Detecting Parkinsons Disease using Machine Learning
ASSIGNMENT - 3

Date	4th October 2022
Team ID	PNT2022TMID27836
Student Name	Paavarasan S (311519104042)
Domain Name	Healthcare
Project Name	Detecting Parkinsons Disease using Machine Learning
Maximum Marks	2 Marks

1.)IMPORT THE REQUIRED LIBRARIES

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

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

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

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()
```

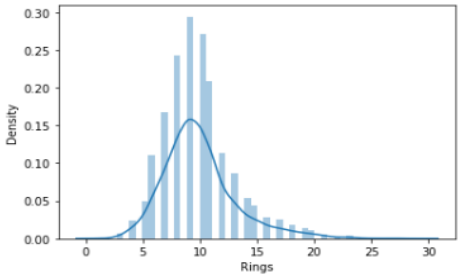
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4177 entries, 0 to 4176
Data columns (total 9 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   Sex             4177 non-null   object 
 1   Length          4177 non-null   float64
 2   Diameter        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

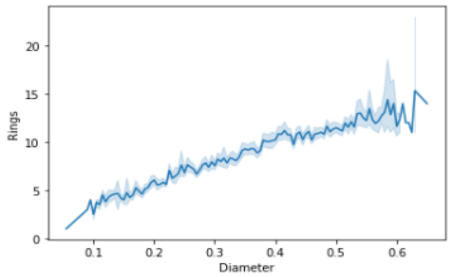
In [6]:
```
sns.distplot(df.Rings)
```

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

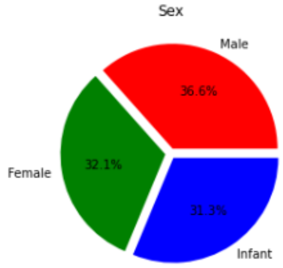


In [7]:
```
sns.lineplot(df.Diameter,df.Rings)
```

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

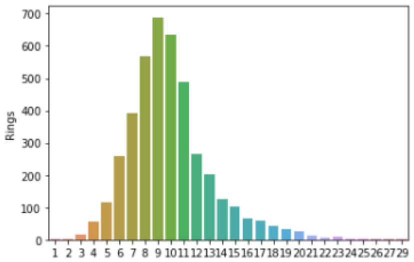


In [8]:
```
plt.pie(df.Sex.value_counts(),[0.05,0.05,0.05],colors=['red','green','blue'],labels=['Male','Female','Infant'],autopct='%1.1f%%')
plt.title('Sex')
plt.show()
```



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

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

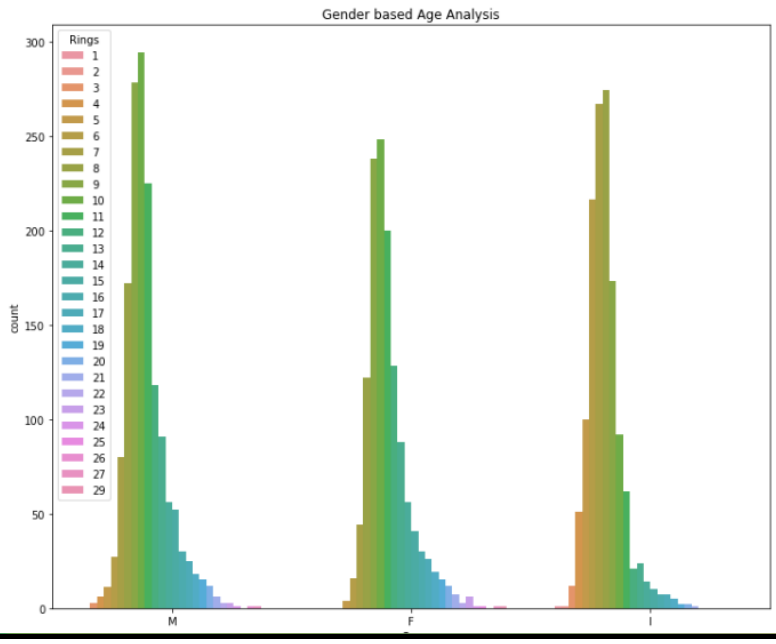


b.) BI - VARIANTE ANALYSIS

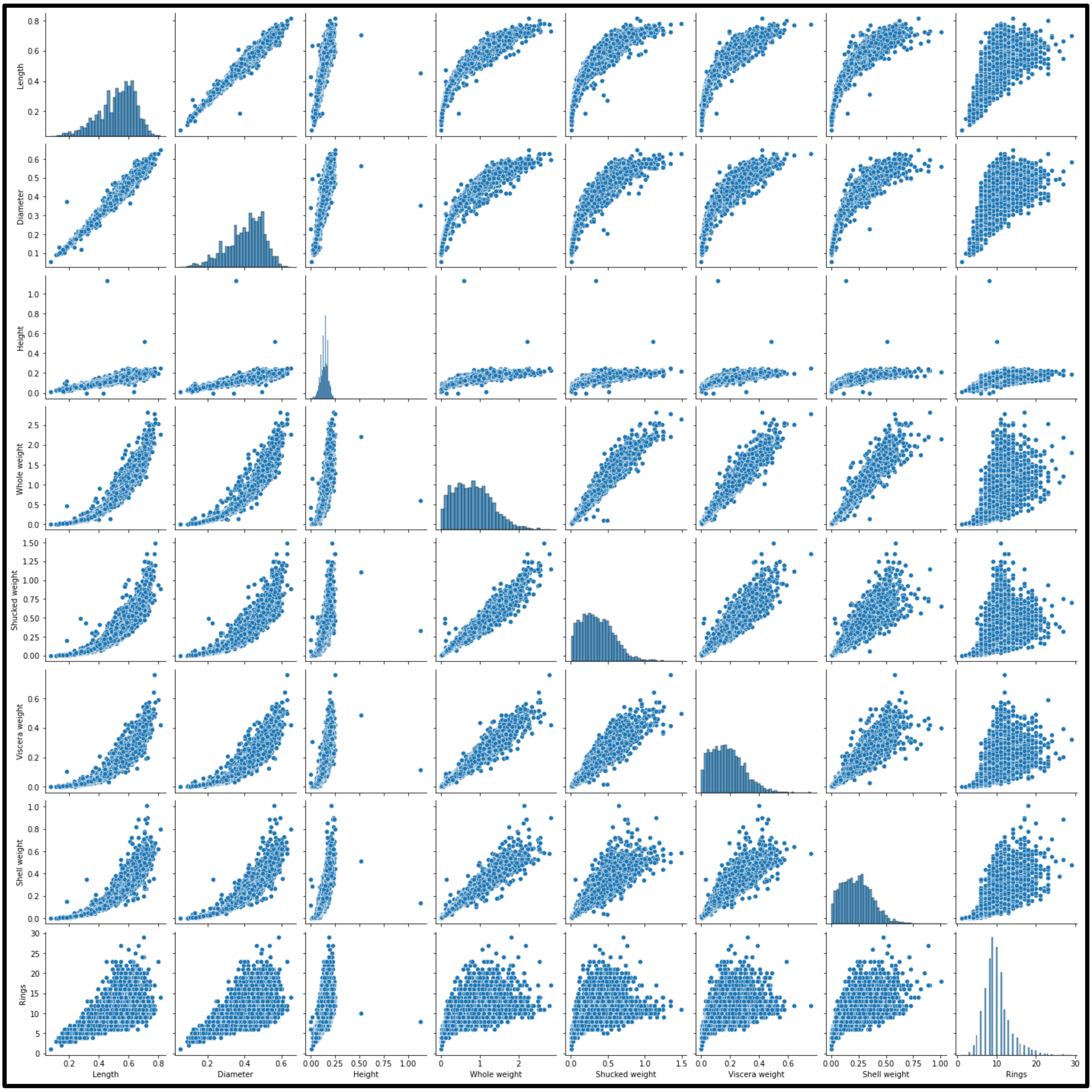
b.)BI-VARIANTE ANALYSIS

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

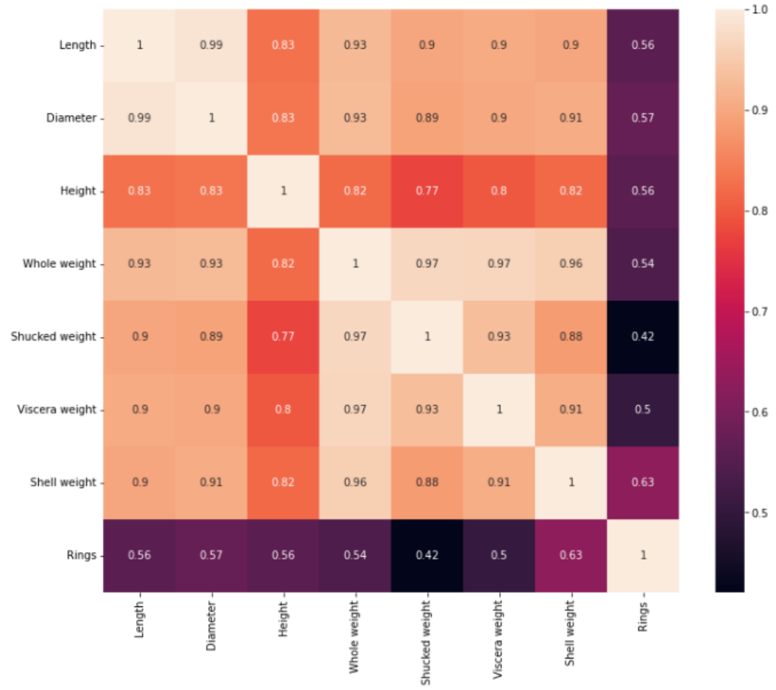



```
In [13]: df.corr()
```

Out[13]:

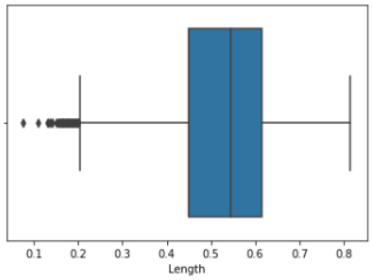
	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
Length	1.000000	0.986812	0.827554	0.925261	0.897914	0.903018	0.897706	0.556720
Diameter	0.986812	1.000000	0.833684	0.925452	0.893162	0.899724	0.905330	0.574660
Height	0.827554	0.833684	1.000000	0.819221	0.774972	0.798319	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

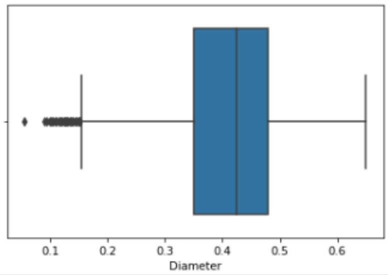
```
In [14]: plt.figure(figsize=(12,10))
         sns.heatmap(df.corr(),annot=True)
         plt.show()
```

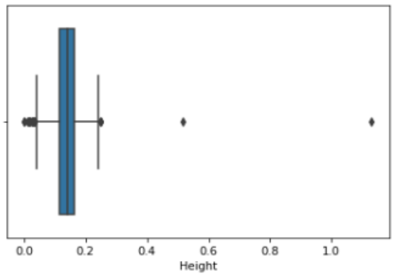


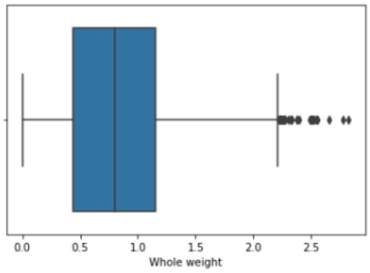
6.) FIND AND REPLACE THE OUTLIERS

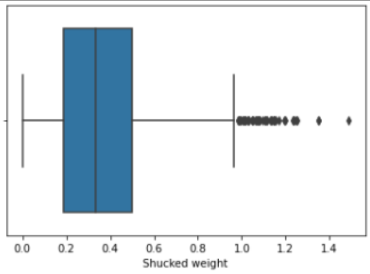
```
In [15]: for i in df.columns.drop('Sex'):
             sns.boxplot(df[i])
             plt.show()
```





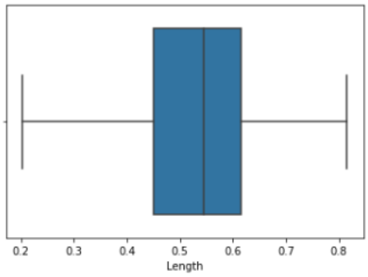


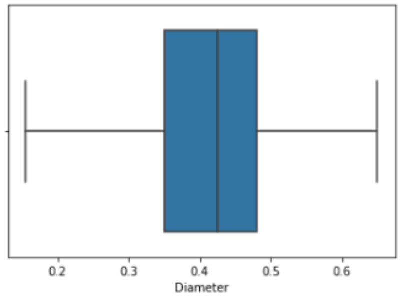


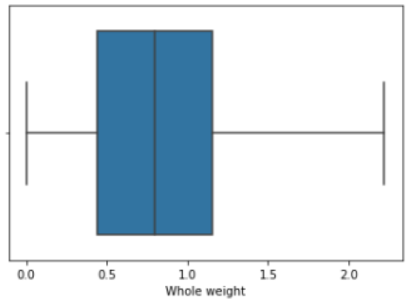


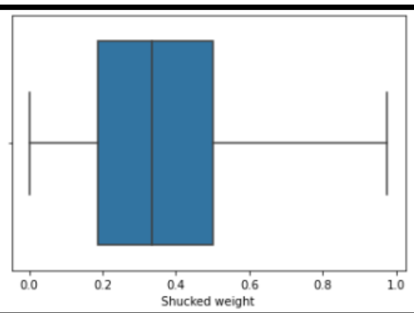
In [16]:
```
for i in df.columns.drop('Sex'):
    Q1 = df[i].quantile(0.25)
    Q3 = df[i].quantile(0.75)
    IQR = Q3-Q1
    upper_limit = Q3 + (1.5*IQR)
    lower_limit = Q1 - (1.5*IQR)
    df[i] = np.where(df[i]>=upper_limit,Q3 + (1.5*IQR),df[i])
    df[i] = np.where(df[i]<=lower_limit,Q1 - (1.5*IQR),df[i])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

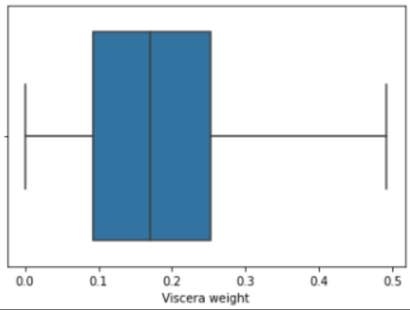
In [17]:
```
for i in  df.columns.drop('Sex'):
    sns.boxplot(df[i])
    plt.show()
```

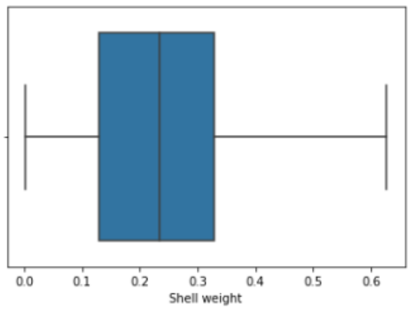


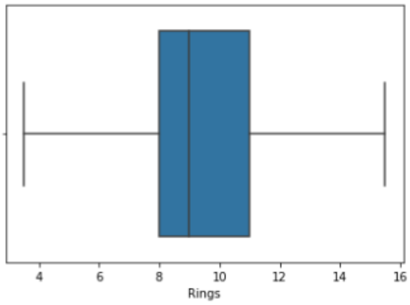

0.2
0.3
0.4
0.5
0.6
Diameter


0.0
0.5
1.0
1.5
2.0
Whole weight


0.0
0.2
0.4
0.6
0.8
1.0
Shucked weight


0.0
0.1
0.2
0.3
0.4
0.5
Viscera weight


0.0
0.1
0.2
0.3
0.4
0.5
0.6
Shell weight



7.) CHECK FOR CATEGORICAL COLUMNS AND ENCODE THEM

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 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

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

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 THE MODEL

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

12.) TRAIN THE MODEL

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

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

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

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

```
Out[28]: 0.58432381444787
```