1) IMPORT THE REQUIRED LIBRARIES

In [3]:

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

2) LOAD THE DATASET INTO THE TOOL

In [4]:

```
df = pd.read_csv('abalone.csv')
df.head()
```

Out[4]:

	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) PERFORM VISUALIZATIONS

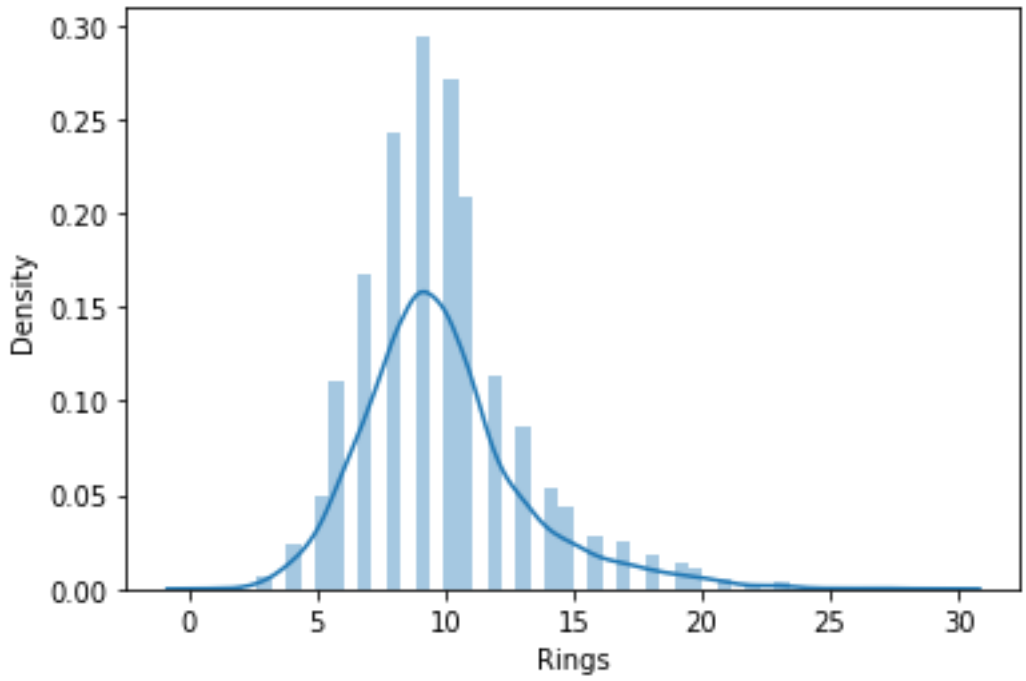
UNIVARIATE ANALYSIS

In [5]:

```
sns.distplot(df.Rings)
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureW
arning: `distplot` is a deprecated function and will be removed in a future v
ersion. Please adapt your code to use either `displot` (a figure-level functi
on with similar flexibility) or `histplot` (an axes-level function for histog
rams).
  warnings.warn(msg, FutureWarning)
```

Out[5]:

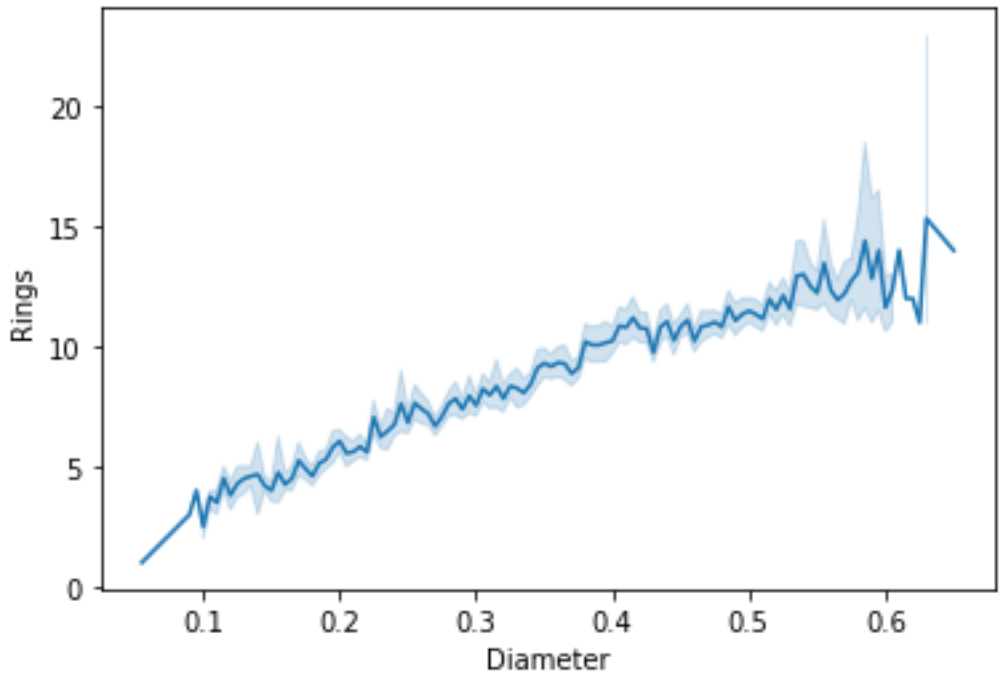


In [6]:

```
sns.lineplot(df.Diameter,df.Rings)
```

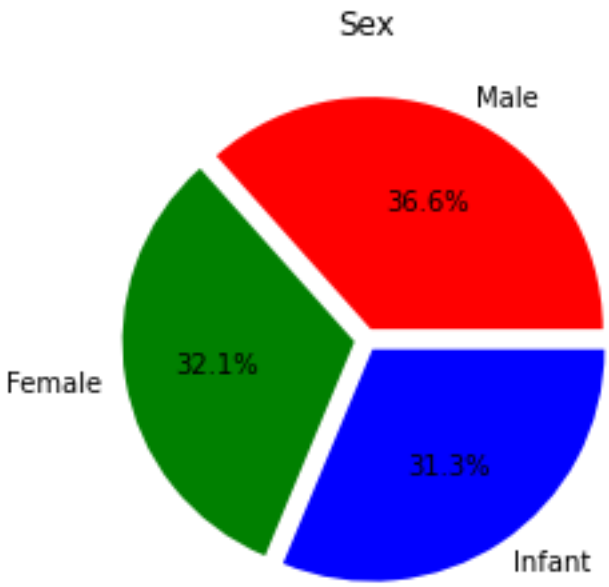
```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarni
ng: Pass the following variables as keyword args: x, y. From version 0.12, th
e only valid positional argument will be `data`, and passing other arguments
without an explicit keyword will result in an error or misinterpretation.
  FutureWarning
```

Out[6]:



In [7]:

```
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.show()
```

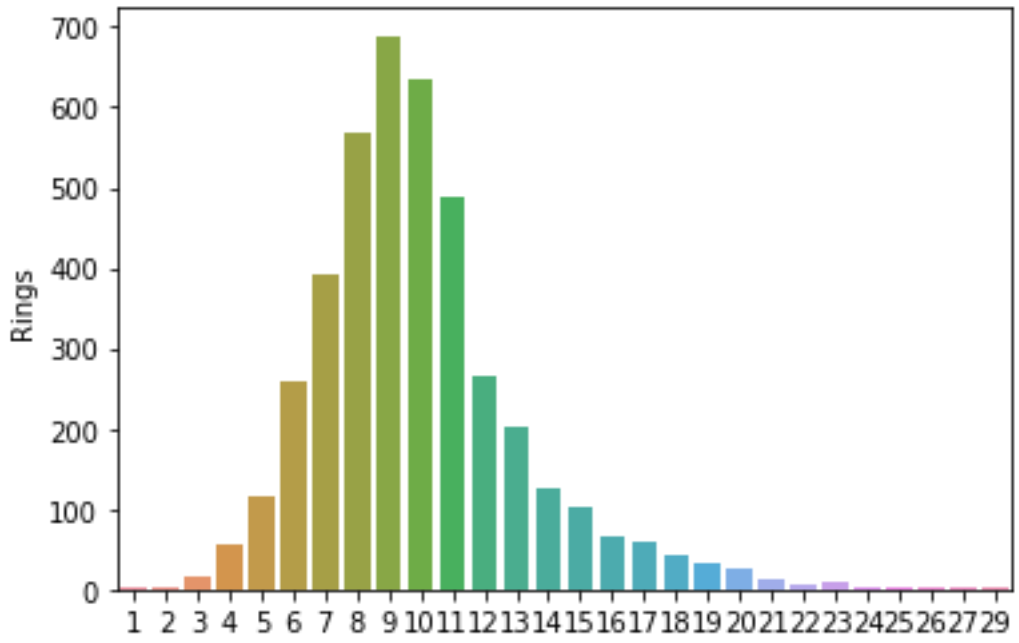


In [8]:

```
sns.barplot(df.Rings.value_counts().index,df.Rings.value_counts())
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarni
ng: Pass the following variables as keyword args: x, y. From version 0.12, th
e only valid positional argument will be `data`, and passing other arguments
without an explicit keyword will result in an error or misinterpretation.
  FutureWarning
```

Out[8]:



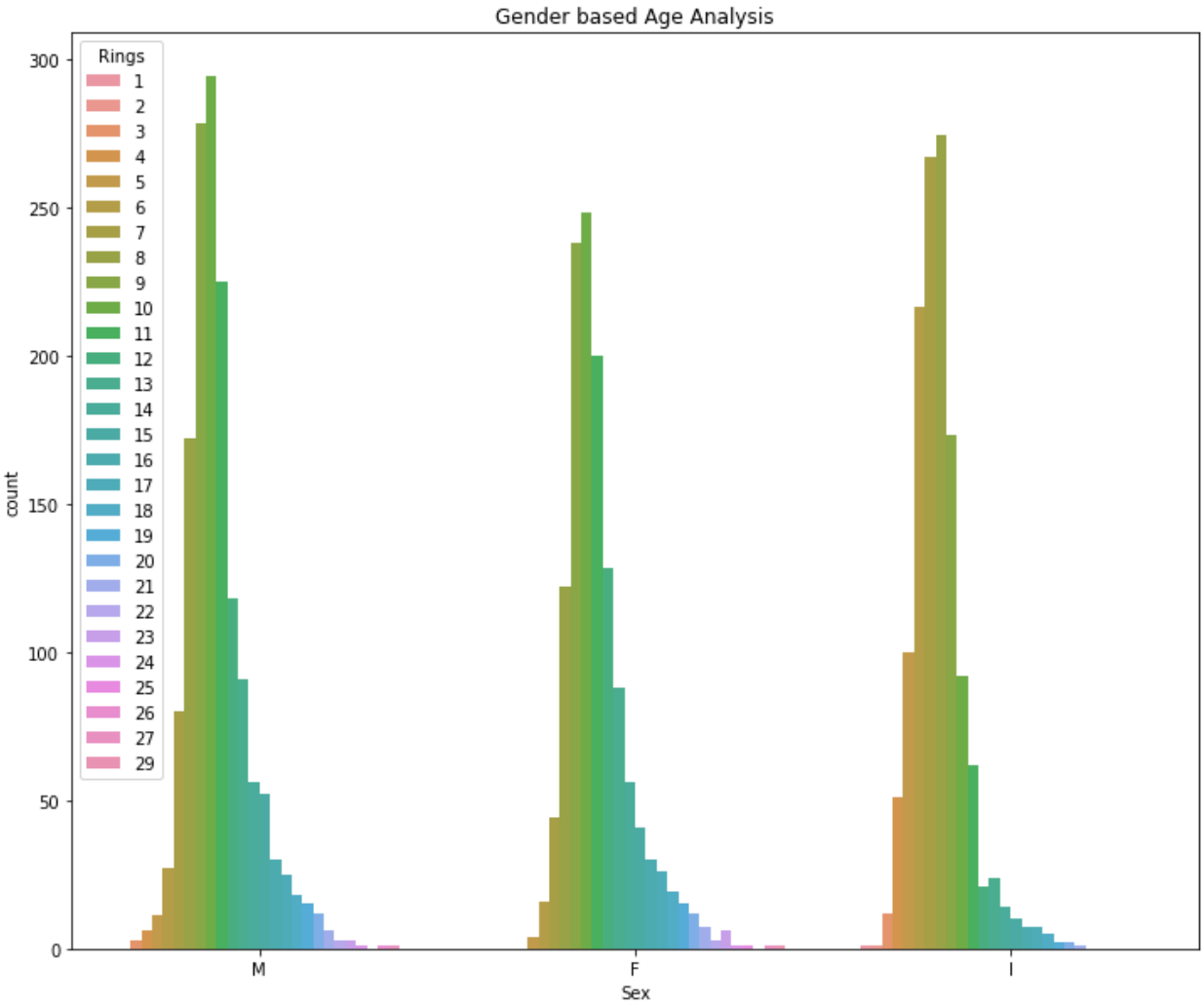
BI-VARIATE ANALYSIS

In [11]:

```
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 [12]:

```
countplot_2('Sex','Rings','Gender based Age Analysis')
```

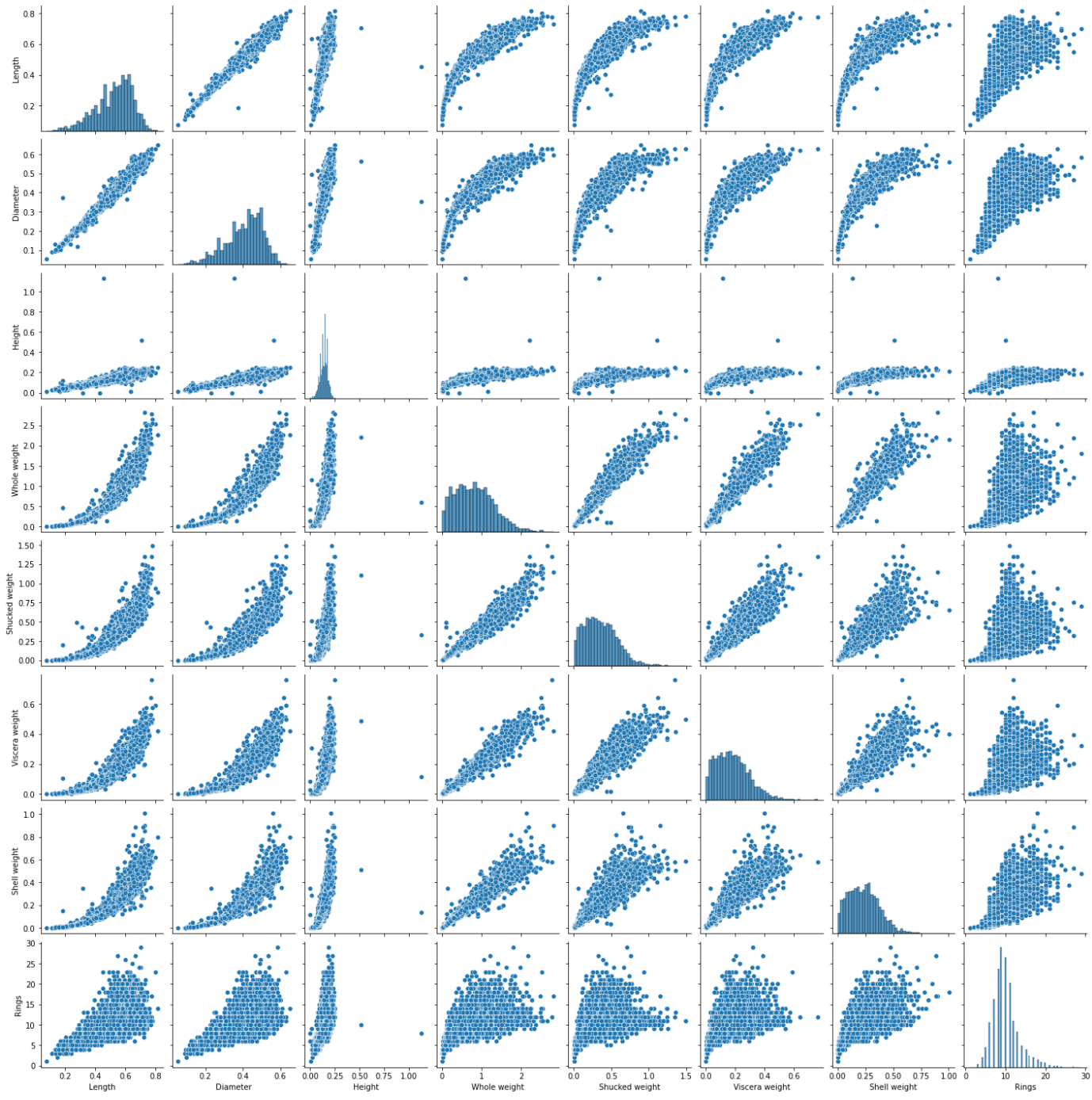


MULTIVARIATE ANALYSIS

In [13]:

```
sns.pairplot(df)
```

Out[13]:



In [14]:

```
df.corr()
```

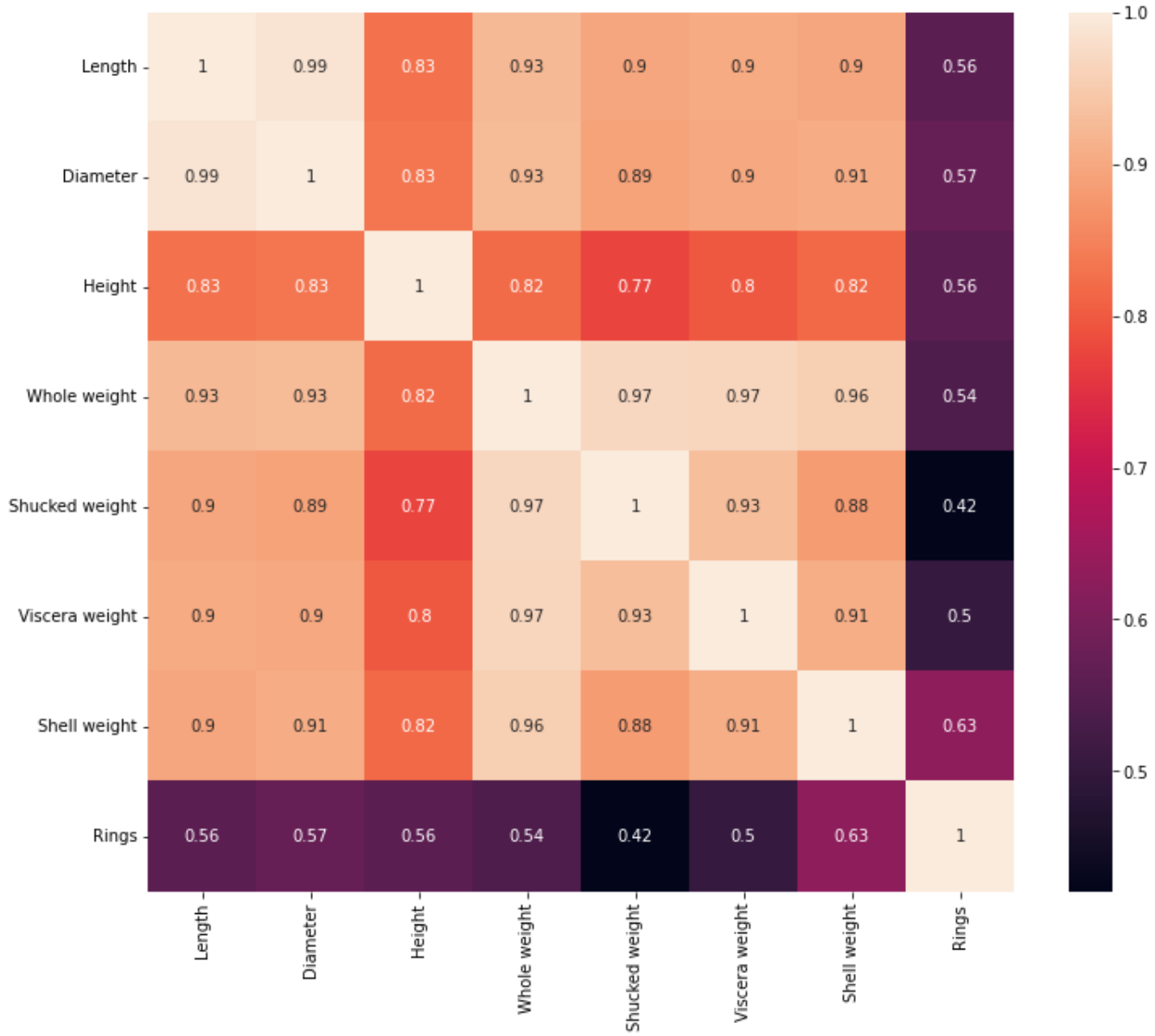
Out[14]:

	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

	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
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

In [15]:

```
plt.figure(figsize=(12,10))
sns.heatmap(df.corr(),annot=True)
plt.show()
```



4) PERFORM DESCRIPTIVE STATISTICS ON THE DATASET

In [16]:

```
df.describe()
```

Out[16]:

	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 [17]:

```
df.info()
```

```
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) CHECK FOR MISSING VALUES AND DEAL WITH THEM

In [18]:

```
df.isnull().sum()
```

Out[18]:

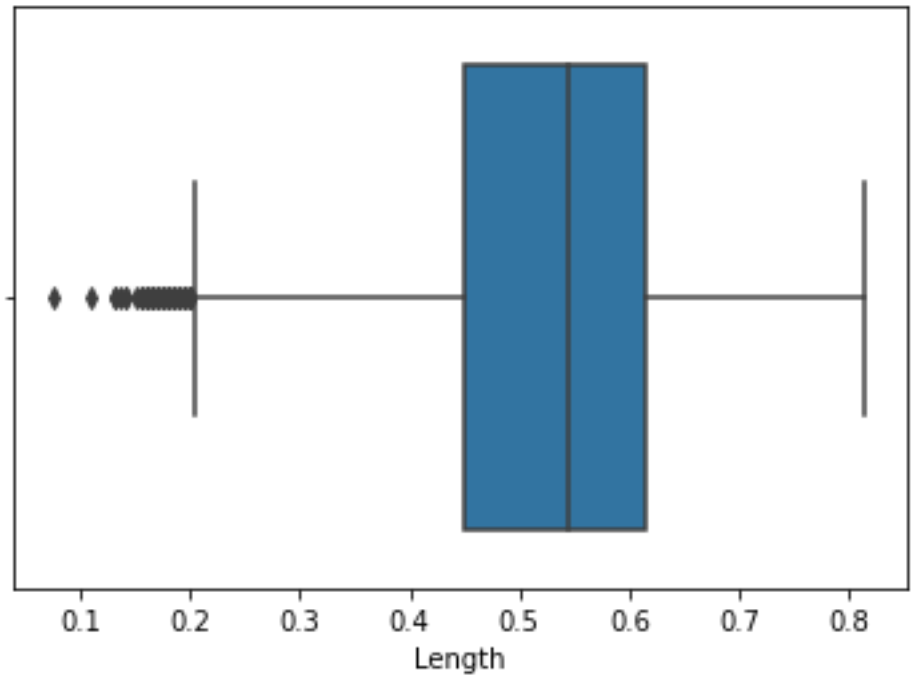
```
Sex                0
Length             0
Diameter           0
Height             0
Whole weight       0
Shucked weight     0
Viscera weight     0
Shell weight       0
Rings              0
dtype: int64
```

6) FIND THE OUTLIERS AND REPLACE THE OUTLIERS

In [19]:

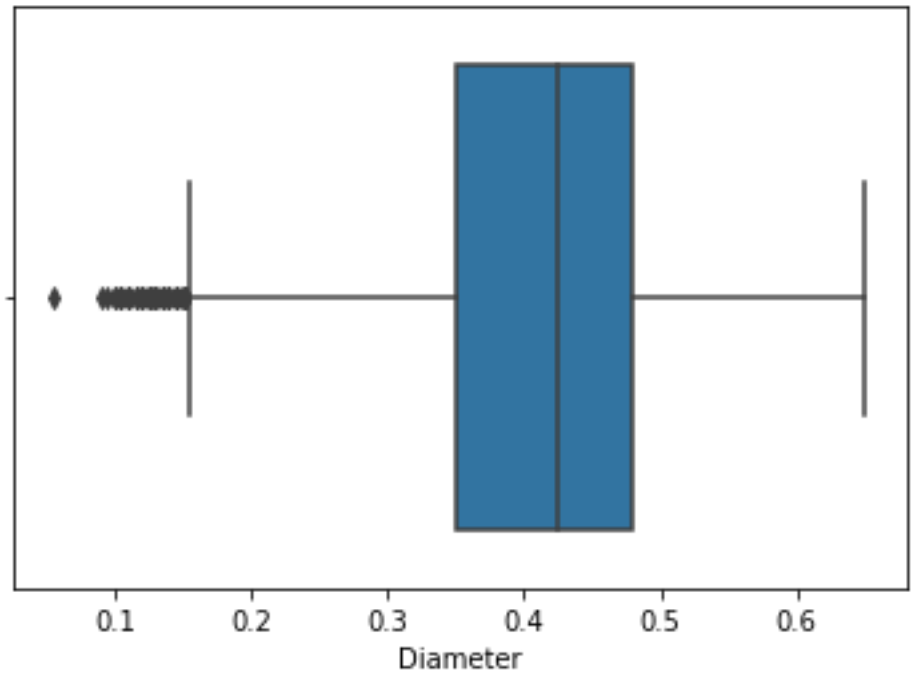
```
for i in df.columns.drop('Sex'):
    sns.boxplot(df[i])
    plt.show()
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarni
ng: Pass the following variable as a keyword arg: x. From version 0.12, the o
nly valid positional argument will be `data`, and passing other arguments wit
hout an explicit keyword will result in an error or misinterpretation.
  FutureWarning
```



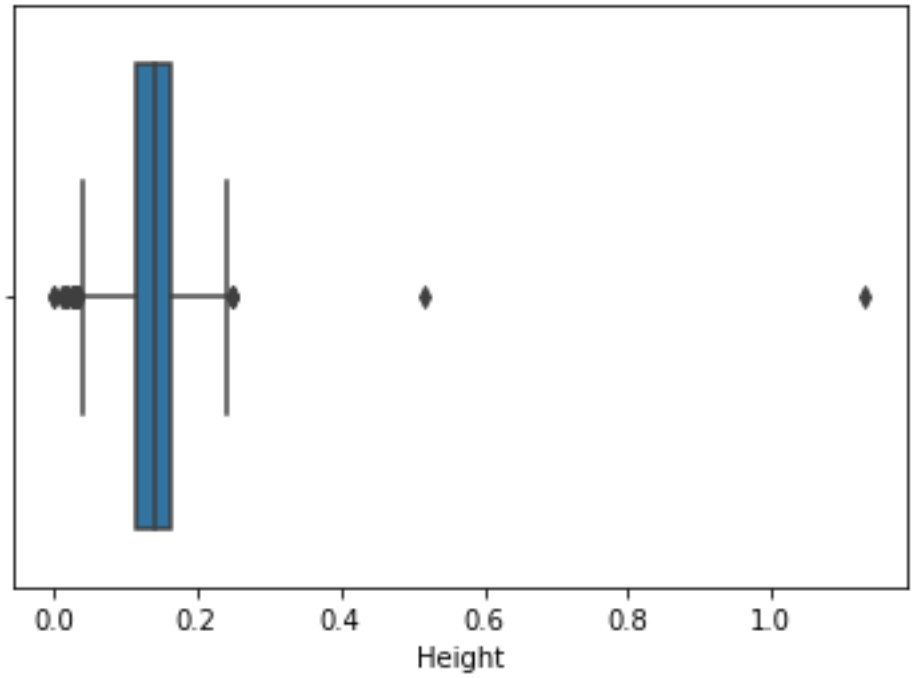

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarni
ng: Pass the following variable as a keyword arg: x. From version 0.12, the o
nly valid positional argument will be `data`, and passing other arguments wit
hout an explicit keyword will result in an error or misinterpretation.
```

FutureWarning



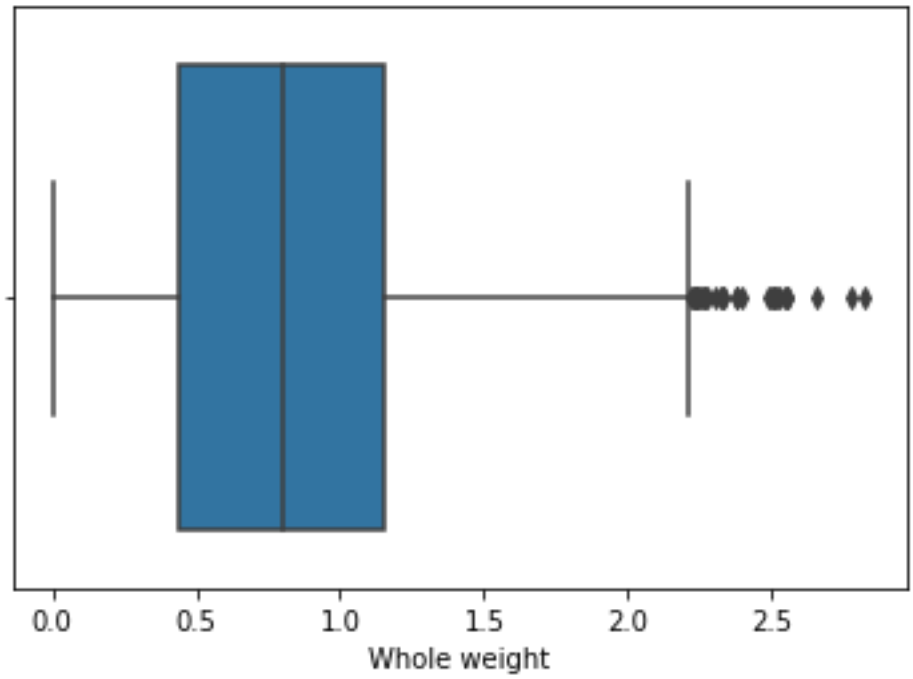
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

FutureWarning



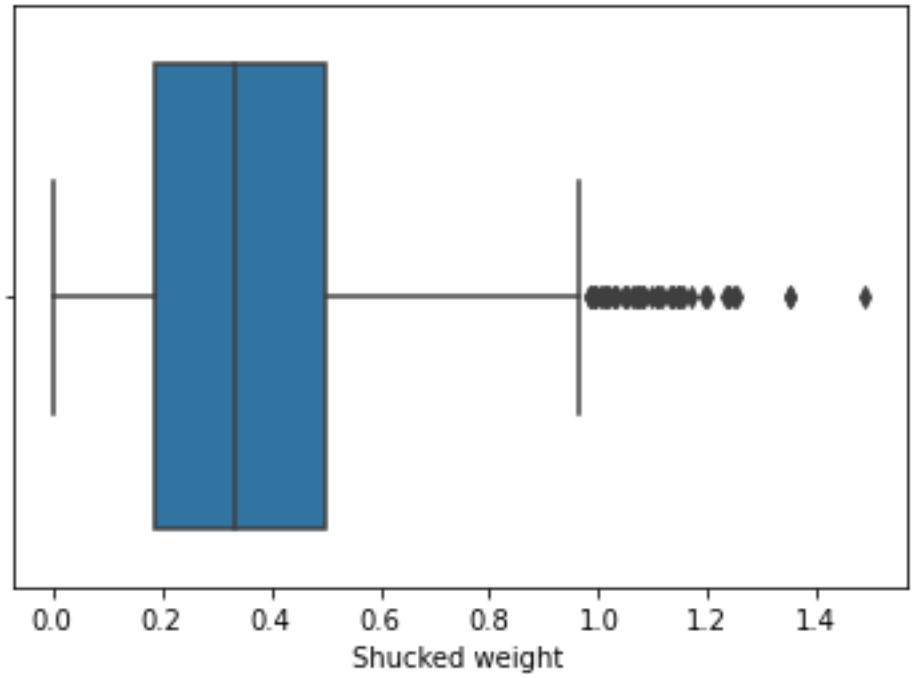
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

FutureWarning



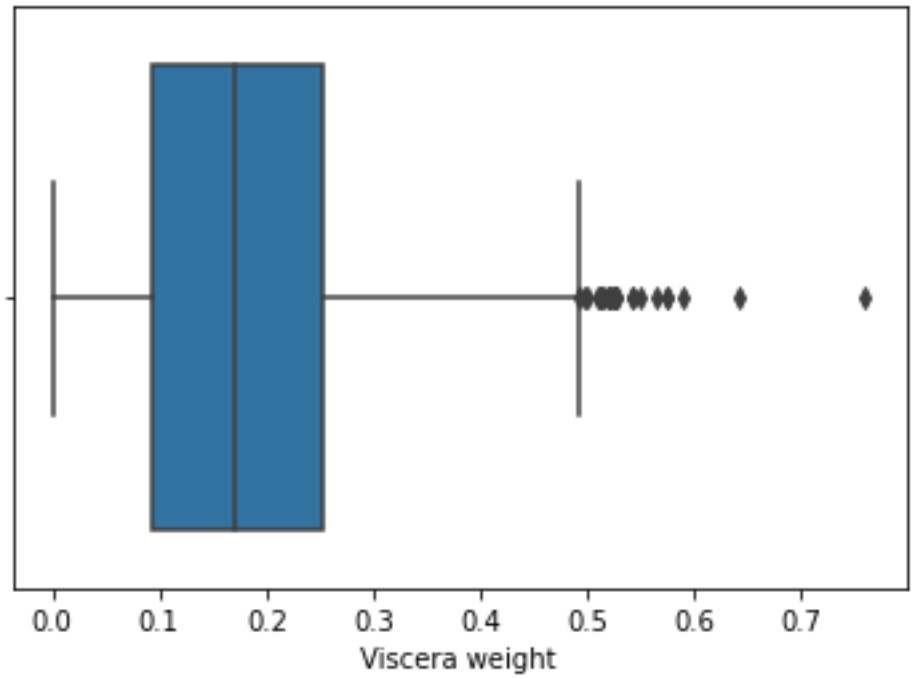
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

FutureWarning



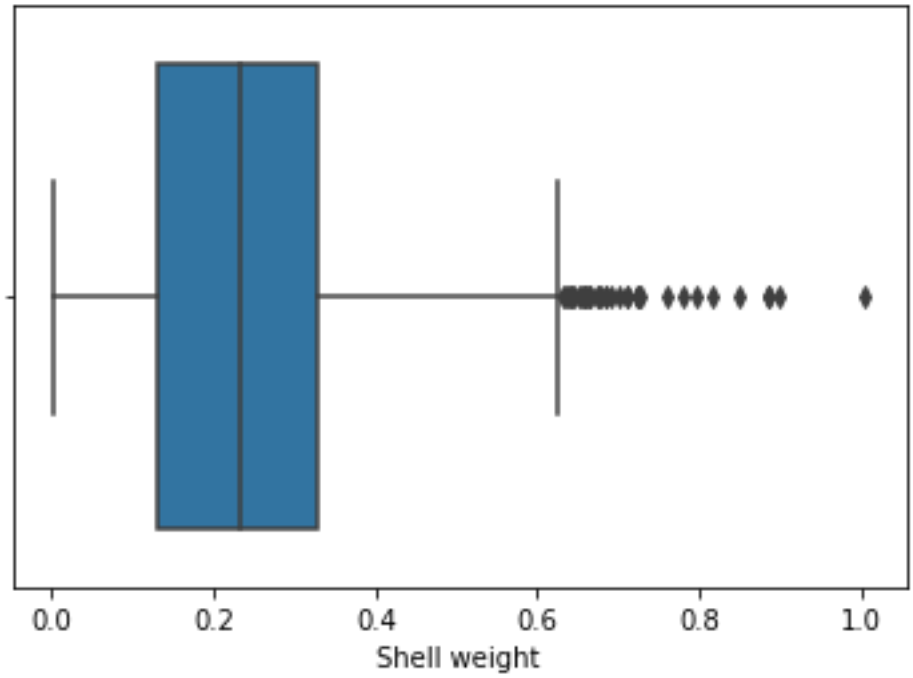
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

FutureWarning



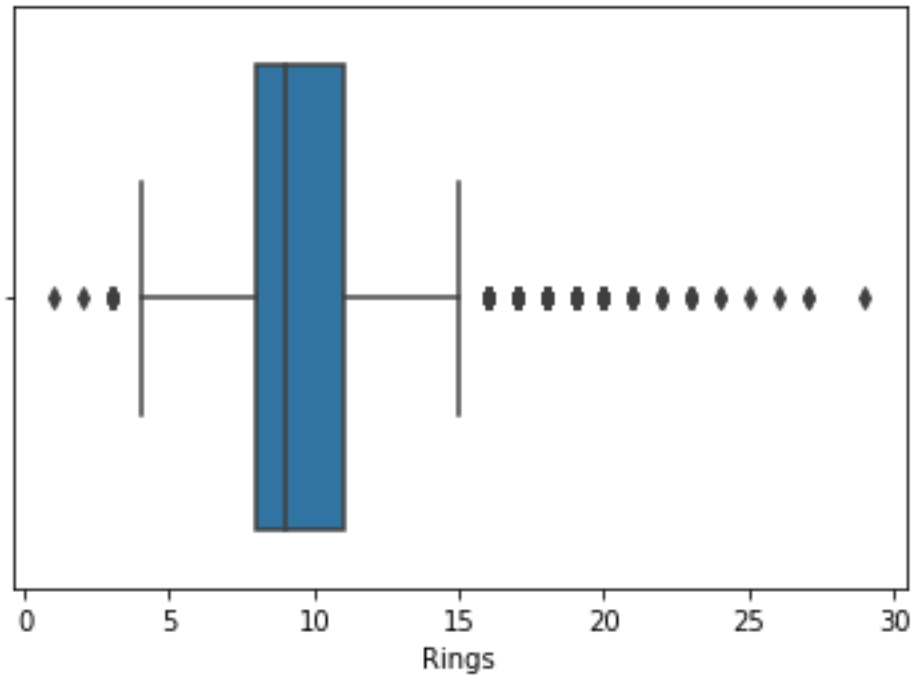
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

FutureWarning



/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 valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
  FutureWarning
```



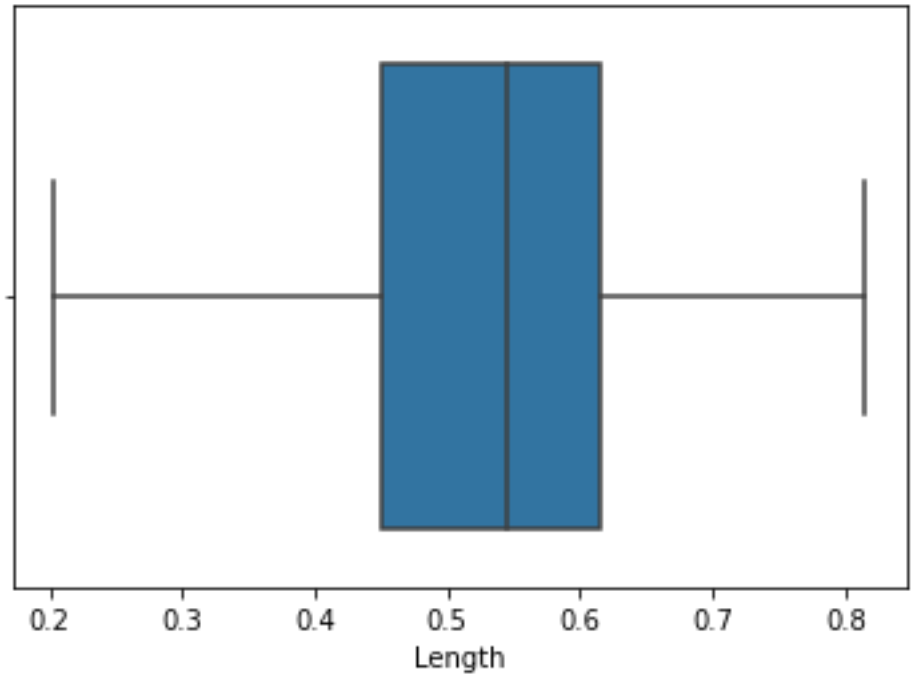
In [23]:

```
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])
```

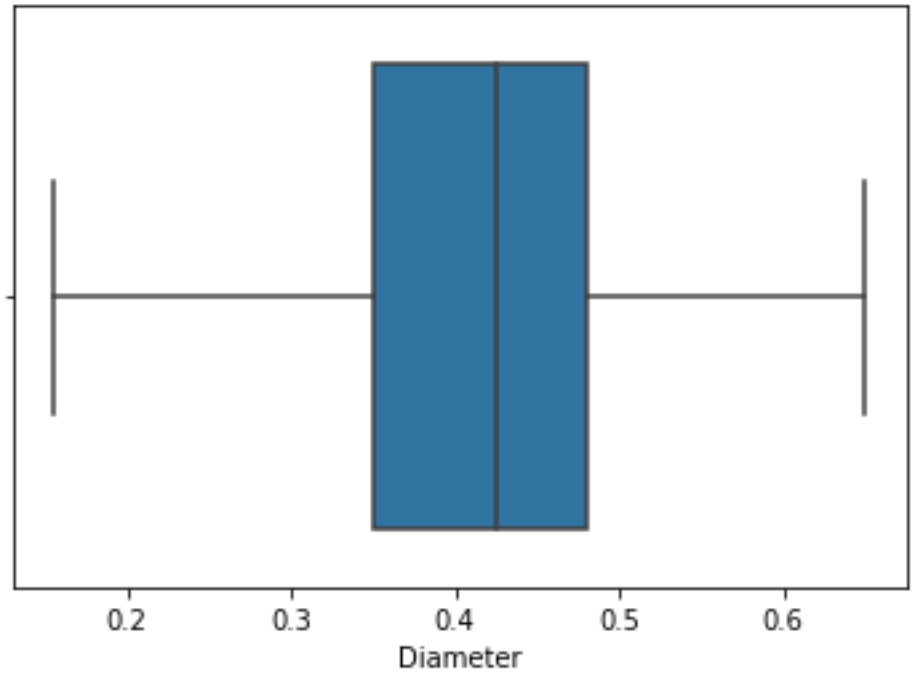
In [24]:

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

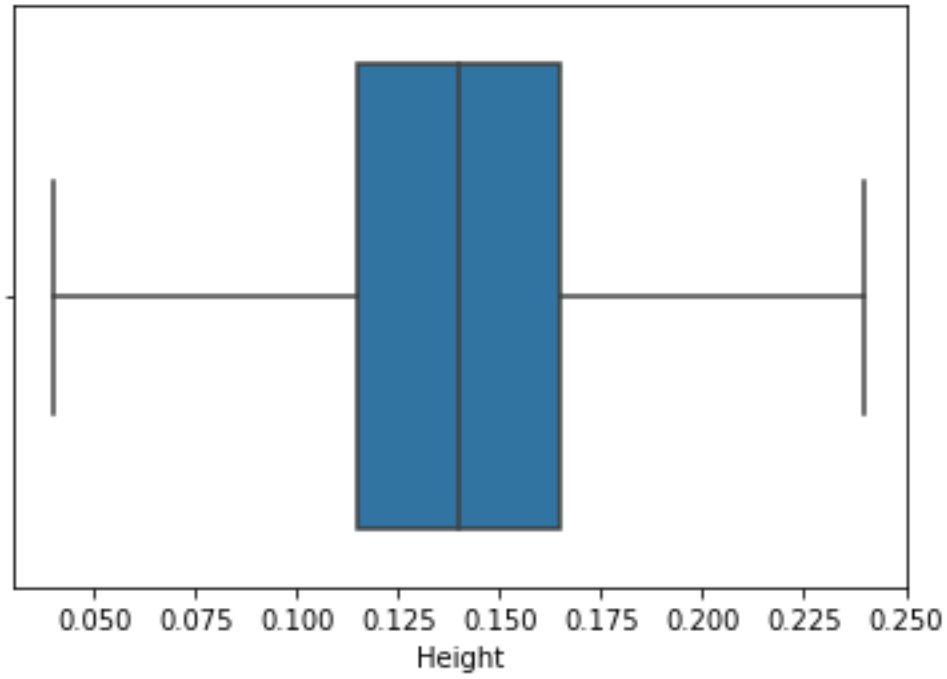
```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarni
ng: Pass the following variable as a keyword arg: x. From version 0.12, the o
nly valid positional argument will be `data`, and passing other arguments wit
hout an explicit keyword will result in an error or misinterpretation.
  FutureWarning
```



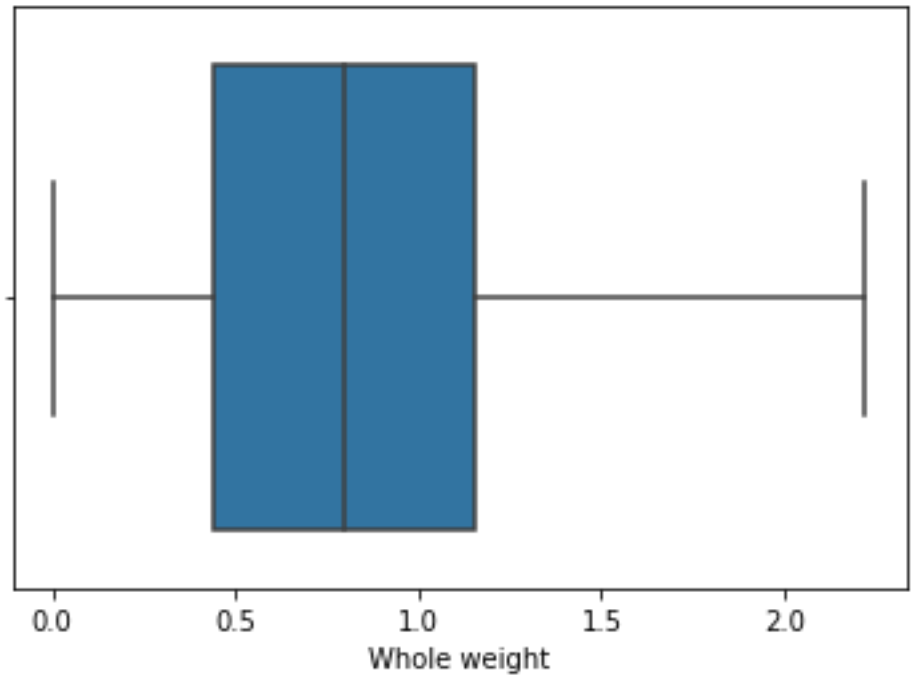

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarni
ng: Pass the following variable as a keyword arg: x. From version 0.12, the o
nly valid positional argument will be `data`, and passing other arguments wit
hout an explicit keyword will result in an error or misinterpretation.
  FutureWarning
```




```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarni
ng: Pass the following variable as a keyword arg: x. From version 0.12, the o
nly valid positional argument will be `data`, and passing other arguments wit
hout an explicit keyword will result in an error or misinterpretation.
  FutureWarning
```

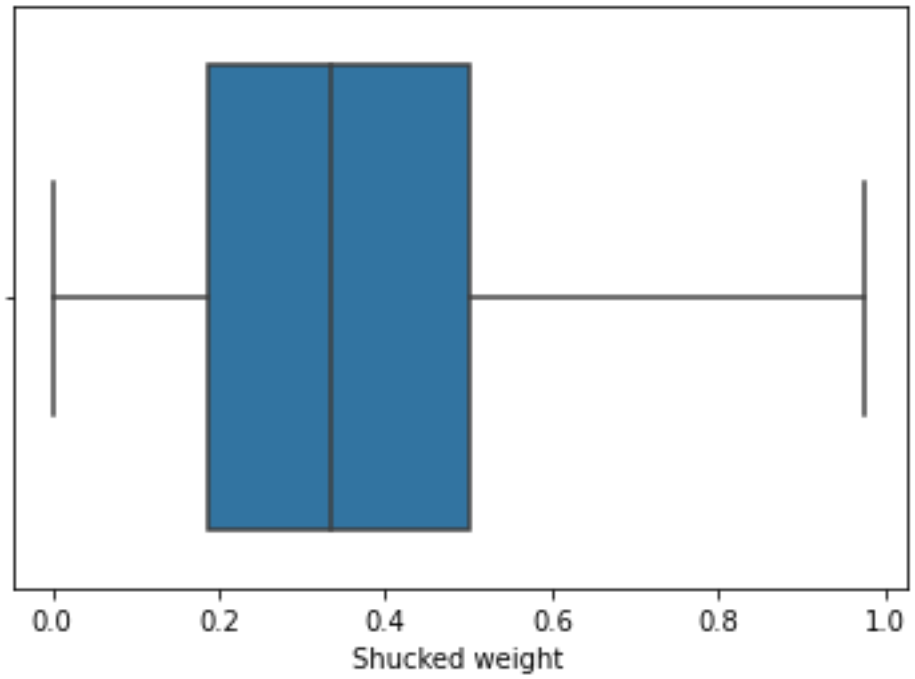



```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarni
ng: Pass the following variable as a keyword arg: x. From version 0.12, the o
nly valid positional argument will be `data`, and passing other arguments wit
hout an explicit keyword will result in an error or misinterpretation.
  FutureWarning
```



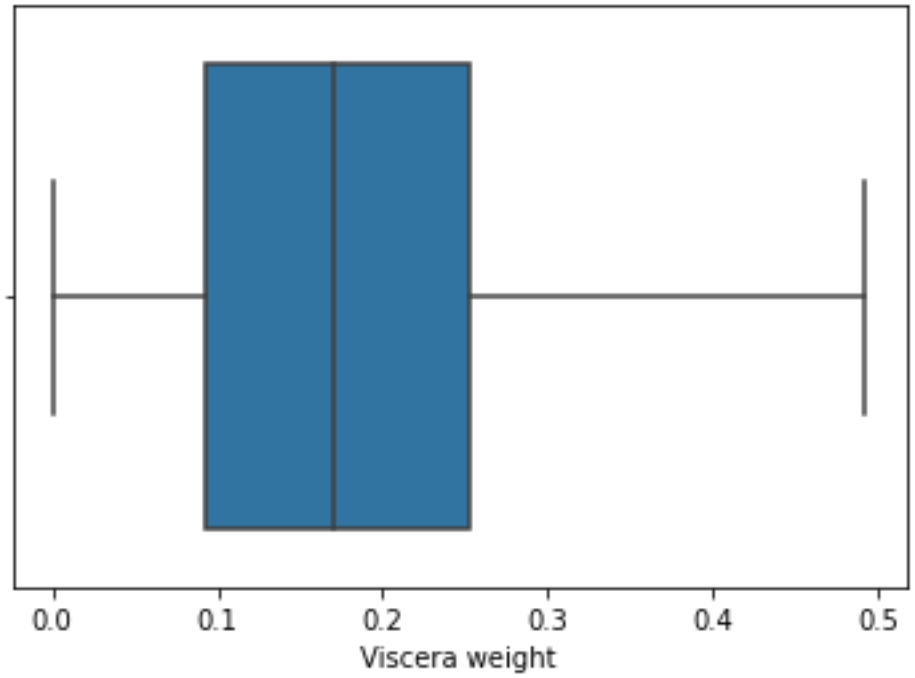

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarni
ng: Pass the following variable as a keyword arg: x. From version 0.12, the o
nly valid positional argument will be `data`, and passing other arguments wit
hout an explicit keyword will result in an error or misinterpretation.
```

FutureWarning



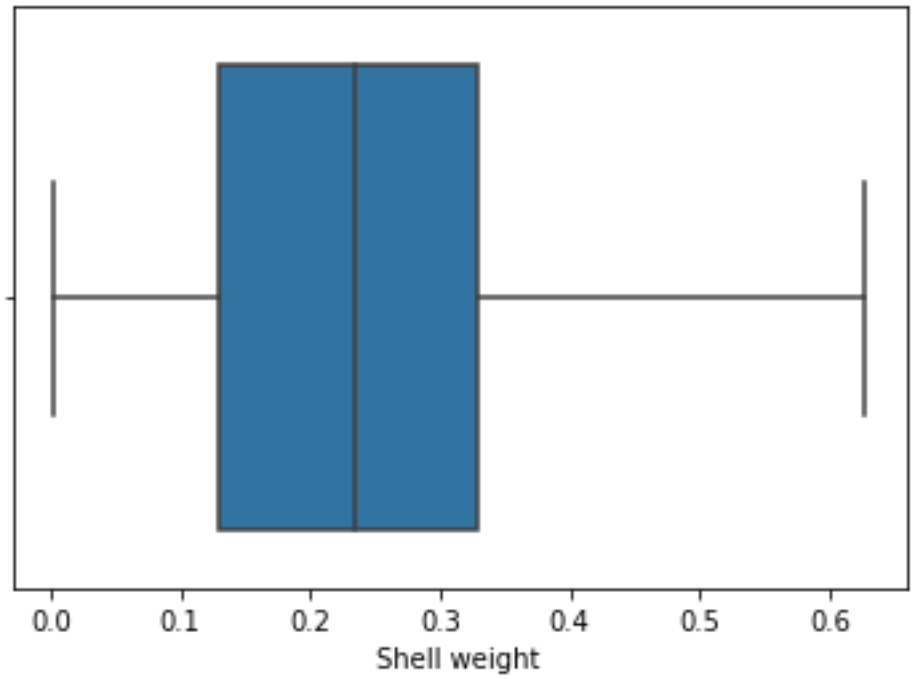
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

FutureWarning



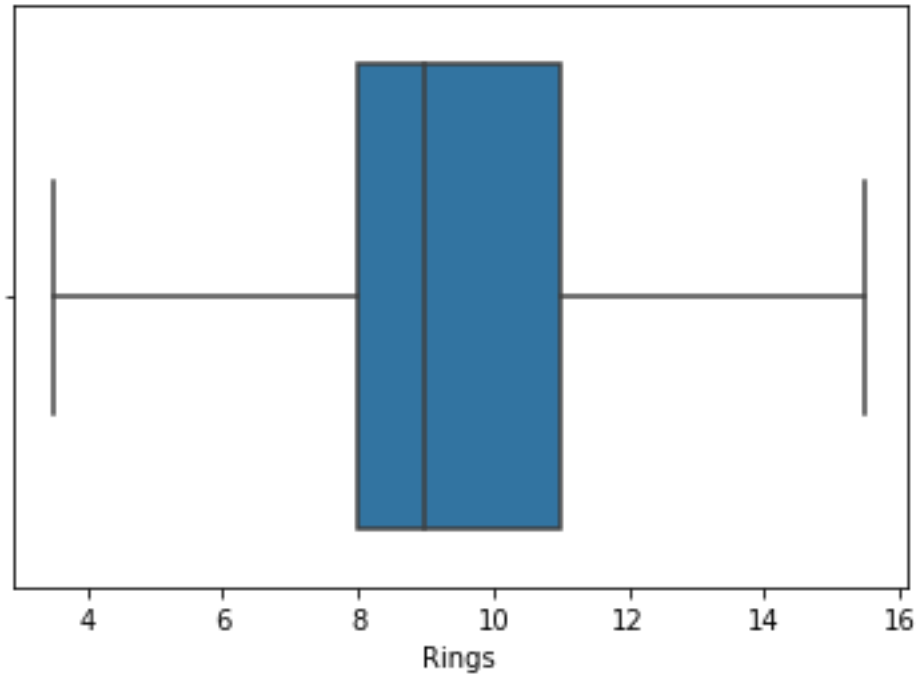
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

FutureWarning




```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarni
ng: Pass the following variable as a keyword arg: x. From version 0.12, the o
nly valid positional argument will be `data`, and passing other arguments wit
hout an explicit keyword will result in an error or misinterpretation.
```

FutureWarning



7) CHECK FOR CATEGORICAL COLUMNS AND PERFORM ENCODING

In [25]:

```
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
df.Sex = le.fit_transform(df.Sex)
```

In [26]:

```
df.head()
```

```
df.head()
```

Out[26]:

	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

Out[26]:

8) SPLIT THE DATA INTO DEPENDENT AND INDEPENDENT VARIABLES

In [27]:

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

Out[27]:

	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

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight
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 [28]:

```
Y = df.Rings
Y.head()
```

Out[28]:

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

9) SCALE THE INDEPENDENT VARIABLES

In [29]:

```
from sklearn.preprocessing import MinMaxScaler
scale = MinMaxScaler()
X_scaled = pd.DataFrame(scale.fit_transform(X),columns=X.columns)
X_scaled.head()
```

Out[29]:

	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

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight
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 DATA

In [31]:

```
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 THE MODEL

In [33]:

```
from sklearn.linear_model import LinearRegression
model = LinearRegression()
```

12) TRAIN THE MODEL

In [34]:

```
model.fit(x_train,y_train)
```

Out[34]:

```
LinearRegression()
```

13) TEST THE MODEL

In [38]:

```
y_predict = model.predict(x_test)
```

In [39]:

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

Out[39]:

	Actual	Predicted
668	13.0	13.0
1580	8.0	9.0

	Actual	Predicted
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

In [45]:

```
from sklearn import metrics
metrics.r2_score(y_test,y_predict)
```

Out[45]:

```
0.58432381444787
```