Assignment 2

Data Visualization and Pre-processing

Assignment Date	25 October 2022
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Maximum Marks	2

1.Importing the Required Package

Solution

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

```
[ ] 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("Churn_Modelling.csv")
df
```

```
[ ] df = pd.read_csv("Churn_Modelling.csv")

[ ] df
```

	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

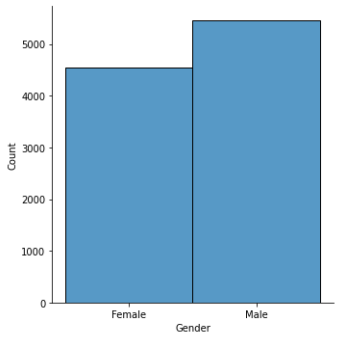
3.1 Univariate Analysis

Solution

```
sns.displot(df.Gender)
```

```
[ ] sns.displot(df.Gender)
```

```
<seaborn.axisgrid.FacetGrid at 0x7fb72626a1d0>
```



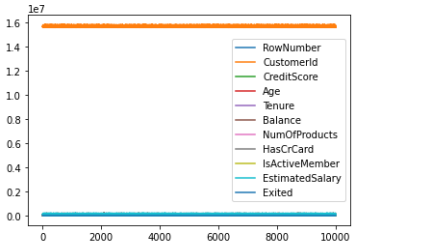
3.2 Bi-Variate Analysis

Solution

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

```
[ ] df.plot.line()
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fb724db2490>
```



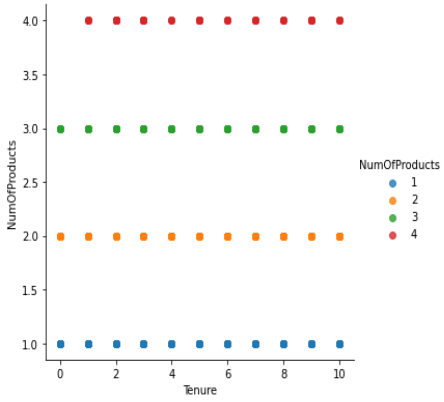
3.3 Multi-Variate Analysis

Solution

```
sns.lmplot("Tenure","NumOfProducts",df,hue="NumOfProducts", fit_
reg=False);
```

```
[ ] sns.lmplot("Tenure","NumOfProducts",df,hue="NumOfProducts", fit_reg=False);
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass the following variables as keyword args: x, y, data. From version 0.12, the
  FutureWarning
```



4. Perform descriptive statistics on the dataset

Solution

```
df.describe()
```

```
[ ] 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

5.Handle the Missing Values.

Solution

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

```
[ ] data = pd.read_csv("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
```

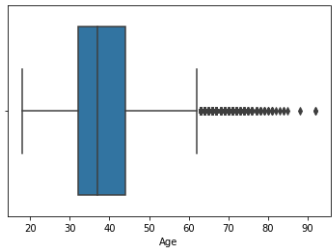
6. Find the outliers and replace the outliers.

Solution

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

```
[13] sns.boxplot(df['Age'])
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only val
  FutureWarning
<matplotlib.axes._subplots.AxesSubplot at 0x7f172a0701d0>
```




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

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

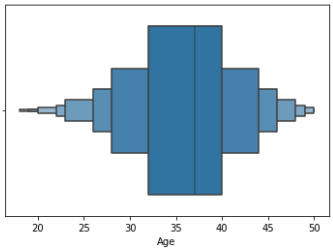
```
[15] df['Age']
```

```
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
```

```
sns.boxenplot(df['Age'])
```

```
[16] sns.boxenplot(df['Age'])
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only val
  FutureWarning
<matplotlib.axes._subplots.AxesSubplot at 0x7f1729cb0590>
```




```
df['Age']=np.where(df['Age']>20,35,df['Age'])
df['Age']
```

```
[17] df['Age']=np.where(df['Age']>20,35,df['Age'])
```

```
df['Age']
```

```
0       35
1       35
2       35
3       35
4       35
        ..
9995    35
9996    35
9997    35
9998    35
9999    35
Name: Age, Length: 10000, dtype: int64
```

7. Check for Categorical columns and perform encoding.

Solution

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

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

	RowNumber	CustomerId	Surname	CreditScore	Geography	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	...	Gender_78	Gender_79	Gender_80	Gende
0	1	15634602	Hargrave	619	France	2	0.00	1	1	1	...	0	0	0	
1	2	15647311	Hill	608	Spain	1	83807.86	1	0	1	...	0	0	0	
2	3	15619304	Onio	502	France	8	159660.80	3	1	0	...	0	0	0	
3	4	15701354	Boni	699	France	1	0.00	2	0	0	...	0	0	0	
4	5	15737888	Mitchell	850	Spain	2	125510.82	1	1	1	...	0	0	0	

5 rows × 84 columns

8. Split the data into dependent and independent variables.

8.1 Split the data into Independent variables.

Solution

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

```
[ ] # independant
    X = df.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]]
```

8.2 Split the data into Dependent variables.

Solution

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

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

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

9. Scale the independent variables

Solution

```
import pandas as pd
from sklearn.preprocessing import MinMaxScaler
scaler = MinMaxScaler()
df[["CustomerId"]] = scaler.fit_transform(df[["CustomerId"]])
print(df)
```

```
[ ] import pandas as pd
    from sklearn.preprocessing import MinMaxScaler
    scaler = MinMaxScaler()
    df[["CustomerId"]] = scaler.fit_transform(df[["CustomerId"]])
    print(df)
```

```
      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

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=0.5)
print(X_train.shape), print(y_train.shape)
print(X_valid.shape), print(y_valid.shape)
print(X_test.shape), print(y_test.shape)
```

```
[ ] 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=0.5)
    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)
```