Assignment Date	12 November 2022
Student Name	ARUNA.A
Student Register Number	620619106005
Maximum Marks	2

1. importing Required package

```
import pandas as pd import
seaborn as snsimport numpy
as np
from matplotlib import pyplot as plt
%matplotlib inline
```

2. Loading the Data

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

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure
0	1	15634602	Hargrave	619	France	Female	42	2
1	2	15647311	Hill	608	Spain	Female	41	1
2	3	15619304	Onio	502	France	Female	42	8
3	4	15701354	Boni	699	France	Female	39	1
4	5	15737888	Mitchell	850	Spain	Female	43	2
...	...	...	...	...	...	...	...	...
9995	9996	15606229	Obijiaku	771	France	Male	39	5
9996	9997	15569892	Johnstone	516	France	Male	35	10
9997	9998	15584532	Liu	709	France	Female	36	7
9998	9999	15682355	Sabbatini	772	Germany	Male	42	3
9999	10000	15628319	Walker	792	France	Female	28	4

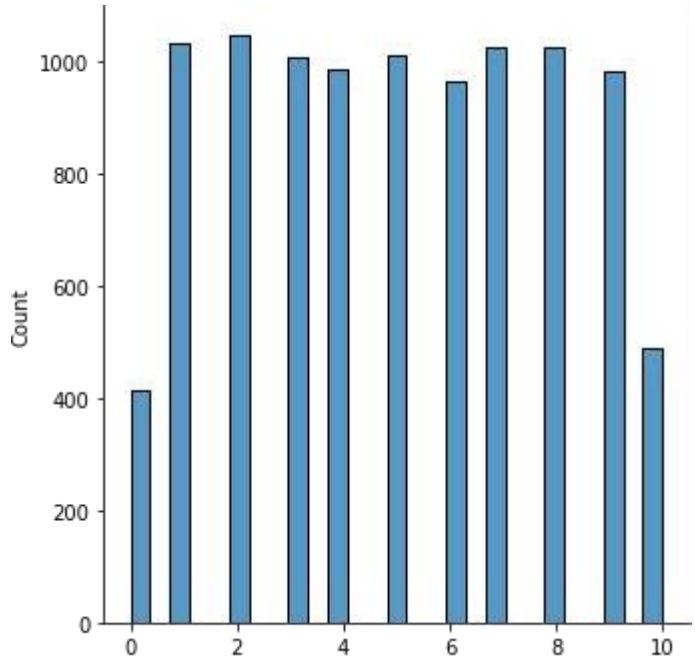
10000 rows × 14 columns

3. isualizations

3.1 Univariate Analysis

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

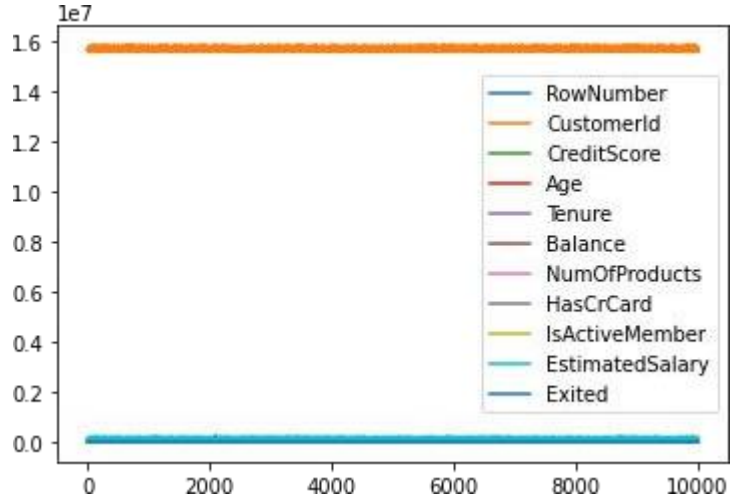
<seaborn.axisgrid.FacetGrid at 0x7f37c0bdabd0>



3.2 Bi-variate

df.plot.line()

<matplotlib.axes._subplots.AxesSubplot at 0x7f37bc8bcd10>



3.3Multi-variate Analysis

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

/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: PasFutureWarning

4. Perform descriptive statistics on the dataset

df.describe()

	RowNumber	CustomerId	CreditScore	Age	Tenure	Bala
count	10000.00000	1.000000e+04	10000.000000	10000.000000	10000.000000	10000.000
mean	5000.50000	1.569094e+07	650.528800	38.921800	5.012800	76485.889
std	2886.89568	7.193619e+04	96.653299	10.487806	2.892174	62397.405
min	1.00000	1.556570e+07	350.000000	18.000000	0.000000	0.000
25%	2500.75000	1.562853e+07	584.000000	32.000000	3.000000	0.000
50%	5000.50000	1.569074e+07	652.000000	37.000000	5.000000	97198.540
75%	7500.25000	1.575323e+07	718.000000	44.000000	7.000000	127644.240
max	10000.00000	1.581569e+07	850.000000	92.000000	10.000000	250898.090

5. Handle the Missing values

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

```
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

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

```
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
```

7. check For Categorical columns and perform encoding

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

	RowNumber	CustomerId	Surname	CreditScore	Geography	Tenure	Balance	NumOf P
0	1	15634602	Hargrave	619	France	2	0.00	
1	2	15647311	Hill	608	Spain	1	83807.86	
2	3	15619304	Onio	502	France	8	159660.80	
3	4	15701354	Boni	699	France	1	0.00	
4	5	15737888	Mitchell	850	Spain	2	125510.82	

5 rows × 84 columns

8. Split the data into dependent and independent variables

8.1 split the data into independent variables

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

```
[[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. Split the data into Dependent variables

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

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

9. Scale the independent variables

```
import pandas as pd
from sklearn.preprocessing import MinMaxScalerScaler =
MinMaxScaler()
df[["RowNumber"]] = Scaler.fit_transform(df[["RowNumber"]])print(df)
```

	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

```
from sklearn.model_selection import train_test_splittrain_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)
```

```
(8000, 13)
(8000,)
(1000, 13)
(1000,)
(1000, 13)
(1000,)
(None, None)
```

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