Assignment -2

Data Visualization and Preprocessing

Assignment Date	19 September 2022
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Maximum Marks	2 Marks

Question-1:

Download the dataset:

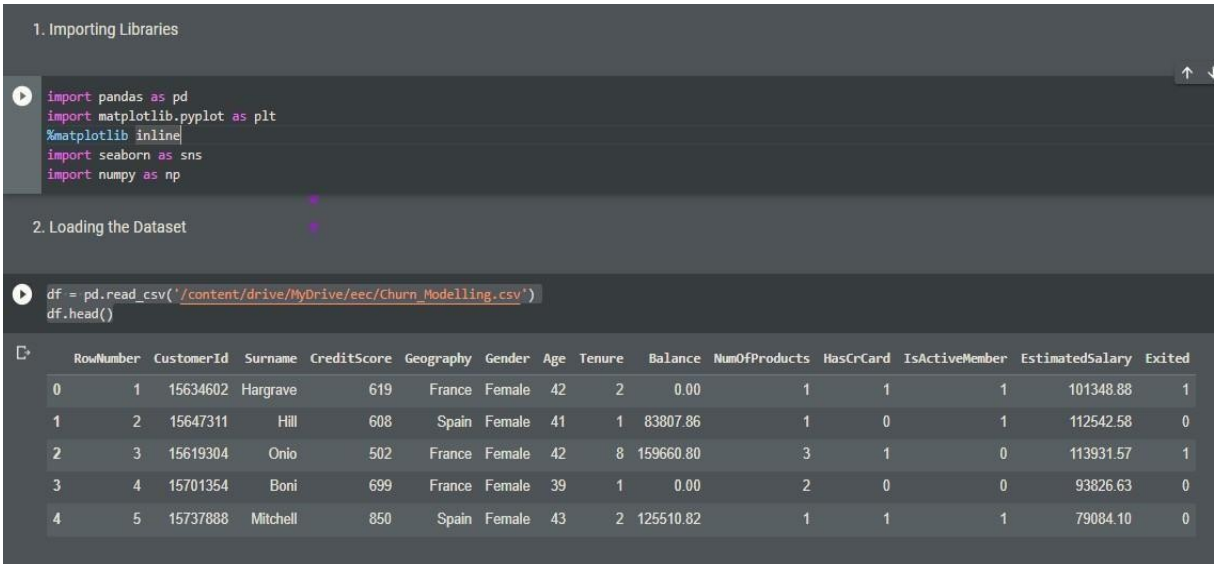
Question-2:

Load the dataset.

Solution:

```
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
import numpy as np

df = pd.read_csv('/content/drive/MyDrive/eec/Churn_Modelling.csv')
df.head()
```



	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

Question-3:

Perform Below Visualizations.

1)Univariate Analysis

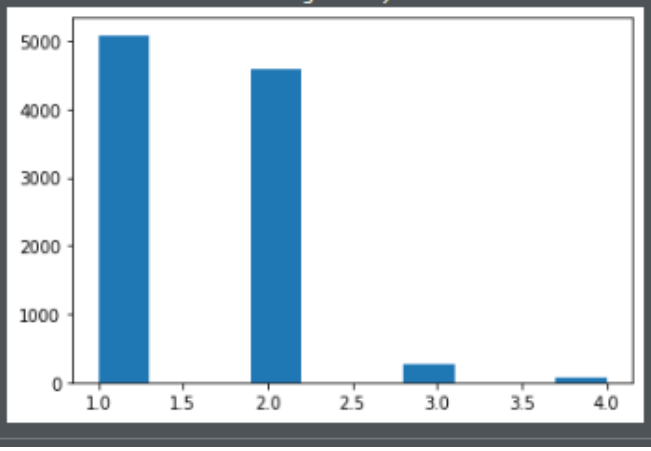
Solution:

plt.hist(df['NumOfProducts'])

Univariate Analysis

```
plt.hist(df['NumOfProducts'])
```

```
(array([5084.,    0.,    0., 4590.,    0.,    0.,  266.,    0.,    0.,
          60.]),
 array([1. , 1.3, 1.6, 1.9, 2.2, 2.5, 2.8, 3.1, 3.4, 3.7, 4. ]),
 <a list of 10 Patch objects>)
```



2)Bi - Variate Analysis

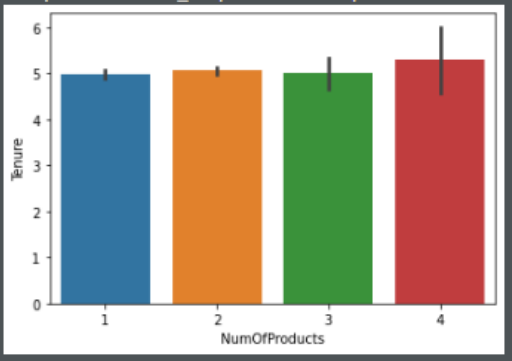
Solution:

sns.barplot(x=df.NumOfProducts,y=df.Tenure)

Bivariate Analysis

```
sns.barplot(x=df.NumOfProducts,y=df.Tenure)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f4e1147f110>
```



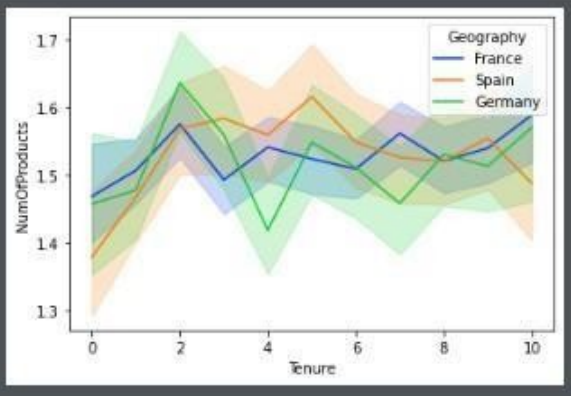
1)Multivariate Analysis

Solution:

```
sns.lineplot(
    x="Tenure",
    y="NumOfProducts",
    data=df,
    palette='bright',
    hue='Geography');
```

Multivariate Anaysis

```
sns.lineplot(
    x="Tenure",
    y="NumOfProducts",
    data=df,
    palette='bright',
    hue='Geography');
```



Question-4:

Perform descriptive statistics on the dataset.

Solution:

```
df.describe()
```

4. Descriptive Statistics

```
df.describe()
```

	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

df.describe(include=['object'])

```
df.describe(include=['object'])
```

	Surname	Geography	Gender
count	10000	10000	10000
unique	2932	3	2
top	Smith	France	Male
freq	32	5014	5457

df.describe(include='all')

```
df.describe(include='all')
```

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
count	10000.00000	1.000000e+04	10000	10000.000000	10000	10000	10000.000000	10000.000000	10000.000000	10000.000000	10000.00000	10000.000000	10000.000000	10000.000000
unique	NaN	NaN	2932	NaN	3	2	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
top	NaN	NaN	Smith	NaN	France	Male	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
freq	NaN	NaN	32	NaN	5014	5457	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
mean	5000.50000	1.569094e+07	NaN	650.528800	NaN	NaN	38.921800	5.012800	76485.889288	1.530200	0.70550	0.515100	100090.239881	0.203700
std	2886.89568	7.193619e+04	NaN	96.653299	NaN	NaN	10.487806	2.892174	62397.405202	0.581654	0.45584	0.499797	57510.492818	0.402769
min	1.00000	1.556570e+07	NaN	350.000000	NaN	NaN	18.000000	0.000000	0.000000	1.000000	0.00000	0.000000	11.580000	0.000000
25%	2500.75000	1.562853e+07	NaN	584.000000	NaN	NaN	32.000000	3.000000	0.000000	1.000000	0.00000	0.000000	51002.110000	0.000000
50%	5000.50000	1.569074e+07	NaN	652.000000	NaN	NaN	37.000000	5.000000	97198.540000	1.000000	1.00000	1.000000	100193.915000	0.000000
75%	7500.25000	1.575323e+07	NaN	718.000000	NaN	NaN	44.000000	7.000000	127644.240000	2.000000	1.00000	1.000000	149388.247500	0.000000
max	10000.00000	1.581569e+07	NaN	850.000000	NaN	NaN	92.000000	10.000000	250898.090000	4.000000	1.00000	1.000000	199992.480000	1.000000

Question-5:

Handle the Missing values.

Solution:

df.fillna(0)

5. Handle the Missing value

```
[ ] df.fillna(0)
```

	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

```
d.isnull(df["HasCrCard"])
```

```
pd.isnull(df["HasCrCard"])

0       False
1       False
2       False
3       False
4       False
        ...
9995    False
9996    False
9997    False
9998    False
9999    False
Name: HasCrCard, Length: 10000, dtype: bool
```

Question-6:

Find the outliers and replace the outliers

Solution:

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

6. Finding the outliers and replace the outliers

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

0        2.0
1        1.0
2        8.0
3        1.0
4        2.0
        ...
9995     5.0
9996    10.0
9997     7.0
9998     3.0
9999     4.0
Name: Tenure, Length: 10000, dtype: float64
```

Question-7:

Check for Categorical columns and perform encoding.

Solution:

```
pd.get_dummies(df, columns=["Tenure","CreditScore"], prefix=["CreditScore","Tenure"]).head()
```

7. Check for categorial columns and perform encoding

```
] pd.get_dummies(df, columns=["Tenure","CreditScore"], prefix=["CreditScore","Tenure"]).head()
```

	RowNumber	CustomerId	Surname	Geography	Gender	Age	Balance	NumOfProducts	HasCrCard	IsActiveMember	...	Tenure_841	Tenure_842	Tenure_843	Tenure_844	Tenure_845	Tenure_846	Tenure_847	Tenure_8
0	1	15634602	Hargrave	France	Female	42	0.00	1	1	1	...	0	0	0	0	0	0	0	
1	2	15647311	Hill	Spain	Female	41	83807.86	1	0	1	...	0	0	0	0	0	0	0	
2	3	15619304	Onio	France	Female	42	159660.80	3	1	0	...	0	0	0	0	0	0	0	
3	4	15701354	Boni	France	Female	39	0.00	2	0	0	...	0	0	0	0	0	0	0	
4	5	15737888	Mitchell	Spain	Female	43	125510.82	1	1	1	...	0	0	0	0	0	0	0	

5 rows × 483 columns

Question-8:

Split the data into dependent and independent variables.

Solution:

Dependent Variable

```
x= df.iloc[:, -2].values
print(x)
```

8. Split the data into dependent and independent variables.

Dependent Variable

```
[ ] x= df.iloc[:, -2].values
    print(x)

    [101348.88 112542.58 113931.57 ...  42085.58  92888.52  38190.78]
```

Independent Variable

```
y= df.iloc[:, :-2].values
print(y)
```

Independent Variable

```
[ ] y= df.iloc[:, :-2].values
    print(y)

    [[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]]
```

Question-9:

Scale the independent variables

Solution:

```
from sklearn.preprocessing import MinMaxScaler
scaler = MinMaxScaler()
df[["Tenure"]] = scaler.fit_transform(df[["Tenure"]])
print(df)
```

9. Scale the Independent variables

```
from sklearn.preprocessing import MinMaxScaler
scaler = MinMaxScaler()
df[["Tenure"]] = scaler.fit_transform(df[["Tenure"]])
print(df)
```

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

      Tenure    Balance  NumOfProducts  HasCrCard  IsActiveMember  \
0        0.2       0.00              1          1               1
1        0.1   83807.86              1          0               1
2        0.8  159660.80              3          1               0
3        0.1       0.00              2          0               0
4        0.2  125510.82              1          1               1
...      ...        ...            ...        ...             ...
9995     0.5       0.00              2          1               0
9996     1.0   57369.61              1          1               1
9997     0.7       0.00              1          0               1
9998     0.3   75075.31              2          1               0
9999     0.4  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
```

Question-10:

Testing and training data

Solution:

```
from sklearn.model_selection import train_test_split
train_size=0.7
X = df.drop(columns = ['CreditScore']).copy()
y = df['CreditScore']
X_train, X_rem, y_train, y_rem = train_test_split(X,y, train_size=0.7)
test_size = 0.4
X_valid, X_test, y_valid, y_test = train_test_split(X_rem,y_rem, test_size=0.4)
print(X_train.shape), print(y_train.shape)
print(X_valid.shape), print(y_valid.shape)
print(X_test.shape), print(y_test.shape)
```