ASSIGNMENT – 3
Python Programming

| | |
|---|---|
| Assignment Date | 06-10-2022 |
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| Student Roll Number | 923819104028 |
| Maximum Marks | 2 Mark |

Question-1 :

## 1 . Importing Required Package

**Solution :**

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

Question-2 :

## 2. Loading the Dataset

**Solution :**

```
df = pd.read_csv("abalone.csv")
df
```

**Output:**

| | Sex | Length | Diameter | Height | Whole weight | Shucked weight | Viscera weight | Shell weight | Rings |
|---|---|---|---|---|---|---|---|---|---|
| 0 | M | 0.455 | 0.365 | 0.095 | 0.5140 | 0.2245 | 0.1010 | 0.1500 | 15 |
| 1 | M | 0.350 | 0.265 | 0.090 | 0.2255 | 0.0995 | 0.0485 | 0.0700 | 7 |
| 2 | F | 0.530 | 0.420 | 0.135 | 0.6770 | 0.2565 | 0.1415 | 0.2100 | 9 |
| 3 | M | 0.440 | 0.365 | 0.125 | 0.5160 | 0.2155 | 0.1140 | 0.1550 | 10 |
| 4 | I | 0.330 | 0.255 | 0.080 | 0.2050 | 0.0895 | 0.0395 | 0.0550 | 7 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 4172 | F | 0.565 | 0.450 | 0.165 | 0.8870 | 0.3700 | 0.2390 | 0.2490 | 11 |
| 4173 | M | 0.590 | 0.440 | 0.135 | 0.9660 | 0.4390 | 0.2145 | 0.2605 | 10 |
| 4174 | M | 0.600 | 0.475 | 0.205 | 1.1760 | 0.5255 | 0.2875 | 0.3080 | 9 |
| 4175 | F | 0.625 | 0.485 | 0.150 | 1.0945 | 0.5310 | 0.2610 | 0.2960 | 10 |
| 4176 | M | 0.710 | 0.555 | 0.195 | 1.9485 | 0.9455 | 0.3765 | 0.4950 | 12 |

4177 rows × 9 columns

## 3. Visualizations

Question-3 :

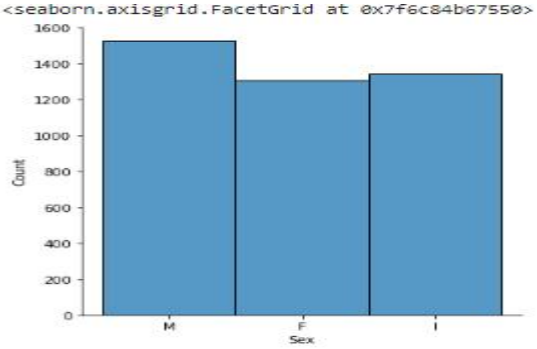
## 3.1 Univariate Analysis

### Solution:

```
sns.displot(df.Sex)
```

### Output:

```
<seaborn.axisgrid.FacetGrid at 0x7f6c84b67550>
```



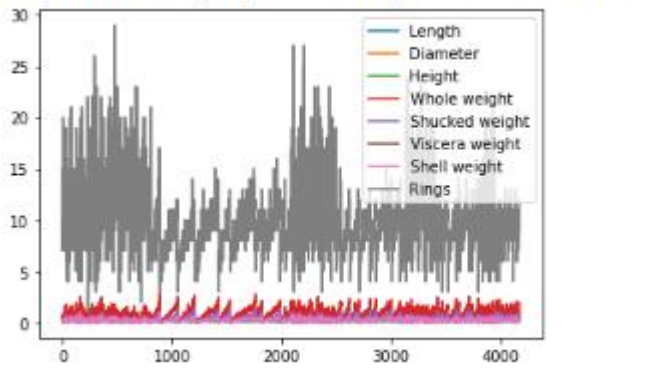

## 3.2 Bi-Variate Analysis

### Solution:

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

### Output:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f6c81d866d0>
```

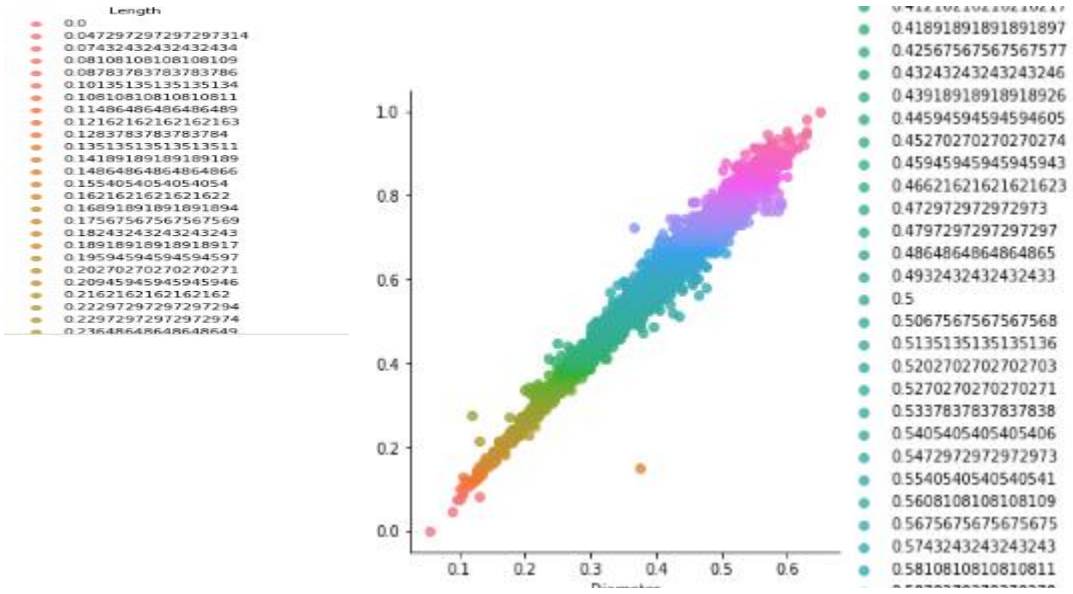



## 3.3 Multi - Variate Analysis

**Solution:**

```
sns.lmplot("Diameter","Length",df,hue="Length", fit_reg=False);
```

**Output:**




**4. Perform descriptive statistics on the dataset.**

Question-4 :

**Solution:**

```
df.describe()
```

**Output:**

| | Length | Diameter | Height | Whole weight | Shucked weight | Viscera weight | Shell weight | Rings |
|---|---|---|---|---|---|---|---|---|
| count | 4177.000000 | 4177.000000 | 4177.000000 | 4177.000000 | 4177.000000 | 4177.000000 | 4177.000000 | 4177.000000 |
| mean | 0.523992 | 0.407881 | 0.139516 | 0.828742 | 0.359367 | 0.180594 | 0.238831 | 9.933684 |
| std | 0.120093 | 0.099240 | 0.041827 | 0.490389 | 0.221963 | 0.109614 | 0.139203 | 3.224169 |
| min | 0.075000 | 0.055000 | 0.000000 | 0.002000 | 0.001000 | 0.000500 | 0.001500 | 1.000000 |
| 25% | 0.450000 | 0.350000 | 0.115000 | 0.441500 | 0.186000 | 0.093500 | 0.130000 | 8.000000 |
| 50% | 0.545000 | 0.425000 | 0.140000 | 0.799500 | 0.336000 | 0.171000 | 0.234000 | 9.000000 |
| 75% | 0.615000 | 0.480000 | 0.165000 | 1.153000 | 0.502000 | 0.253000 | 0.329000 | 11.000000 |
| max | 0.815000 | 0.650000 | 1.130000 | 2.825500 | 1.488000 | 0.760000 | 1.005000 | 29.000000 |

**5. Handle the Missing values.**

Question-5 :

**Solution:**

```
data = pd.read_csv("abalone.csv")
pd.isnull(data["Sex"])
```

**Output:**

```
0       False
1       False
2       False
3       False
4       False
        ...
4172    False
4173    False
4174    False
4175    False
4176    False
Name: Sex, Length: 4177, dtype: bool
```

Question-6:

**6. Find the outliers and replace the outliers.**

**Solution:**

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

**Output:**

```
0       <function median at 0x7f6c9fd64cb0>
1                                         7
2                                         9
3                                        10
4                                         7
                       ...
4172    <function median at 0x7f6c9fd64cb0>
4173                                     10
4174                                      9
4175                                     10
4176    <function median at 0x7f6c9fd64cb0>
Name: Rings, Length: 4177, dtype: object
```

Question-7 :

**7. Check for Categorical columns and perform encoding.**

**Solution:**

```
pd.get_dummies(df, columns=["Sex", "Length"], prefix=["Length", "Sex"])
.head()
```

**Output:**

| | Diameter | Height | Whole weight | Shucked weight | Viscera weight | Shell weight | Rings | Length_F | Length_I | Length_M | ... | Sex_0.745 | Sex_0.75 | Sex_0.755 | Sex_0.76 | Sex_0.765 | Sex_0.77 | Sex_0.775 | Sex_0.78 | Sex_0.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.365 | 0.095 | 0.5140 | 0.2245 | 0.1010 | 0.150 | <function median at 0x7f6c9fd64cb0> | 0 | 0 | 1 | ... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0.265 | 0.090 | 0.2255 | 0.0995 | 0.0485 | 0.070 | 7 | 0 | 0 | 1 | ... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0.420 | 0.135 | 0.6770 | 0.2565 | 0.1415 | 0.210 | 9 | 1 | 0 | 0 | ... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 0.365 | 0.125 | 0.5160 | 0.2155 | 0.1140 | 0.155 | 10 | 0 | 0 | 1 | ... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 0.255 | 0.080 | 0.2050 | 0.0895 | 0.0395 | 0.055 | 7 | 0 | 1 | 0 | ... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

5 rows × 144 columns

Question-8:

**8. Split the data into dependent and independent variables**

### 8.1 Split the data into Independent variables.

**Solution:**

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

**Output:**

```
[['M' 0.455 0.365 ... 0.514 0.2245 0.101]
 ['M' 0.35 0.265 ... 0.2255 0.0995 0.0485]
 ['F' 0.53 0.42 ... 0.677 0.2565 0.1415]
 ...
 ['M' 0.6 0.475 ... 1.176 0.5255 0.2875]
 ['F' 0.625 0.485 ... 1.0945 0.531 0.261]
 ['M' 0.71 0.555 ... 1.9485 0.9455 0.3765]]
```

### 8.2 Split the data into Dependent variables.

**Solution:**

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

**Output:**

```
[<function median at 0x7f6c9fd64cb0> 7 9 ... 9 10
 <function median at 0x7f6c9fd64cb0>]
```

Question-9 :

### 9. Scale the independent variables

**Solution:**

```
import pandas as pd
from sklearn.preprocessing import MinMaxScaler
scaler = MinMaxScaler()
```

```
df[["Length"]] = scaler.fit_transform(df[["Length"]])
print(df)
```

**Output:**

```
     Sex    Length  Diameter  Height  Whole weight  Shucked weight  \
0      M  0.513514     0.365   0.095        0.5140          0.2245
1      M  0.371622     0.265   0.090        0.2255          0.0995
2      F  0.614865     0.420   0.135        0.6770          0.2565
3      M  0.493243     0.365   0.125        0.5160          0.2155
4      I  0.344595     0.255   0.080        0.2050          0.0895
...   ..       ...       ...     ...           ...             ...
4172   F  0.662162     0.450   0.165        0.8870          0.3700
4173   M  0.695946     0.440   0.135        0.9660          0.4390
4174   M  0.709459     0.475   0.205        1.1760          0.5255
4175   F  0.743243     0.485   0.150        1.0945          0.5310
4176   M  0.858108     0.555   0.195        1.9485          0.9455

      Viscera weight  Shell weight                                Rings
0             0.1010        0.1500  <function median at 0x7f6c9fd64cb0>
1             0.0485        0.0700                                   7
2             0.1415        0.2100                                   9
3             0.1140        0.1550                                  10
4             0.0395        0.0550                                   7
...              ...           ...                                 ...
4172          0.2390        0.2490  <function median at 0x7f6c9fd64cb0>
4173          0.2145        0.2605                                  10
4174          0.2875        0.3080                                   9
4175          0.2610        0.2960                                  10
4176          0.3765        0.4950  <function median at 0x7f6c9fd64cb0>

[4177 rows x 9 columns]
```

Question-10 :

### 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 = ['Sex']).copy()
y = df['Sex']
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)
```

## Output:

```
(3341, 8)
(3341,)
(418, 8)
(418,)
(418, 8)
(418,)
(None, None)
```

## 11.Build the Model

```
test_size = 0.33
seed = 7
X_train, X_test, y_train, y_test =  train_test_split(X, y, test_size=test_
size, random_state=seed)
```

## 12.Train the model

```
X_train
```

## Output:

| | Length | Diameter | Height | Whole weight | Shucked weight | Viscera weight | Shell weight | Rings |
|---|---|---|---|---|---|---|---|---|
| **4131** | 0.682432 | 0.425 | 0.145 | 0.8300 | 0.3790 | 0.1605 | 0.2575 | <function median at 0x7f6c9fd64cb0> |
| **3204** | 0.797297 | 0.530 | 0.185 | 1.3955 | 0.4560 | 0.3205 | 0.4900 | <function median at 0x7f6c9fd64cb0> |
| **2622** | 0.844595 | 0.575 | 0.205 | 1.7975 | 0.7295 | 0.3935 | 0.5165 | <function median at 0x7f6c9fd64cb0> |
| **2114** | 0.074324 | 0.095 | 0.035 | 0.0105 | 0.0050 | 0.0065 | 0.0035 | 4 |
| **1422** | 0.871622 | 0.575 | 0.215 | 2.1730 | 0.9515 | 0.5640 | 0.5365 | <function median at 0x7f6c9fd64cb0> |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... |
| **1372** | 0.729730 | 0.475 | 0.165 | 1.0230 | 0.4905 | 0.1955 | 0.3035 | <function median at 0x7f6c9fd64cb0> |
| **919** | 0.452703 | 0.310 | 0.090 | 0.3335 | 0.1635 | 0.0610 | 0.0910 | 6 |
| **2550** | 0.277027 | 0.220 | 0.080 | 0.1315 | 0.0660 | 0.0240 | 0.0300 | 5 |
| **537** | 0.290541 | 0.230 | 0.075 | 0.1165 | 0.0430 | 0.0255 | 0.0400 | 7 |
| **1220** | 0.344595 | 0.250 | 0.095 | 0.2085 | 0.1020 | 0.0395 | 0.0520 | 7 |

2798 rows × 8 columns

```
y_train
```

## Output:

```
4131    I
3204    F
2622    F
2114    I
1422    M
       ..
1372    F
919     I
2550    I
537     M
1220    I
Name: Sex, Length: 2798, dtype: object
```

## 13.Test the model:

```
X_test
```

## Output:

| | Length | Diameter | Height | Whole weight | Shucked weight | Viscera weight | Shell weight | Rings |
|---|---|---|---|---|---|---|---|---|
| **1157** | 0.716216 | 0.470 | 0.165 | 1.1775 | 0.6110 | 0.2275 | 0.2920 | 9 |
| **1125** | 0.641892 | 0.425 | 0.150 | 0.8315 | 0.4110 | 0.1765 | 0.2165 | 10 |
| **2053** | 0.520270 | 0.345 | 0.110 | 0.4595 | 0.2350 | 0.0885 | 0.1160 | 7 |
| **3591** | 0.777027 | 0.475 | 0.165 | 1.3875 | 0.5800 | 0.3485 | 0.3095 | 9 |
| **455** | 0.675676 | 0.470 | 0.140 | 0.8375 | 0.3485 | 0.1735 | 0.2400 | <function median at 0x7f6c9fd64cb0> |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... |
| **3150** | 0.783784 | 0.505 | 0.165 | 1.3670 | 0.5835 | 0.3515 | 0.3960 | 10 |
| **3037** | 0.655405 | 0.450 | 0.145 | 0.8940 | 0.3885 | 0.2095 | 0.2640 | 9 |
| **2050** | 0.506757 | 0.350 | 0.130 | 0.4655 | 0.2075 | 0.1045 | 0.1350 | 8 |
| **1690** | 0.743243 | 0.500 | 0.170 | 1.0985 | 0.4645 | 0.2200 | 0.3540 | 9 |
| **253** | 0.675676 | 0.460 | 0.185 | 1.0940 | 0.4485 | 0.2170 | 0.3450 | <function median at 0x7f6c9fd64cb0> |

1379 rows × 8 columns

```
y_test
```

## Output:

```
1157    F
1125    M
2053    M
3591    F
455     M
       ..
3150    F
3037    M
2050    M
1690    M
253     F
Name: Sex, Length: 1379, dtype: object
```

## 14.Measure the performance using Metrics

```
from sklearn.metrics import r2_score
from sklearn.metrics import mean_absolute_error
from sklearn.metrics import mean_squared_error
X_train = [5, -1, 2, 10]
y_test = [3.5, -0.9, 2, 9.9]
print ('R Squared =',r2_score(X_train, y_test))
print ('MAE =',mean_absolute_error(X_train, y_test))
print ('MSE =',mean_squared_error(X_train, y_test))
```

**Output:**

```
R Squared = 0.9656060606060606
MAE = 0.42499999999999993
MSE = 0.5674999999999999
```