# ASSIGNMENT – 2

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|---|---|
| **PROJECT TITLE** | FERTILIZER RECOMMENDATION SYSTEM FOR DISEASE PREDICTION |
| **TEAM MEMBERS** | TEAM LEADER : SOWNDARYA S<br>TEAM MEMBER 1 : MONISHA S<br>TEAM MEMBER 2 : SRIVARSHINI R<br>TEAM MEMBER 3 : SWAATHI S |

## 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
```

## 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 | 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 | Obijiaku | 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 × 14 columns

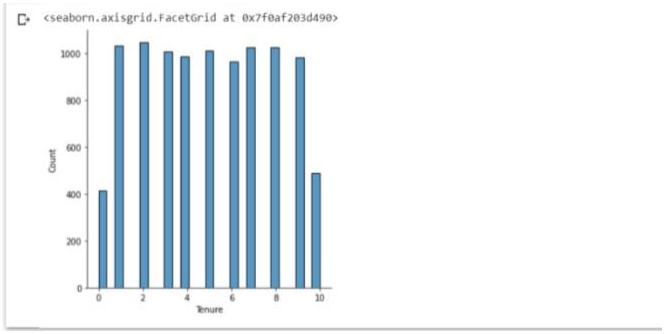
## 3. Visualizations

### 3.1 Univariate Analysis

**Solution:**

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

**Output:**

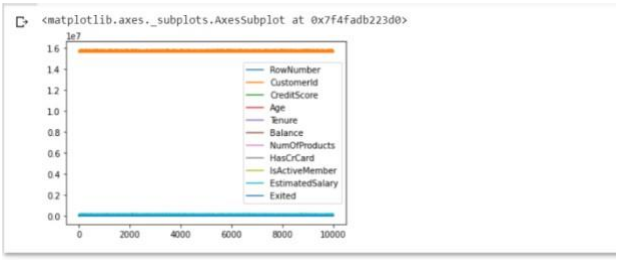



### 3.2 Bi-Variate Analysis

**Solution:**

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

**Output:**

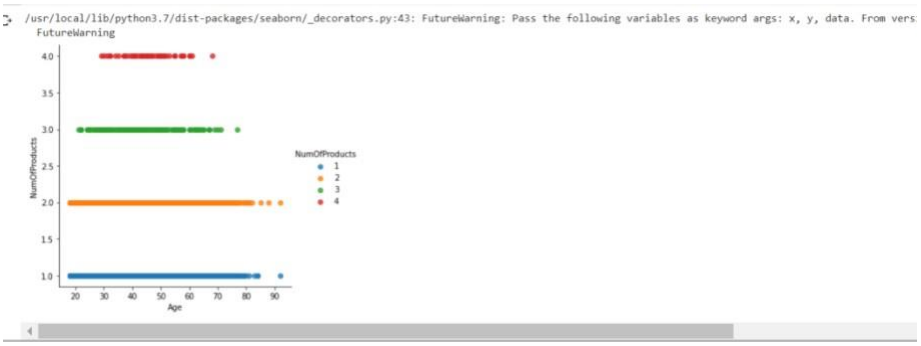



### 3.3 Multi - Variate Analysis

**Solution:**

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

## Output:




## 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 | 10000.00000 | 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.

## Solution:

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

**Output:**


## 6. Find the outliers and replace the outliers.

**Solution:**

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

**Output:**


## 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 |

## 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:**

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

**Output:**

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

## 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  Obijiaku          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]
```

## 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)
```