

PREDICTING THE ENERGY OUTPUT OF WIND TURBINE BASED ON WEATHER CONDITION

ASSIGNMENT - 3

Date	4th October 2022
Team ID	PNT2022TMID54445
Student Name	N.SUDHARSHANA RAM (310619106147)
Domain Name	Education
Project Name	PREDICTING THE ENERGY OUTPUT OF Wind TURBINE BASED ON WEATHER CONDITION
Maximum Marks	2 Marks

1.)IMPORT THE REQUIRED LIBRARIES

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```
In [1]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

2.)DOWNLOAD AND UPLOAD THE DATASET

2.)DOWNLOAD AND UPLOAD THE DATASET INTO THE TOOL

```
In [2]: df = pd.read_csv('abalone.csv')
df.head()
```

Out[2]:

	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	0.150	15
1	M	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7
2	F	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9
3	M	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10
4	I	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7

3.)HANDLE MISSING VALUES AND DEAL WITH THEM

3.)CHECK FOR MISSING VALUES AND DEAL WITH THEM

```
In [3]: df.isnull().sum()
```

```
Out[3]: Sex          0
Length        0
Diameter      0
Height        0
Whole weight  0
Shucked weight 0
Viscera weight 0
Shell weight  0
Rings         0
dtype: int64
```

4.) PERFORM THE DESCRIPTIVE STATISTICS ON THE DATASET

4.)PERFORM DESCRIPTIVE STATISTICS ON THE DATASET

```
In [4]: df.describe()
```

```
Out[4]:
```

	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

```
In [5]: df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4177 entries, 0 to 4176
Data columns (total 9 columns):
#   Column             Non-Null Count  Dtype
---  ---
0   Sex                 4177 non-null   object
1   Length              4177 non-null   float64
2   Diameter            4177 non-null   float64
3   Height              4177 non-null   float64
4   Whole weight        4177 non-null   float64
5   Shucked weight      4177 non-null   float64
6   Viscera weight      4177 non-null   float64
7   Shell weight        4177 non-null   float64
8   Rings               4177 non-null   int64
dtypes: float64(7), int64(1), object(1)
memory usage: 293.8+ KB
```

5.) PERFORM VARIOUS VISUALISATIONS

a.) UNIVARIANTE ANALYSIS

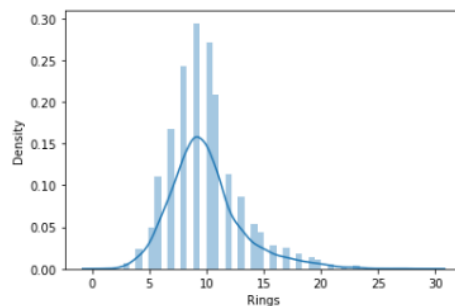
5.)PERFORM VISUALIZATIONS

a.)UNIVARIANTE ANALYSIS

In [6]: `sns.distplot(df.Rings)`

C:\Users\Prem\anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).
warnings.warn(msg, FutureWarning)

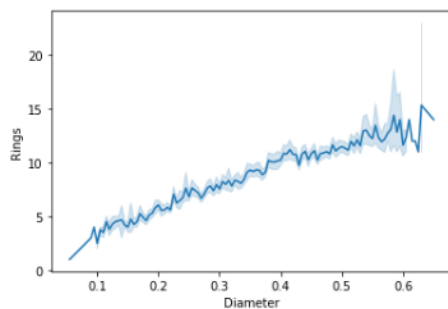
Out[6]: <AxesSubplot:xlabel='Rings', ylabel='Density'>



In [7]: `sns.lineplot(df.Diameter,df.Rings)`

C:\Users\Prem\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variables as keyword arguments: x, y. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn()

Out[7]: <AxesSubplot:xlabel='Diameter', ylabel='Rings'>



```
In [8]: plt.pie(df.Sex.value_counts(), [0.05, 0.05, 0.05], colors=['red', 'green', 'blue'], labels=['Male', 'Female', 'Infant'], autopct='%1.1f%%',
plt.title('Sex')
plt.shcm()
```

```
In [9]: sns.barplot(df.Rings.value_counts().index, df.Rings.value_counts())
```

C:\Users\Prent\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the `hue` var names as keyword arguments: `sns.barplot(x=x, y=y, hue=hue)` instead of `sns.barplot(x=x, y=y, hue=hue)` to avoid this warning. The only valid positional argument will be `data`, and passing other arguments without an explicit `data` keyword will result in an error or misinterpretation.

```
Out[9]: <AxesSubplot:ylabel='Rings'>
```

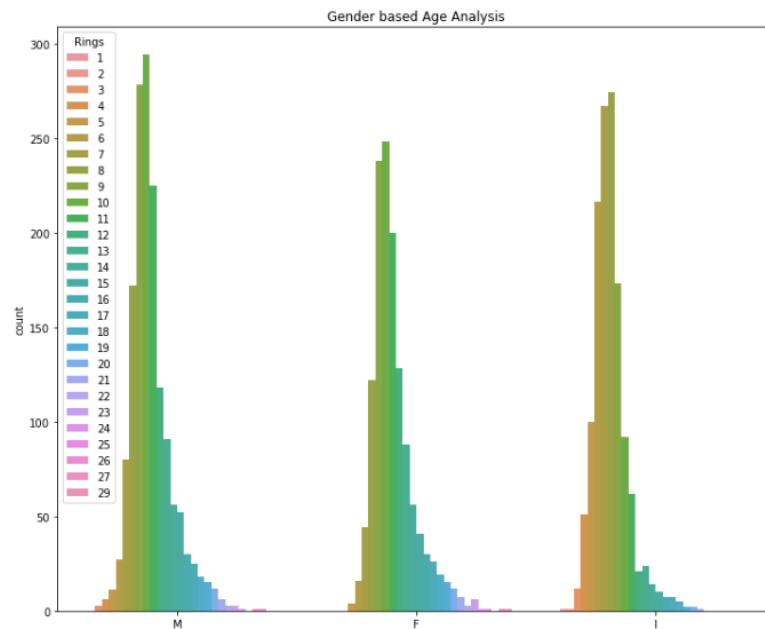
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

b.) BI - VARIANTE ANALYSIS

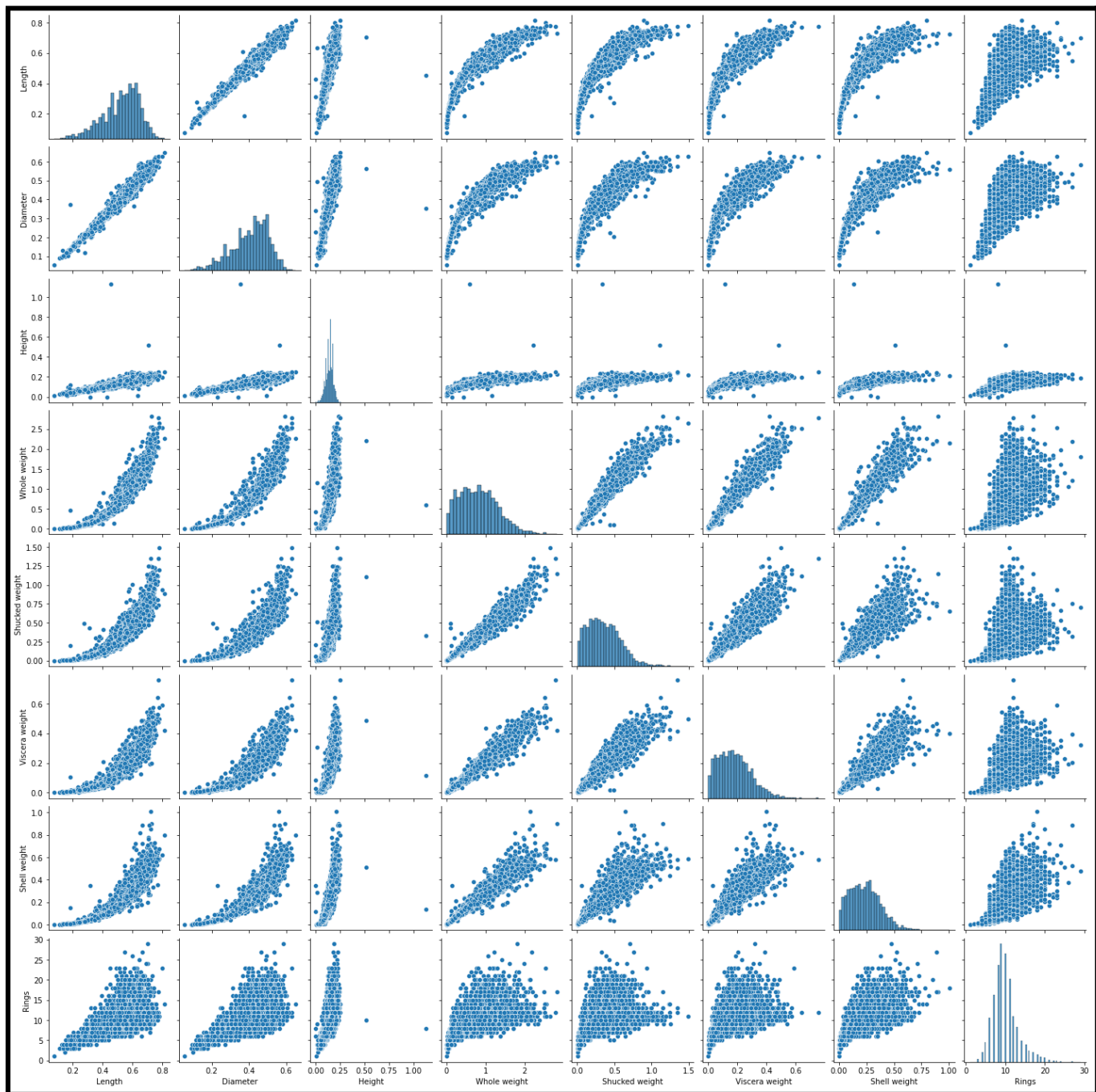
b.)BI-VARIANTE ANALYSIS

```
In [10]: def countplot_2(x,hue,title=None,figsize=(12,10)):  
plt.figure(figsize=figsize)  
sns.countplot(data=df[[x,hue]],x=x,hue=hue)  
plt.title(title)  
plt.show()
```

```
In [11]: countplot_2('Sex','Rings','Gender based Age Analysis')
```



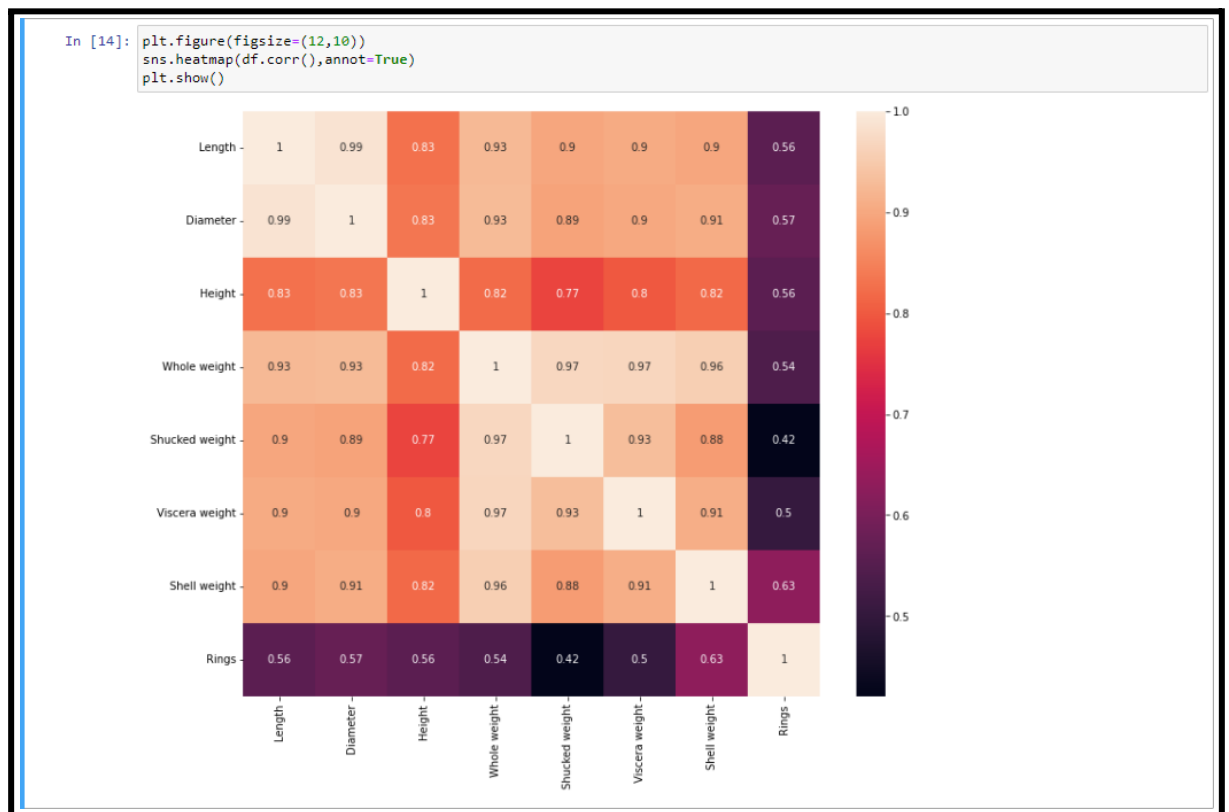
c.) MULTI - VARIANTE ANALYSIS



In [13]: `df.corr()`

Out[13]:

	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
Length	1.000000	0.986812	0.827554	0.925261	0.897914	0.903018	0.897706	0.556720
Diameter	0.986812	1.000000	0.833684	0.925452	0.893162	0.899724	0.905330	0.574660
Height	0.827554	0.833684	1.000000	0.819221	0.774972	0.798319	0.817338	0.557467
Whole weight	0.925261	0.925452	0.819221	1.000000	0.969405	0.966375	0.955355	0.540390
Shucked weight	0.897914	0.893162	0.774972	0.969405	1.000000	0.931961	0.882617	0.420884
Viscera weight	0.903018	0.899724	0.798319	0.966375	0.931961	1.000000	0.907656	0.503819
Shell weight	0.897706	0.905330	0.817338	0.955355	0.882617	0.907656	1.000000	0.627574
Rings	0.556720	0.574660	0.557467	0.540390	0.420884	0.503819	0.627574	1.000000

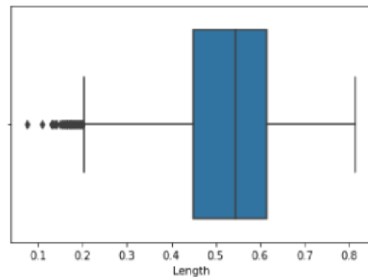


6.) FIND AND REPLACE THE OUTLIERS

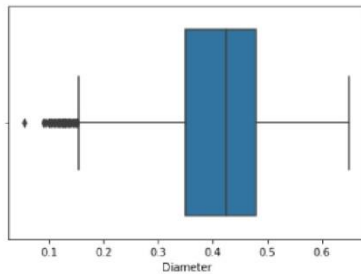
6.)FIND THE OUTLIERS AND REPLACE THE OUTLIERS

```
In [15]: for i in df.columns.drop('Sex'):  
         sns.boxplot(df[i])  
         plt.show()
```

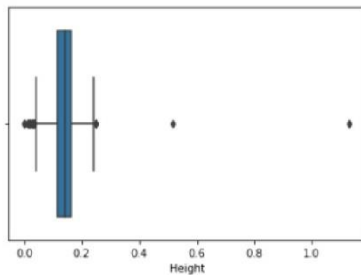
C:\Users\Prem\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword argument: x. From version 0.12, the only valid positional argument will be 'data', and passing other arguments without an explicit key word will result in an error or misinterpretation.
warnings.warn()



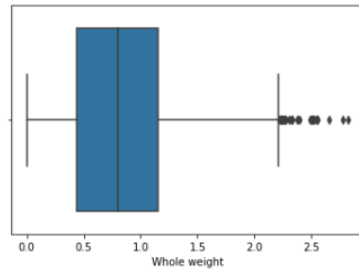
C:\Users\Prem\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword argument: x. From version 0.12, the only valid positional argument will be 'data', and passing other arguments without an explicit key word will result in an error or misinterpretation.
warnings.warn()



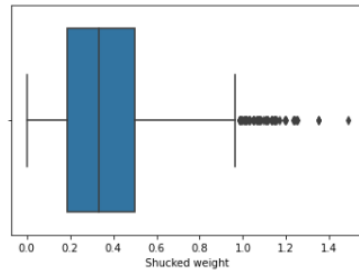
C:\Users\Prem\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword argument: x. From version 0.12, the only valid positional argument will be 'data', and passing other arguments without an explicit key word will result in an error or misinterpretation.
warnings.warn()



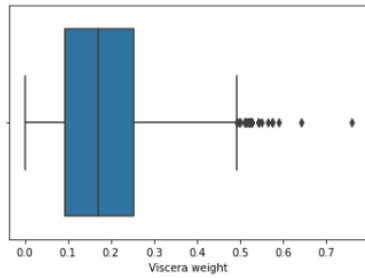

```
C:\Users\Prem\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword argument: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



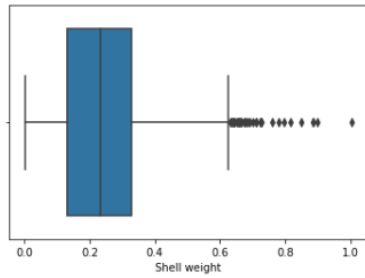
```
C:\Users\Prem\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword argument: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



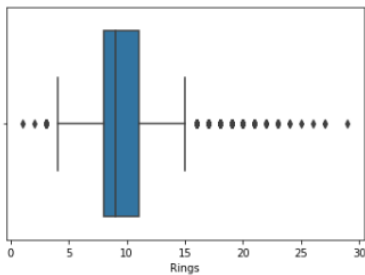
```
C:\Users\Prem\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword argument: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



```
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warnings.warn(
```



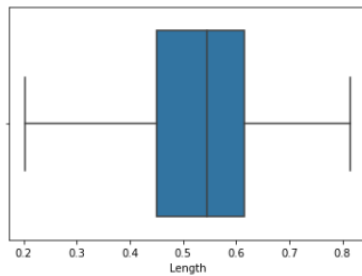
```
C:\Users\Prem\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword argument: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



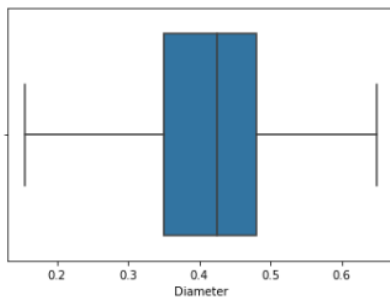
```
In [16]: for i in df.columns.drop('Sex'):
         Q1 = df[i].quantile(0.25)
         Q3 = df[i].quantile(0.75)
         IQR = Q3-Q1
         upper_limit = Q3 + (1.5*IQR)
         lower_limit = Q1 - (1.5*IQR)
         df[i] = np.where(df[i]>upper_limit,Q3 + (1.5*IQR),df[i])
         df[i] = np.where(df[i]<=lower_limit,Q1 - (1.5*IQR),df[i])
```

```
In [17]: for i in df.columns.drop('Sex'):
         sns.boxplot(df[i])
         plt.show()
```

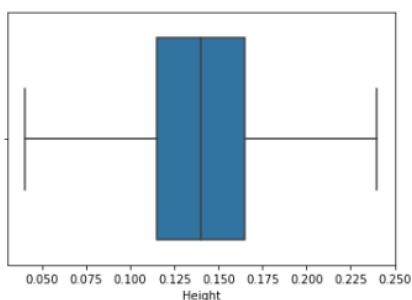
C:\Users\Prem\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword argument: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit key word will result in an error or misinterpretation.



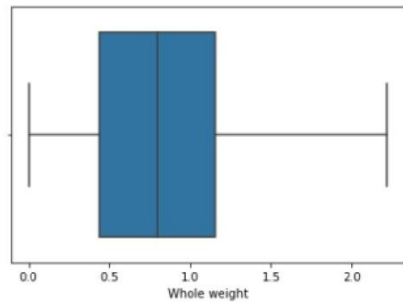
C:\Users\Prem\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword argument: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit key word will result in an error or misinterpretation.



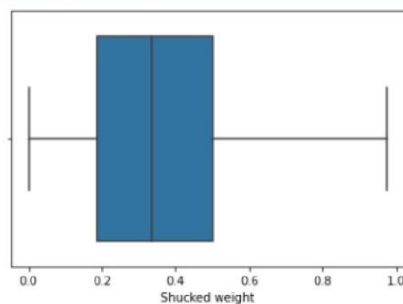
C:\Users\Prem\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword argument: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit key word will result in an error or misinterpretation.



```
C:\Users\Prem\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword argument: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



```
C:\Users\Prem\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword argument: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



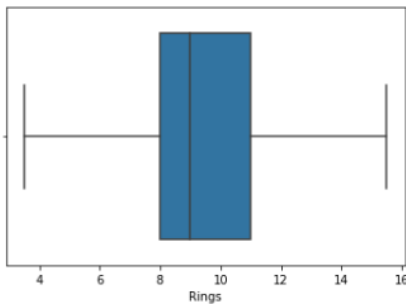
```
C:\Users\Prem\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword argument: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```

e.o or oz or a< es

```
C:\Users\Prem\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword argument: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```

e.o e.i o.z e.z e.s es es

C:\Users\Prem\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword argument: x. From version 0.12, the only valid positional argument will be 'data', and passing other arguments without an explicit keyword will result in an error or misinterpretation.



7.) CHECK FOR CATEGORICAL COLUMNS AND ENCODE THEM

7.)CHECK FOR CATEGORICAL COLUMNS AND PERFORM ENCODING

```
In [18]: from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
df.Sex = le.fit_transform(df.Sex)
```

```
In [19]: df.head()
```

```
Out[19]:
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	2	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15.0
1	2	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7.0
2	0	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9.0
3	2	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10.0
4	1	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7.0

8.)SPLIT DATA INTO DEPENDENT AND INDEPENDENTVARIABLES

8.)SPLIT THE DATA INTO DEPENDENT AND INDEPENDENT VARIABLES

```
In [20]: X = df.drop(columns=['Rings'])
X.head()
```

```
Out[20]:
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight
0	2	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150
1	2	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070
2	0	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210
3	2	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155
4	1	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055

```
In [21]: Y = df.Rings
Y.head()
```

```
Out[21]: 0    15.0
1     7.0
2     9.0
3    10.0
4     7.0
Name: Rings, dtype: float64
```

9.) SCALE THE INDEPENDENT VARIABLES

9.)SCALE THE INDEPENDENT VARIABLES

```
In [22]: from sklearn.preprocessing import MinMaxScaler
scale = MinMaxScaler()
X_scaled = pd.DataFrame(scale.fit_transform(X),columns=X.columns)
X_scaled.head()
```

```
Out[22]:
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight
0	1.0	0.412245	0.424242	0.275	0.230813	0.229231	0.204372	0.237220
1	1.0	0.240816	0.222222	0.250	0.100755	0.101026	0.097611	0.109425
2	0.0	0.534694	0.535354	0.475	0.304294	0.262051	0.286731	0.333067
3	1.0	0.387755	0.424242	0.425	0.231714	0.220000	0.230808	0.245208
4	0.5	0.208163	0.202020	0.200	0.091514	0.090769	0.079309	0.085463

10.)SPLIT THE DATA INTO TRAINING AND TESTING

10.)SPLIT THE DATA INTO TRAINING AND TESTING DATA

```
In [23]: from sklearn.model_selection import train_test_split
x_train , x_test , y_train , y_test = train_test_split(X_scaled,Y,test_size=0.2,random_state=0)
```

11.) BUILD THEMODEL

11.)BUILD THE MODEL

```
In [24]: from sklearn.linear_model import LinearRegression
model = LinearRegression()
```

12.) TRAIN THEMODEL

12.)TRAIN THE MODEL

```
In [25]: model.fit(x_train,y_train)
```

```
Out[25]: LinearRegression()
```

13.) TEST THE MODEL

13.)TEST THE MODEL

```
In [26]: y_predict = model.predict(x_test)
```

```
In [27]: pd.DataFrame({"Actual":y_test,"Predicted":y_predict.round(0)})
```

Out[27]:

	Actual	Predicted
668	13.0	13.0
1580	8.0	9.0
3784	11.0	10.0
463	5.0	5.0
2615	12.0	10.0
...
575	11.0	10.0
3231	12.0	9.0
1084	7.0	9.0
290	15.5	12.0
2713	4.0	6.0

836 rows × 2 columns

14.) MEASURE THE PERFORMANCE USING METRICS

14.)MEASURE THE PERFORMANCE USING METRICS

```
In [28]: from sklearn import metrics  
metrics.r2_score(y_test,y_predict)
```

Out[28]: 0.58432381444787