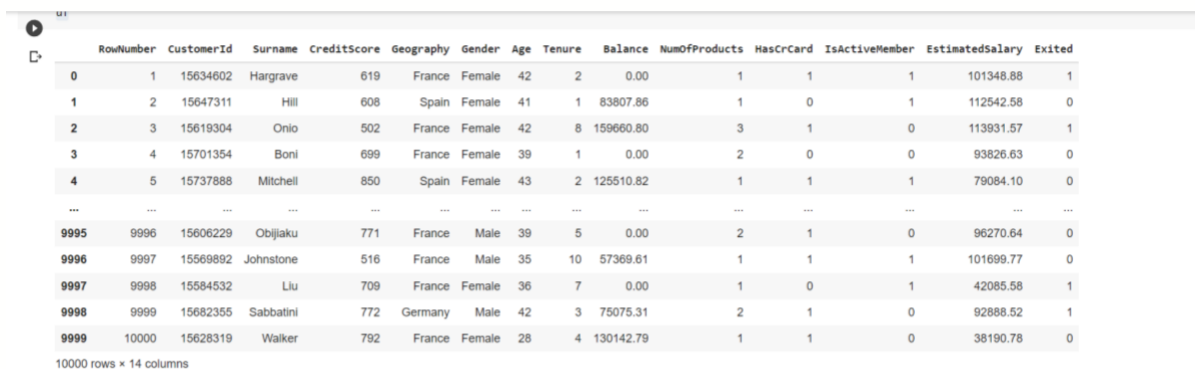
### 2. Loading the Dataset

**Solution :**

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

df
```

**Output:**



The screenshot shows a Jupyter Notebook interface with a pandas DataFrame displayed. The DataFrame has 14 columns: RowNumber, CustomerId, Surname, CreditScore, Geography, Gender, Age, Tenure, Balance, NumOfProducts, HasCrCard, IsActiveMember, EstimatedSalary, and Exited. The data is presented in a table format with alternating light and dark gray rows. The first five rows are indexed 0 to 4, followed by a gap, then rows 9995 to 9999. The last row is indexed 10000. The 'Exited' column contains binary values (0 or 1).

	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	15619304	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	15569892	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

### 3. Visualizations

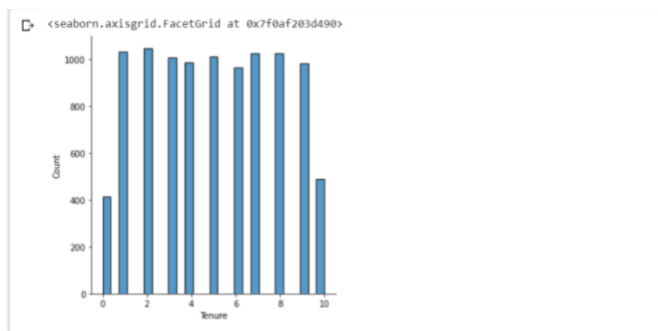
Question-3 :

### 3.1 Univariate Analysis

#### Solution:

```
sns.displot(df.Tenure)
```

#### Output:

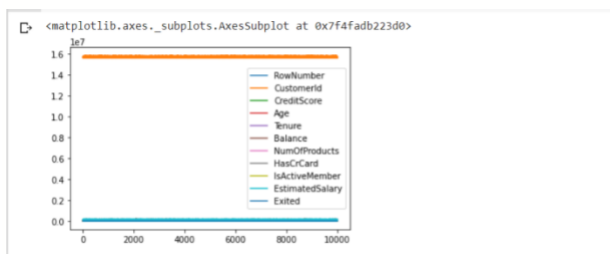


### 3.2 Bi-Variate Analysis

#### Solution:

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

#### Output:

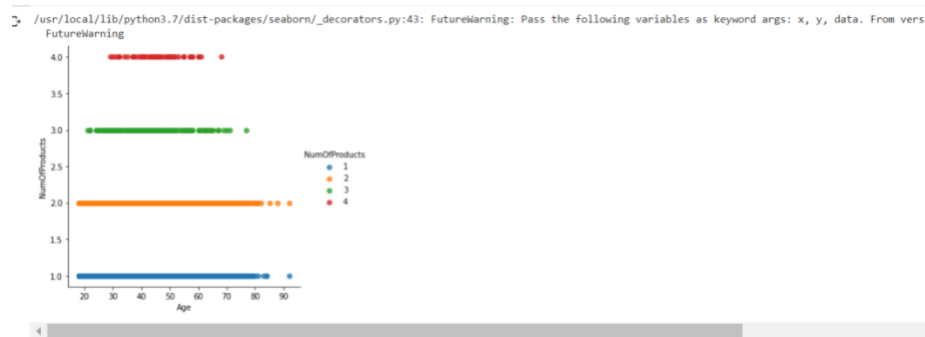


### 3.3 Multi - Variate Analysis

#### Solution:

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

## Output:



## 4. Perform descriptive statistics on the dataset.

Question-4 :

### 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	10000.00000	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	0.00000	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

## 5. Handle the Missing values.

Question-5 :

### 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:

```
pd.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 × 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

5 rows × 14 columns

## 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:

```

RouNumber CustomerId Surname CreditScore Geography Gender Age \
0 0.0000 15634602 Hargrave 619 France Female 42
1 0.0001 15647311 Hill 688 Spain Female 41
2 0.0002 15619304 Ohio 582 France Female 42
3 0.0003 15781354 Boni 699 France Female 39
4 0.0004 15737888 Mitchell 850 Spain Female 43
...
9995 0.9996 15686229 Ohijaku 771 France Male 39
9996 0.9997 15569892 Johnstone 516 France Male 35
9997 0.9998 15584532 Liu 789 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=0.5)

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)

```

Team ID : PNT2022TMID37970

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