Assignment -II

Name	**HARINI B**
Register Number	**820319106009**
Team Size	**4**
Team ID	**PNT2022TMID46416**

1) Importing

In [ ]:

```
import pandas as pd import numpy

as np import seaborn as sns from

matplotlib import pyplot as plt

import warnings

warnings.filterwarnings('ignore')
```

2.Load the Dataset

In [ ]:

```
data=pd.read_csv("Churn_Modelling.csv")
```

In [43]: data

Out[43]:

	Row	**Cust**	**Sur**	**Credi**	**Geog**	**Ge**	**A**	**Te**	**Bala**	**NumOf**	**HasC**	**IsActiv**	**Estimat**	**Ex**
		omer	**nam**	**tScor**	**raph**	**nd**		**nu**	**nce**		**rCar**		**edSalar**	
	Num						**g**			**Produc**		**eMemb**		**ite**
	ber	**Id**	**e**	**e**	**y**	**er**	**e**	**re**		**ts**	**d**	**er**	**y**	**d**
0	1	0.275 616	Har grav e	619	Franc e	Fe mal e	4 2	2	0.00	1	1	1	101348. 88	1

1	2	0.326454	Hill	608	Spain	Female	41	1	83807.86	1	0	1	112542.58	0
2	3	0.214421	Onio	502	France	Female	42	8	159660.80	3	1	0	113931.57	1
3	4	0.542636	Boni	699	France	Female	39	1	0.00	2	0	0	93826.63	0
4	5	0.688778	Mitchell	850	Spain	Female	43	2	125510.82	1	1	1	79084.10	0
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9995	9996	0.162119	Obijiaku	771	France	Male	39	5	0.00	2	1	0	96270.64	0
9996	9997	0.016765	Johnstone	516	France	Male	35	10	57369.61	1	1	1	101699.77	0
9997	9998	0.075327	Liu	709	France	Female	36	7	0.00	1	0	1	42085.58	1

9998	9999	0.466637	Sabbatini	772	Germany	Male	42	3	75075.31	2	1	0	92888.52	1
9999	10000	0.250483	Walker	792	France	Female	28	4	130142.79	1	1	0	38190.78	0

10000 rows × 14 columns

3.Visualizations

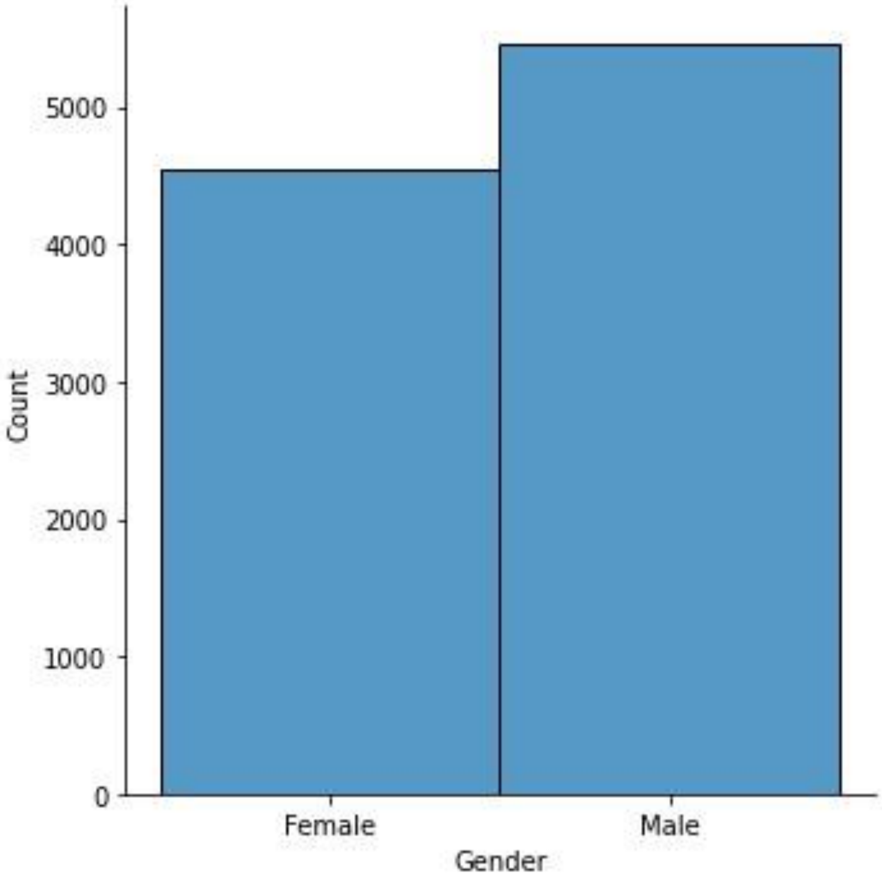
a) Univariate Analysis

In [44]:

```
sns.displot(data.Gender)
```

Out[44]:

```
<seaborn.axisgrid.FacetGrid at 0x7f80cb07c690>
```

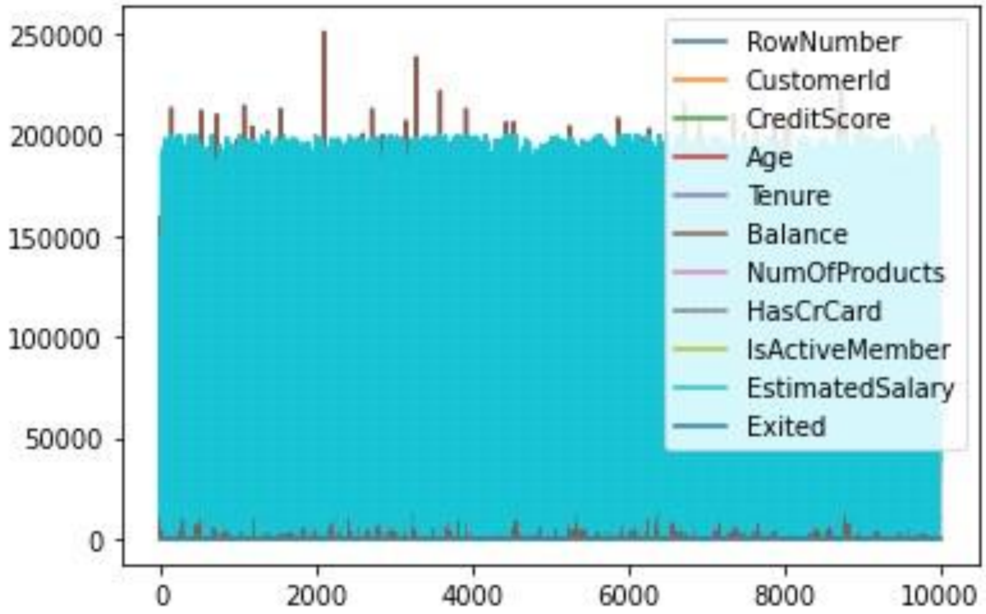


B)Bi-Variate Analysis

```
In [45]: data.plot.line()
```

```
Out[45]:
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f80cb9a8a50>
```

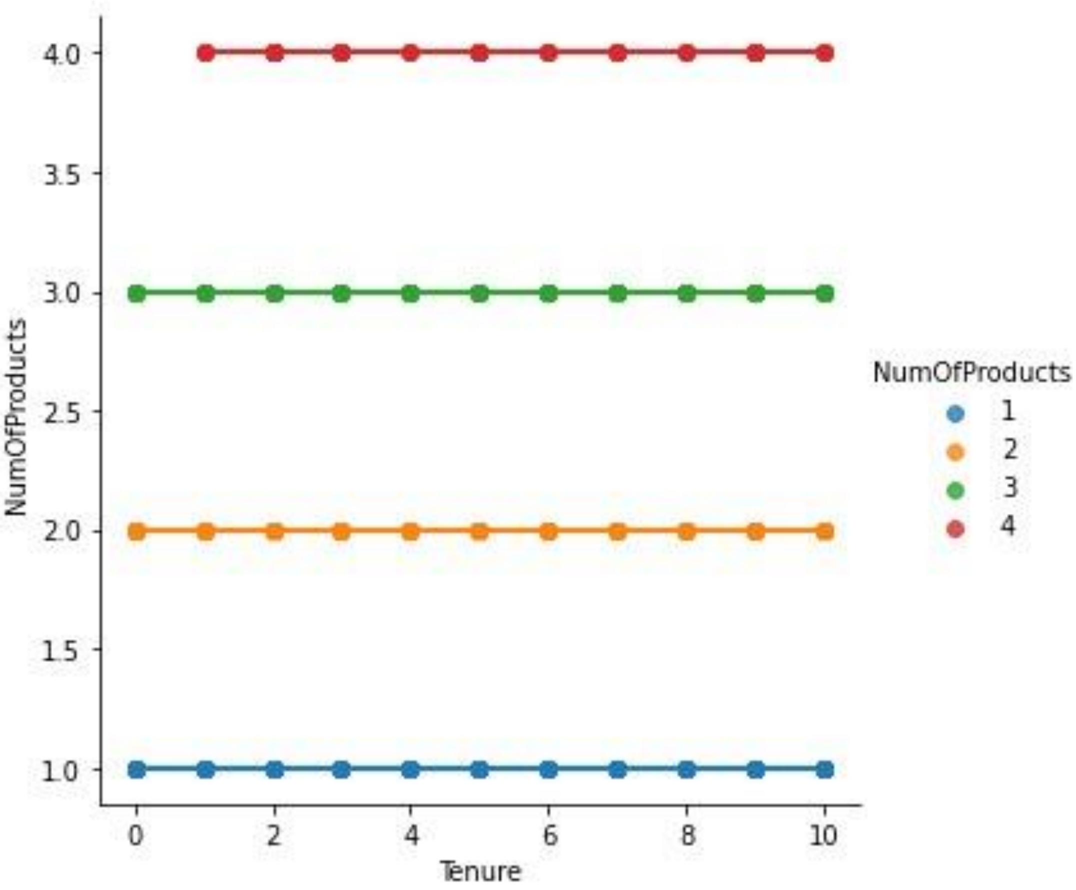


C)Multi - Variate Analysis

In [46]: sns.lmplot("Tenure","NumOfProducts",data,hue="NumOfProducts")

Out[46]:

<seaborn.axisgrid.FacetGrid at 0x7f80cb95fe10>



4)Perform descriptive statistics on the dataset.

In [47]: data.describe()
Out[47]:

	RowNumber	**CustomerId**	**Credit Score**	**Age**	**Tenur e**	**Balanc e**	**NumOf Products**	**HasCrCard**	**IsActive Member**	**EstimatedSalar y**	**Exited**
co un t	10000.00000	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.00000	10000.000000	10000.000000	10000.000000

m **ea**	5000.5	0.5009	650.52	36.533	5.0128	76485.8	1.53020	0.7055	0.515100	100090.2	0.2037
n	0000	80	8800	900	00	89288	0	0		39881	00
st **d**	2886.8 9568	0.2877 57	96.6 53 299	6.4738 43	2.8921 74	62397.4 05202	0.58165 4	0.4558 4	0.499797	57510.49 2818	0.4027 69
mi **n**	1.0000 0	0.0000 00	35000 0000	20.000 000	0.0000 00	0.00000 0	1.00000 0	0.0000 0	0.000000	11.58000 0	0.0000 00
25 **%**	2500.7 5000	0.2513 20	58400 0000	32.000 000	3.0000 00	0.00000 0	1.00000 0	0.0000 0	0.000000	51002.11 0000	0.0000 00
50 **%**	5000.5 0000	0.5001 70	65200 0000	37.000 000	5.0000 00	97198.5 40000	1.00000 0	1.0000 0	1.000000	100193.9 15000	0.0000 00
75 **%**	7500.2 5000	0.7501 64	71800 0000	40.000 000	7.0000 00	127644. 240000	2.00000 0	1.0000 0	1.000000	149388.2 47500	0.0000 00
m **ax**	10000. 00000	1.0000 00	85000 0000	50.000 000	10.000 000	250898. 090000	4.00000 0	1.0000 0	1.000000	199992.4 80000	1.0000 00

5)Handle the Missing values.

In [ ]:

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

Out[ ]:

```
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 6)Find
```

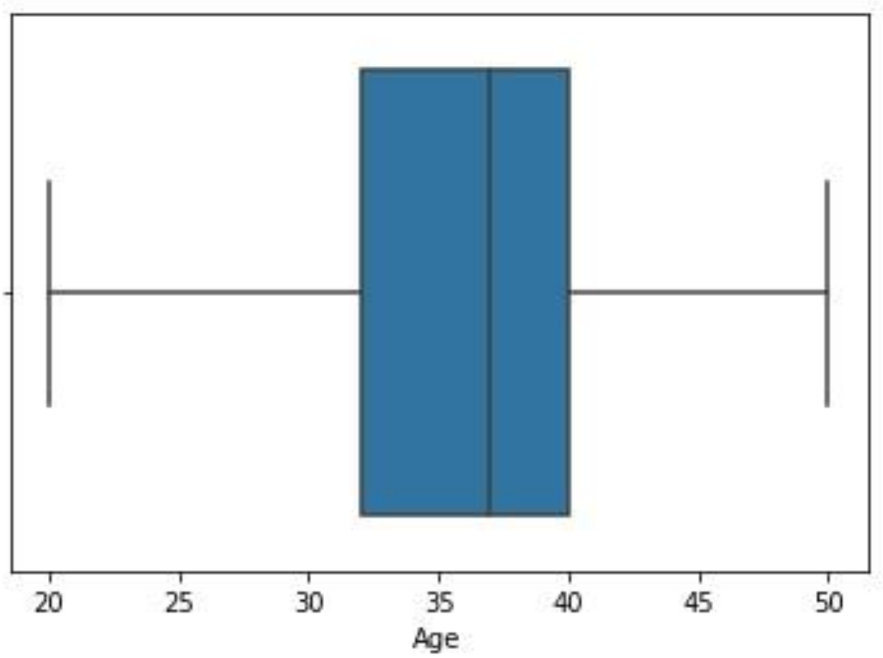
the outliers and replace the outliers

In [48]:

```
sns.boxplot(data['Age'])
```

Out[48]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f80caeafc50>
```



In [28]:

```
data['Age']=np.where(data['Age']>50,40,data['Age'])

data['Age']
```

Out[28]:

```
0       42

1       41

2       42

3       39

4       43

        ..

9995    39
```

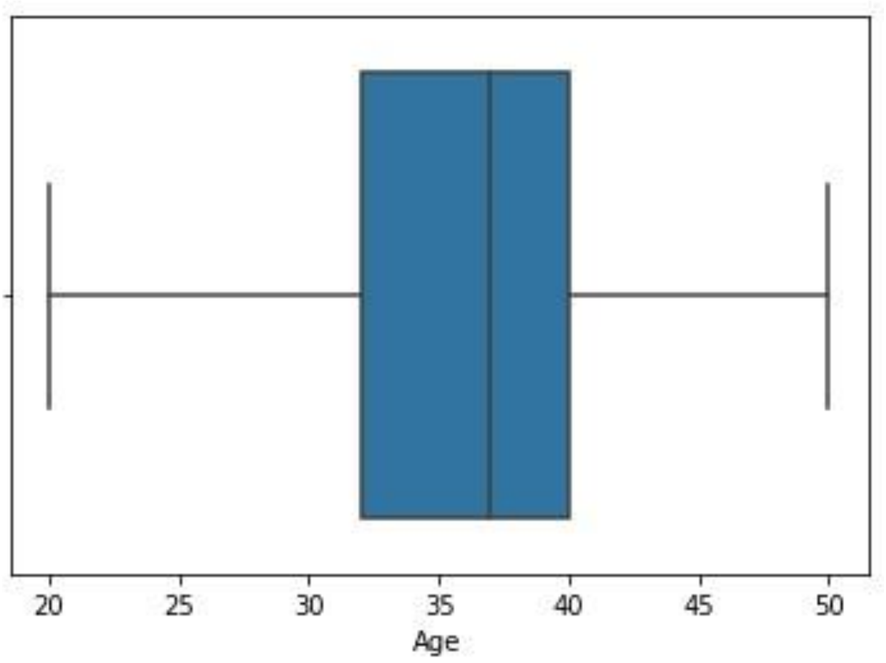
```
9996    35

9997    36

9998    42

9999    28

Name: Age, Length: 10000, dtype: int64
```

In [49]:

```
sns.boxplot(data['Age'])
```

Out[49]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f80cb95fc10>
```



In [34]:

```
data['Age']=np.where(data['Age']<20,35,data['Age'])

data['Age']
```

Out[34]:

```
0       42

1       41

2       42

3       39

4       43
```

```
..
9995    39
9996    35
9997    36
9998    42
9999    28
Name: Age, Length: 10000, dtype: int64
```

7) Check for Categorical columns and perform encoding.

In [50]:

```
pd.get_dummies(data, columns=["Gender", "Age"], prefix=["Age", "Gender"]).head()
```

Out[50]:

	RowNumber	**CustomerId**	**Surname**	**CreditScore**	**Geography**	**Tenure**	**Balance**	**NumOfProducts**	**HasCrCard**	**IsActiveMember**	**...**	**Gender_41**	**Gender_42**	**Gender_43**	**Gender_44**	**Gender_45**	**Gender_46**	**Gender_47**	**Gender_48**	**Gender_49**	**Gender_50**
0	1	0.275616	Hargrave	619	France	2	0.00	1	1	1	...	0	1	0	0	0	0	0	0	0	0

1	2	0.326454	Hill	608	Spain	1	83807.86	1	0	1	...	1	0	0	0	0	0	0	0	0	0
2	3	0.214421	Onio	502	France	8	159660.80	3	1	0	...	0	1	0	0	0	0	0	0	0	0
3	4	0.542636	Boni	699	France	1	0.00	2	0	0	...	0	0	0	0	0	0	0	0	0	0
4	5	0.688778	Mitchell	850	Spain	2	125510.82	1	1	1	...	0	0	1	0	0	0	0	0	0	0

5 rows × 45 columns

8) Split the data into dependent and independent variables.

A) Split the data into Independent variables.

In [37]:

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

```
[[1 15634602 'Hargrave' ... 1 1 101348.88]

 [2 15647311 'Hill' ... 0 1 112542.58]

[3 15619304 'Onio' ... 1 0 113931.57]

 ...

[9998 15584532 'Liu' ... 0 1 42085.58]

[9999 15682355 'Sabbatini' ... 1 0 92888.52]  [10000 15628319

          'Walker' ... 1 0 38190.78]] B) Split the data into Dependent

          variables.
```

In [38]:

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

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

9) Scale the independent variables

In [39]:

```
import pandas as pd from sklearn.preprocessing

import MinMaxScaler scaler = MinMaxScaler()


data[["CustomerId"]] = scaler.fit_transform(data[["CustomerId"]])
```

In [40]: print(data)

```
     RowNumber  CustomerId    Surname  CreditScore Geography  Gender  Age  \

0            1  0.275616  Hargrave       619    France  Female   42

1            2  0.326454         Hill       608     Spain  Female   41

2            3  0.214421         Onio      502    France  Female   42

3            4  0.542636         Boni      699    France  Female   39 4            5  0.688778

             Mitchell              850     Spain  Female   43

...         ...         ...        ...          ...       ...     ...  ...

9995         9996  0.162119  Obijiaku   771    France    Male   39

9996         9997    0.016765  Johnstone            516    France    Male   35
```

```
9997      9998  0.075327    Liu        709    France  Female   36

9998      9999    0.466637  Sabbatini            772   Germany    Male   42

9999      10000  0.250483  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

In [42]:

```
from sklearn.model_selection import train_test_split train_size=0.8

X = data.drop(columns = ['Tenure']).copy() y

= data['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)
```

```
(8000, 13)

(8000,)

(1000, 13)

(1000,)

(1000, 13)

(1000,)
```

Out[42]:

```
(None, None)
```