Assignment -II

Assignment date	24 September 2022
Student Name	K. Muhil
Student register number	820319106014
Maximum marks	2 marks

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]:

	RowNum	Customer	Surnam	CreditScor	Geograph	Gend	Ag	Tenu	Balance	NumOfProduc	HasCrCar	IsActiveMemb	EstimatedSalar	Exite

	ber	**Id**	**e**	**e**	**y**	**er**	**e**	**re**		**ts**	**d**	**er**	**y**	**d**
0	1	0.275616	Hargrave	619	France	Female	42	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

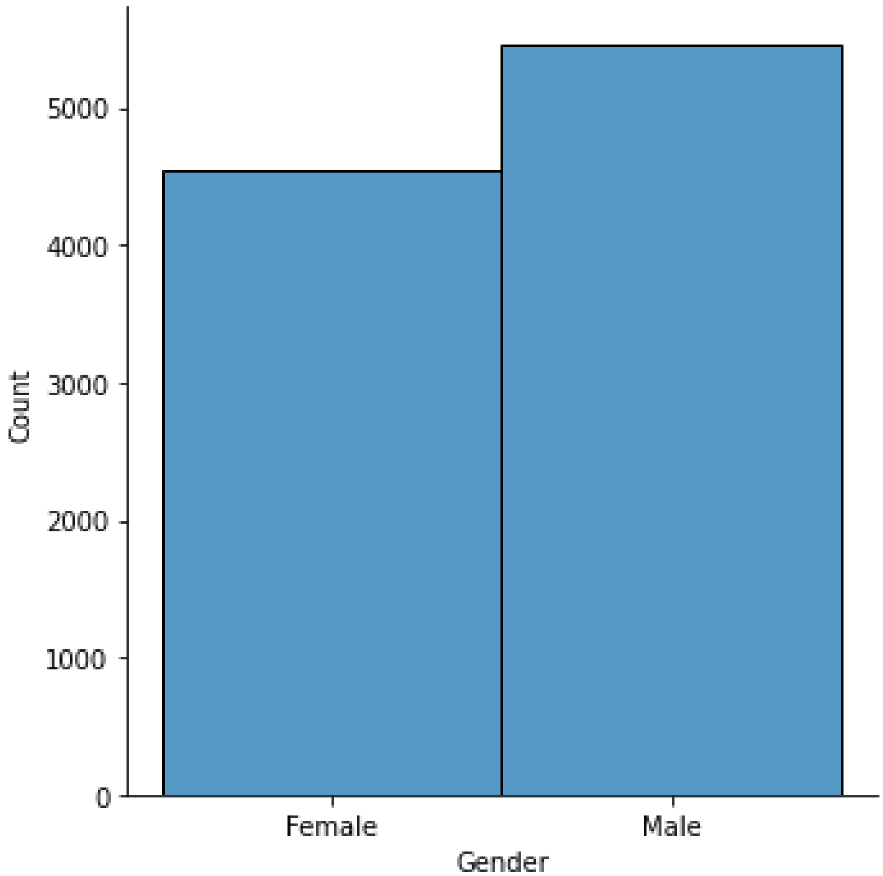
a) Univariate Analysis

In [44]:

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

Out[44]:

<seaborn.axisgrid.FacetGrid at 0x7f80cb07c690>



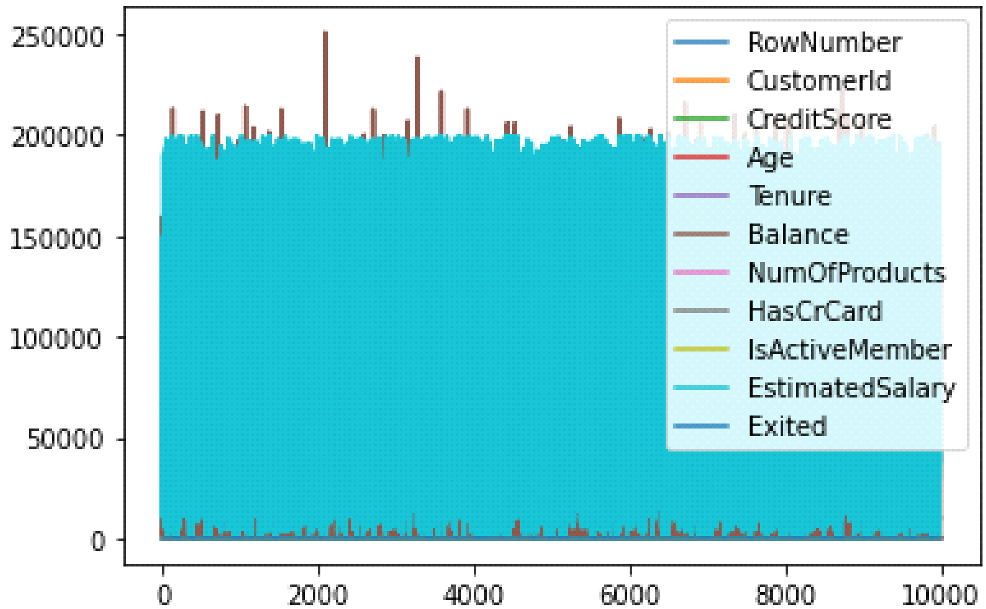
B) Bi-Variate Analysis

In [45]:

```
data.plot.line()
```

Out[45]:

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



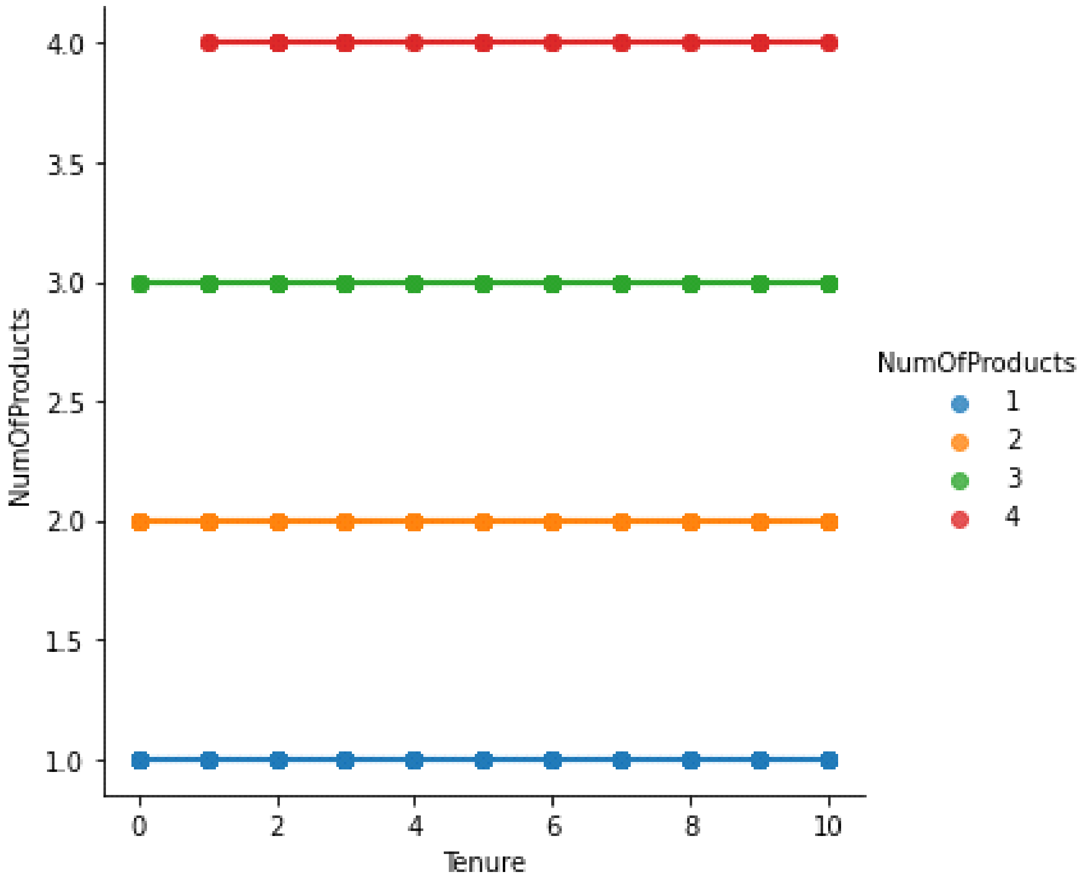
C) Multi - Variate Analysis

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**	**CreditScore**	**Age**	**Tenure**	**Balance**	**NumOfProducts**	**HasCrCard**	**IsActiveMember**	**EstimatedSalary**	**Exited**
count	10000.00000	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.00000	10000.000000	10000.000000	10000.000000
mea	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
std	2886.89568	0.287757	96.653299	6.473843	2.892174	62397.405202	0.581654	0.45584	0.499797	57510.492818	0.402769
min	1.00000	0.000000	350.000000	20.000000	0.000000	0.000000	1.000000	0.00000	0.000000	11.580000	0.000000
25%	2500.75000	0.251320	584.000000	32.000000	3.000000	0.000000	1.000000	0.00000	0.000000	51002.110000	0.000000
50%	5000.50000	0.500170	652.000000	37.000000	5.000000	97198.540000	1.000000	1.00000	1.000000	100193.915000	0.000000
75%	7500.25000	0.750164	718.000000	40.000000	7.000000	127644.240000	2.000000	1.00000	1.000000	149388.247500	0.000000
max	10000.00000	1.000000	850.000000	50.000000	10.000000	250898.090000	4.000000	1.00000	1.000000	199992.480000	1.000000

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

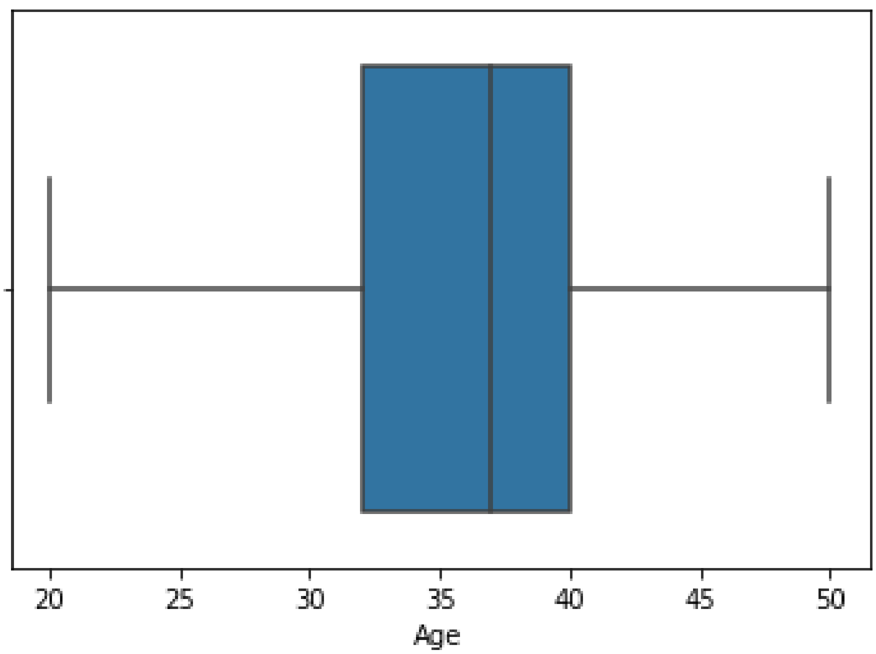
6) Find the outliers and replace the outliers

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

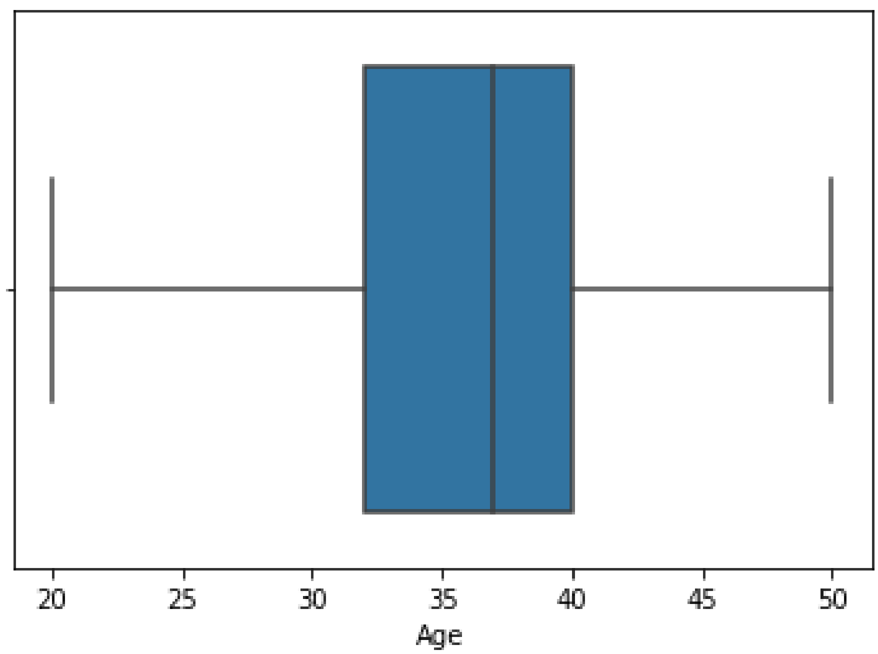
Name: Age, Length: 10000, dtype: int64

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	0.27	Har	619	Fran	2	0.0	1	1	1	..	0	1	0	0	0	0	0	0	0	0

		5616	grave		ce		0				.										
1	2	0.326454	Hill	608	Spain	1	838807.86	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	Mitchel	850	Spain	2	125551	1	1	1	...	0	0	1	0	0	0	0	0	0	0

			l				0. 8 2														

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)