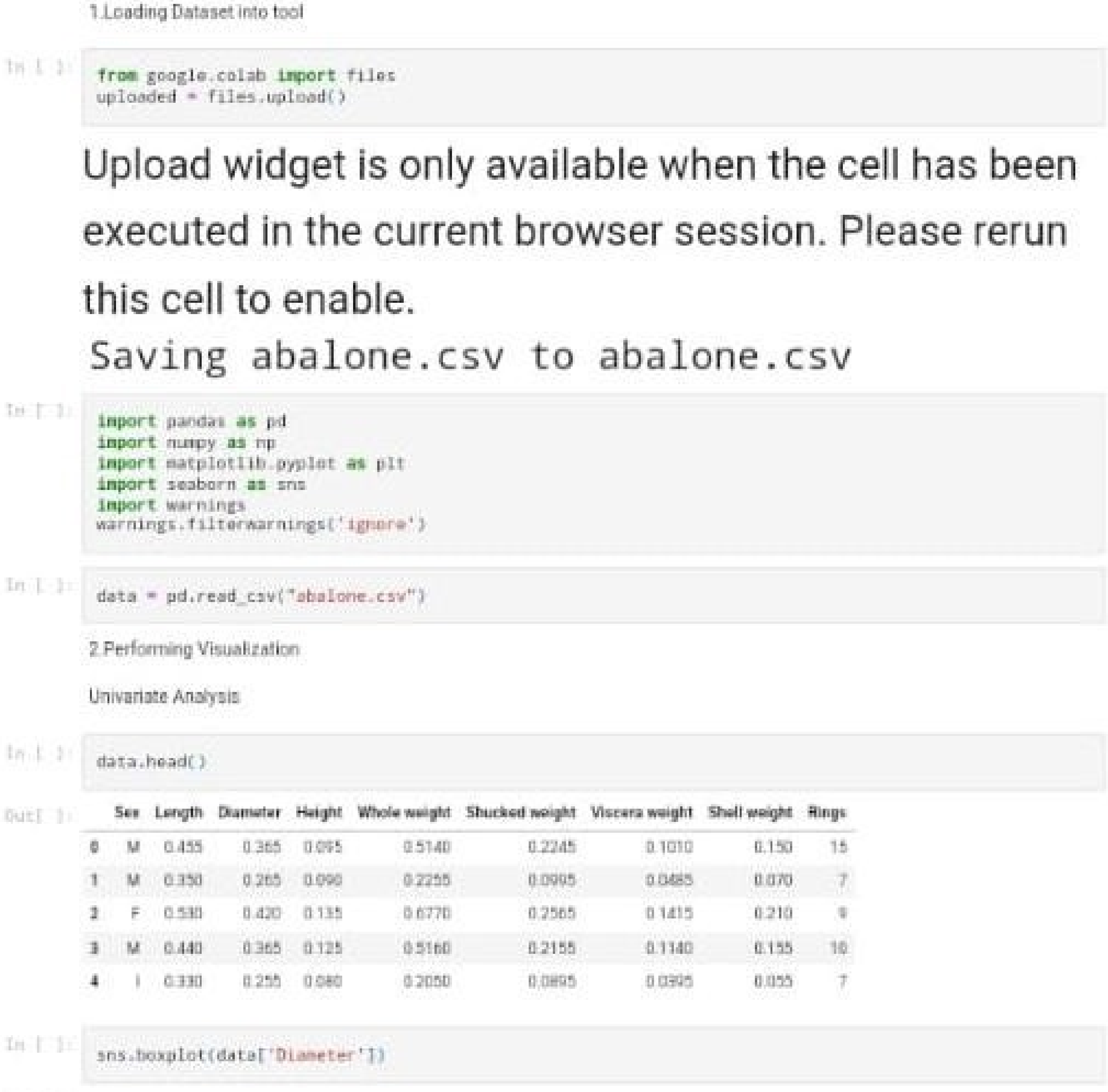
Assignment date	07 November 2022
Student Name	Ms.J.Priyadharshini
Student Roll Number	821719106019
Maximum Marks	2 Marks



1.Loading Dataset into tool

```
In [ ]:
from google.colab import files
uploaded = files.upload()
```

Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

```
Saving abalone.csv to abalone.csv
```

```
In [ ]:
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
```

```
In [ ]:
data = pd.read_csv("abalone.csv")
```

2.Performing Visualization

Univariate Analysis

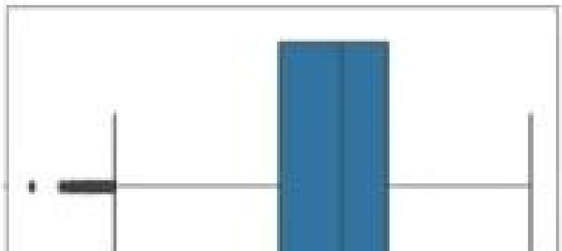
```
In [ ]:
data.head()
```

Out[ ]:

	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

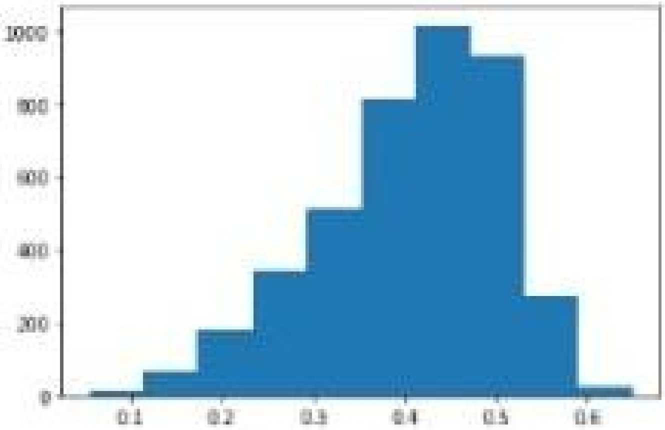
```
In [ ]:
sns.boxplot(data['Diameter'])
```

Out[ ]:



Out[ ]:

```
(array([  13.,   66.,  180.,  344.,  513.,
812., 1017.,  934.,  275.,
          23.]),
 array([0.055 , 0.1145, 0.174 , 0.2335, 0.2
93 , 0.3525, 0.412 , 0.4715,
        0.531 , 0.5905, 0.65  ]),
 )
```

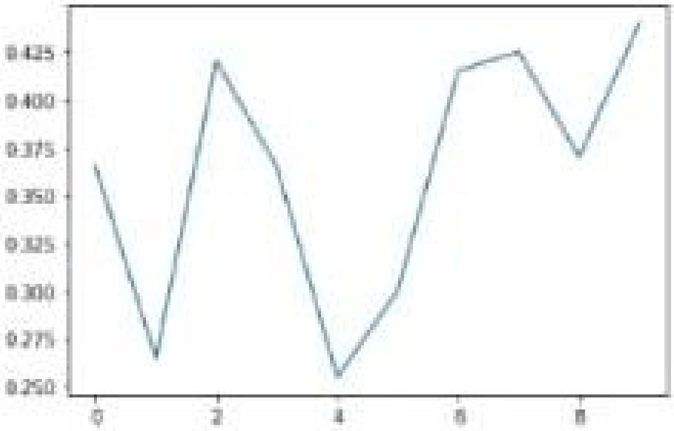


In [ ]:

```
plt.plot(data['Diameter'].head(10))
```

Out[ ]:

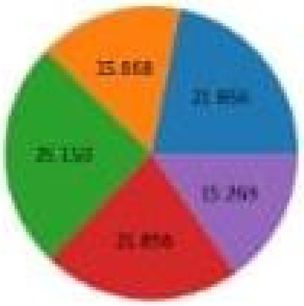
```
[]
```



In [ ]:

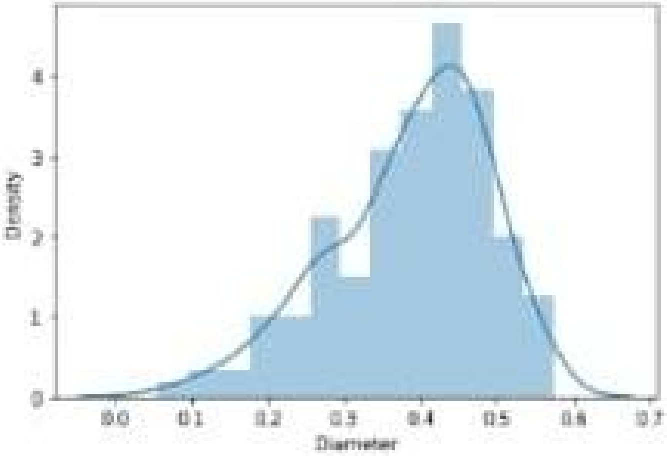
```
plt.pie(data['Diameter'].head(),autopct='%.3f')
```

```
([,
  ,
  ,
  ,
  ],
 [Text(0.8507215626110557, 0.69733264867536
76, ''),
  Text(-0.32611344931648134, 1.050547484969
1026, ''),
  Text(-1.0998053664078908, -0.020691931287
47144, ''),
  Text(-0.08269436219656089, -1.09688725148
0709, ''),
  Text(0.9758446362287218, -0.5076684409569
241, '')],
 [Text(0.46402994324239394, 0.3803632629138
369, '21.856'),
  Text(-0.17788006326353525, 0.573025900892
2377, '15.868'),
  Text(-0.5998938362224858, -0.011286507974
984419, '25.150'),
  Text(-0.045106015743578656, -0.5983021371
712958, '21.856'),
  Text(0.5322788924883937, -0.2769100587037
768, '15.269')])
```



In [ ]:

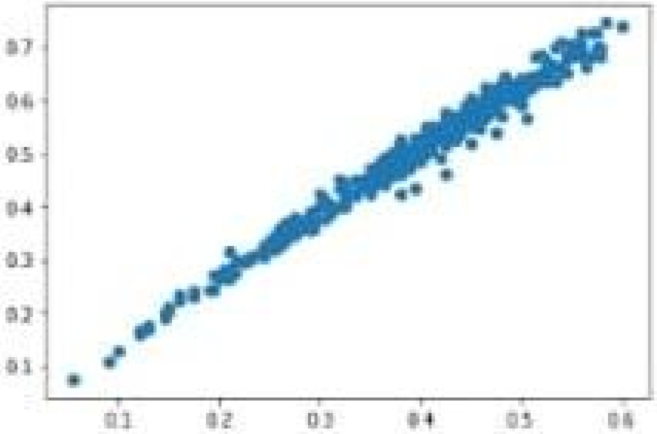
```
sns.distplot(data['Diameter'].head(300))
```



In [ ]:

```
plt.scatter(data['Diameter'].head(400),data['Length'].head(400))
```

Out[ ]:

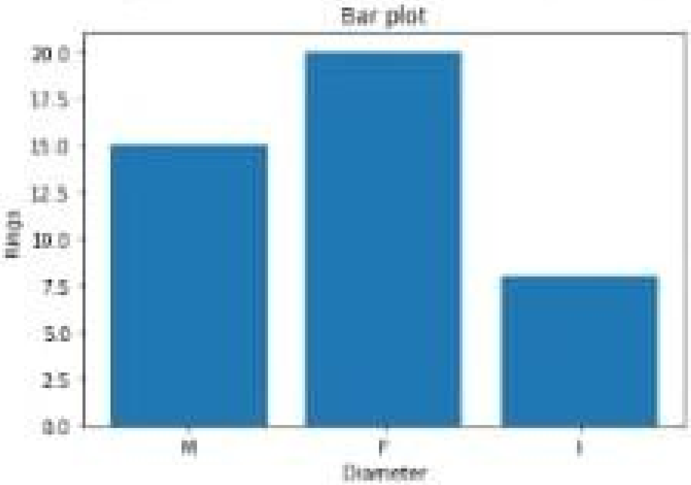


In [ ]:

```
plt.bar(data['Sex'].head(20),data['Rings'].head(20))
plt.title('Bar plot')
plt.xlabel('Diameter')
plt.ylabel('Rings')
```

Out[ ]:

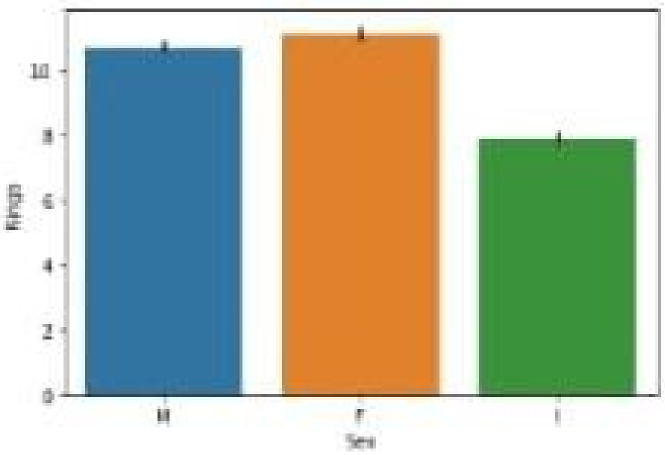
```
Text(0, 0.5, 'Rings')
```



In [ ]:

```
sns.barplot(data['Sex'], data['Rings'])
```

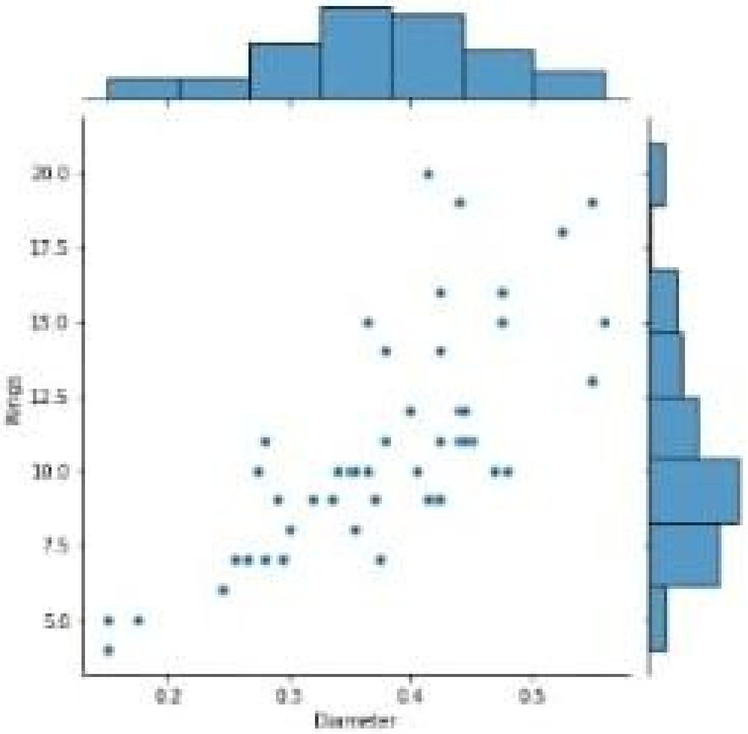
Out[ ]:



In [ ]:

```
sns.jointplot(data['Diameter'].head(50),data['Rings'].head(100))
```

Out[ ]:

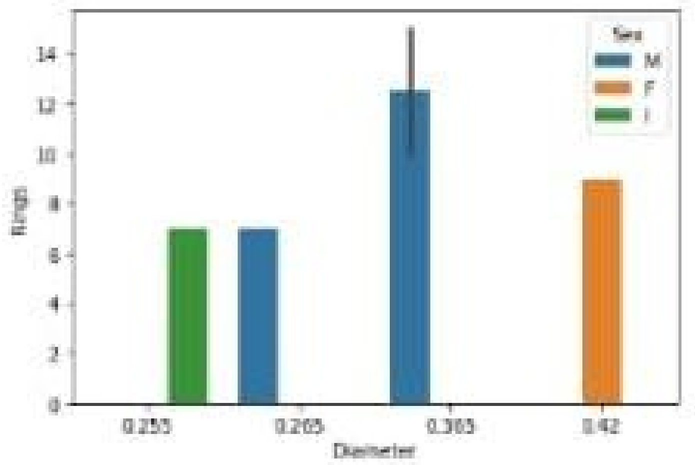


In [ ]:

```
sns.barplot('Diameter','Rings',hue='Sex',data=data.head())
```

Out[ ]:

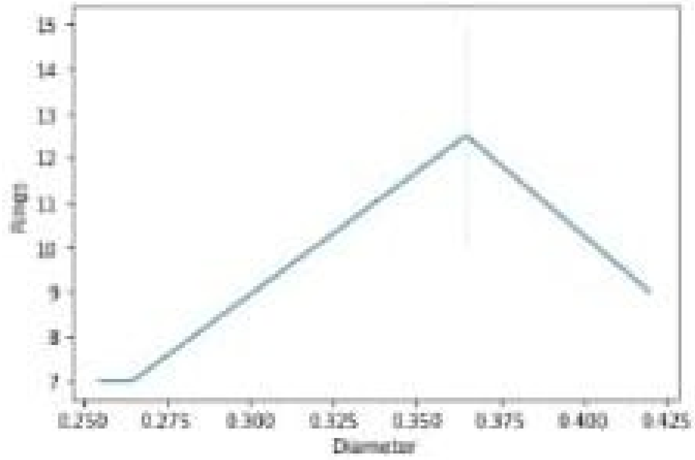
Out[ ]:



In [ ]:

```
sns.lineplot(data['Diameter'].head(),data['Rings'].head())
```

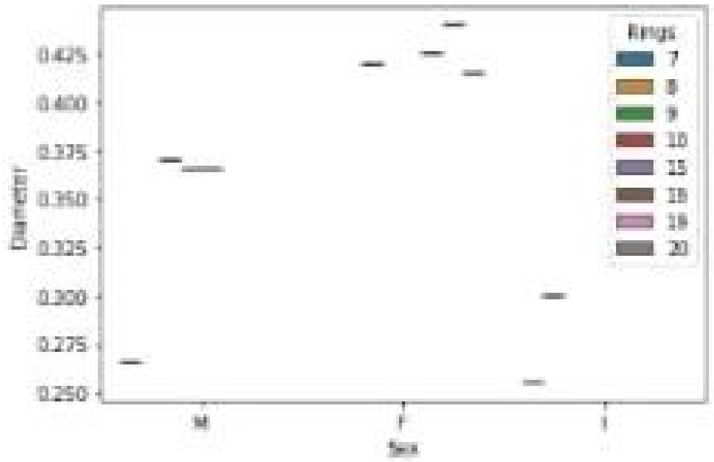
Out[ ]:



In [ ]:

```
sns.boxplot(data['Sex'].head(10),data['Diameter'].head(10),data['Rings'].head(10))
```

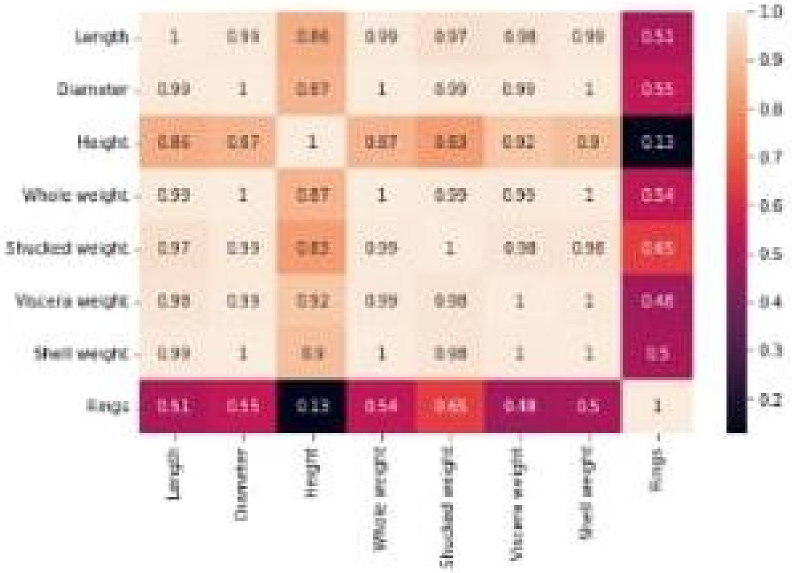
Out[ ]:



In [ ]:

```
fig=plt.figure(figsize=(8,5))
sns.heatmap(data.head().corr(),annot=True)
```

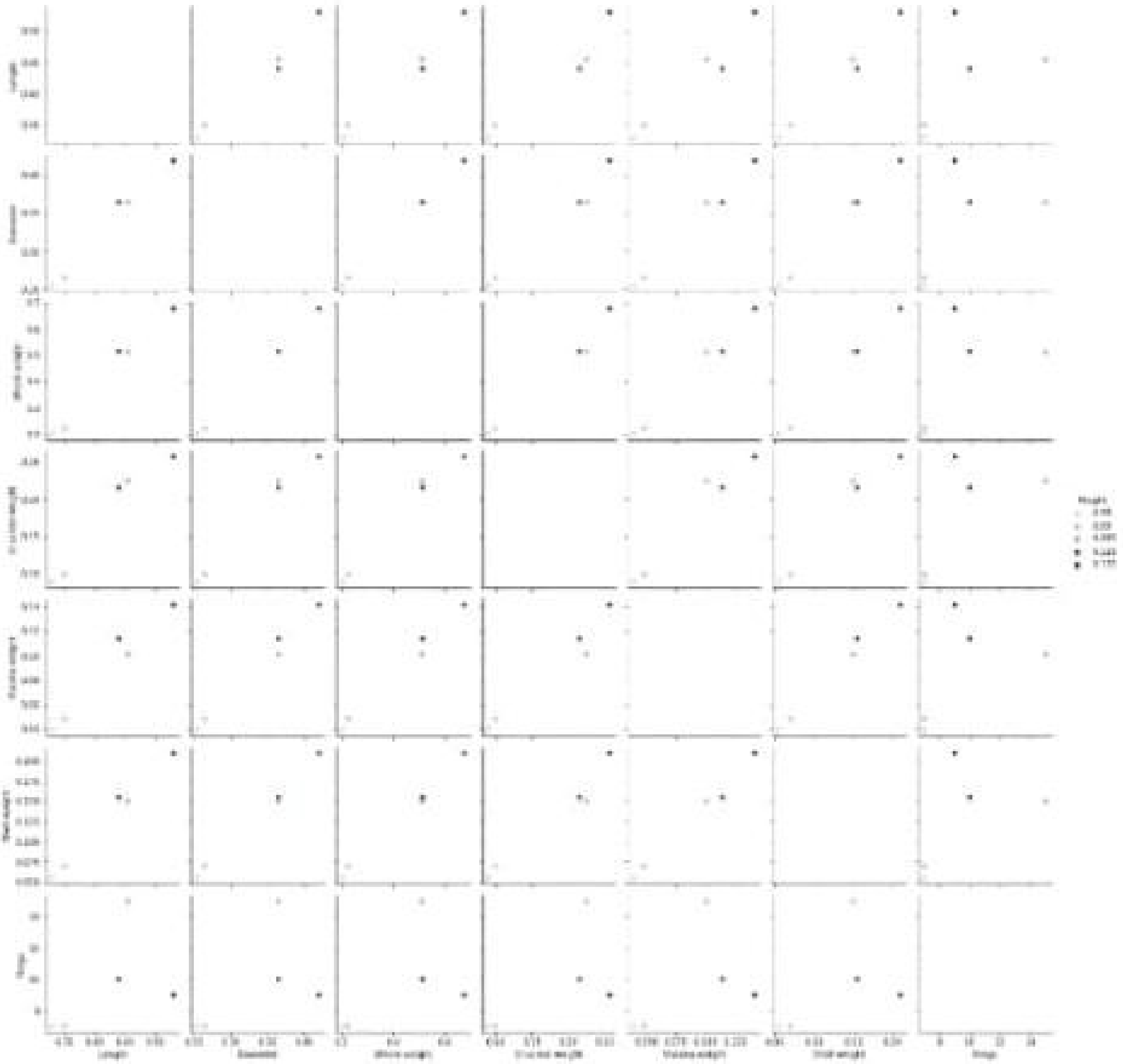
Out[ ]:



In [ ]:

```
sns.pairplot(data.head(),hue='Height')
```

Out[ ]:

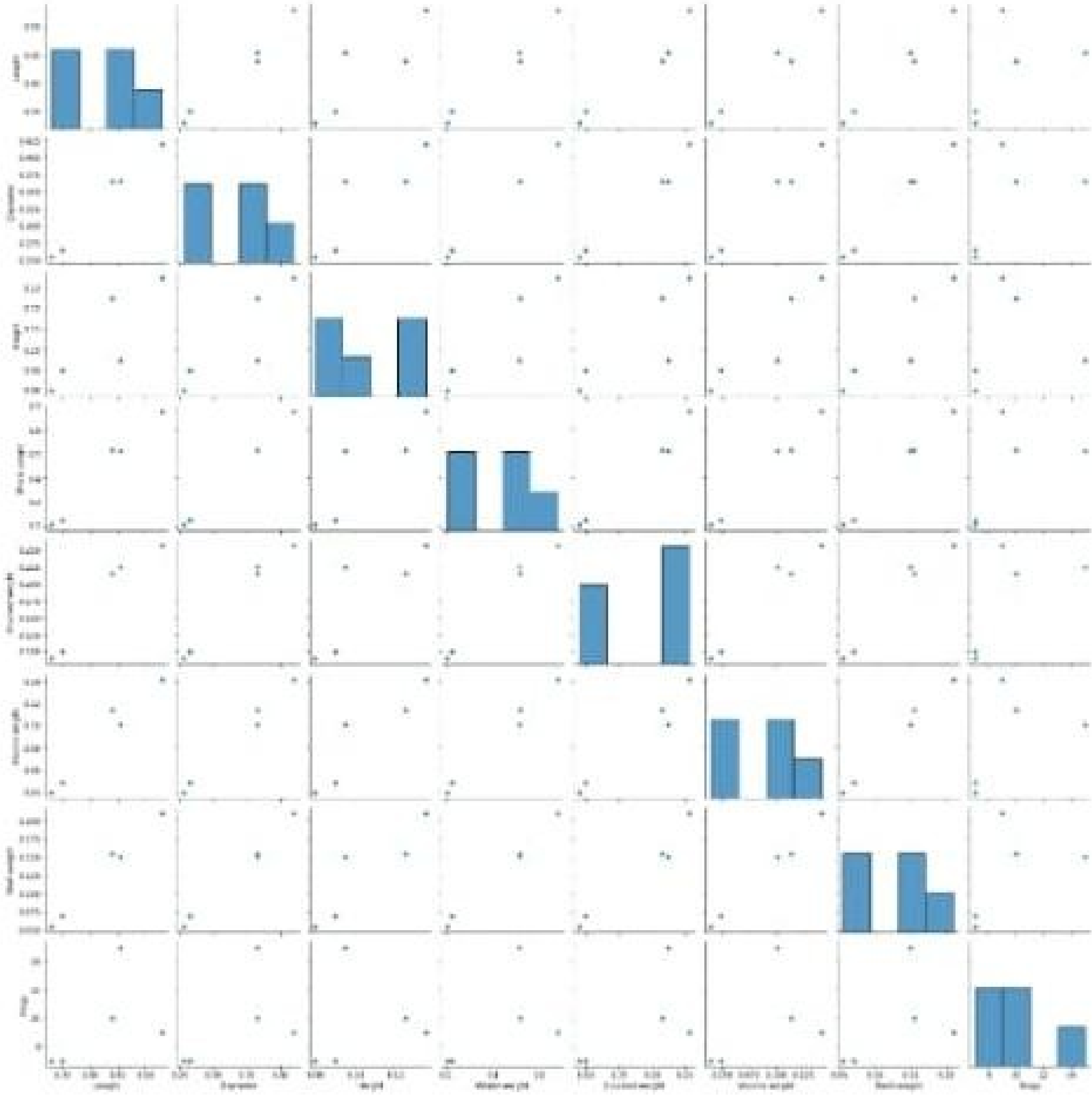


In [ ]:

```
sns.pairplot(data.head())
```

Out[ ]:

Out[ ]:



3.Perform Descriptive Statistics on the dataset

In [ ]:

```
data.head()
```

Out[ ]:

	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

In [ ]:

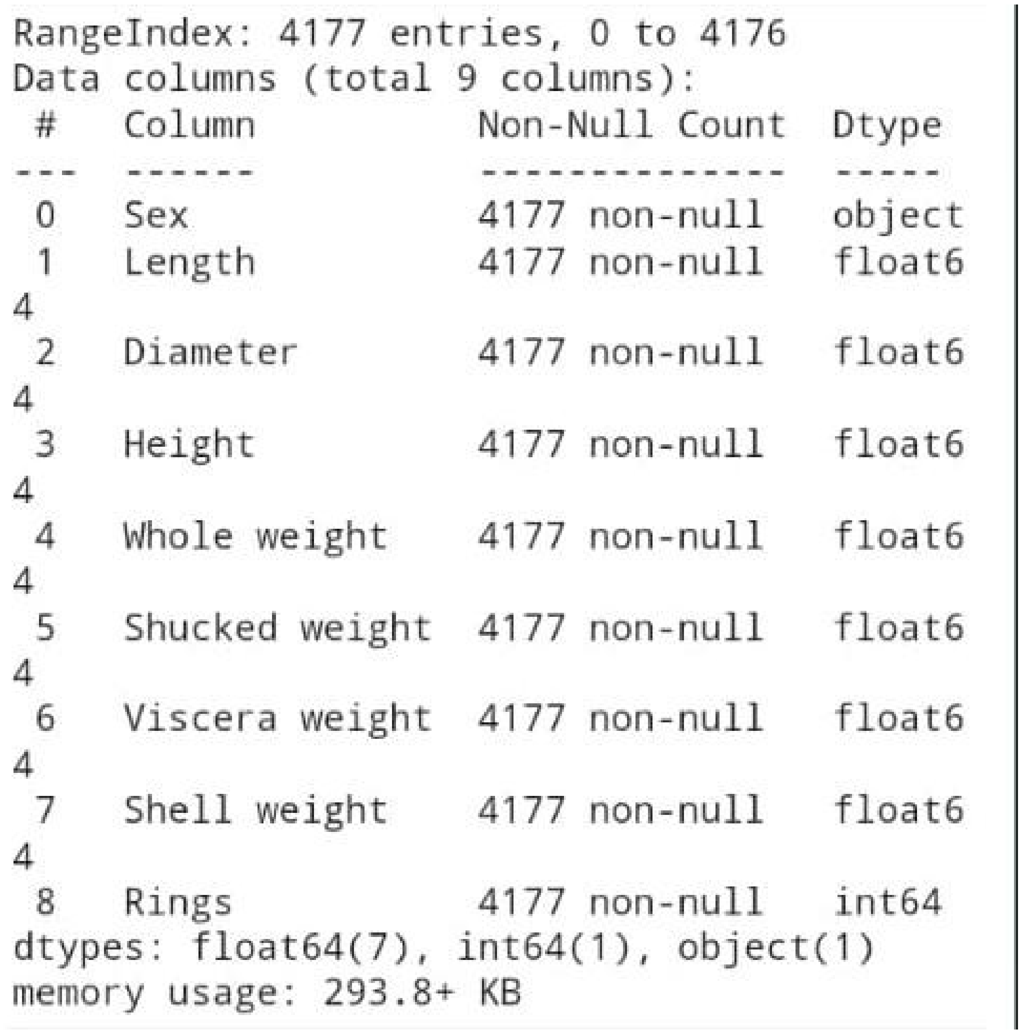
```
data.tail()
```

Out[ ]:

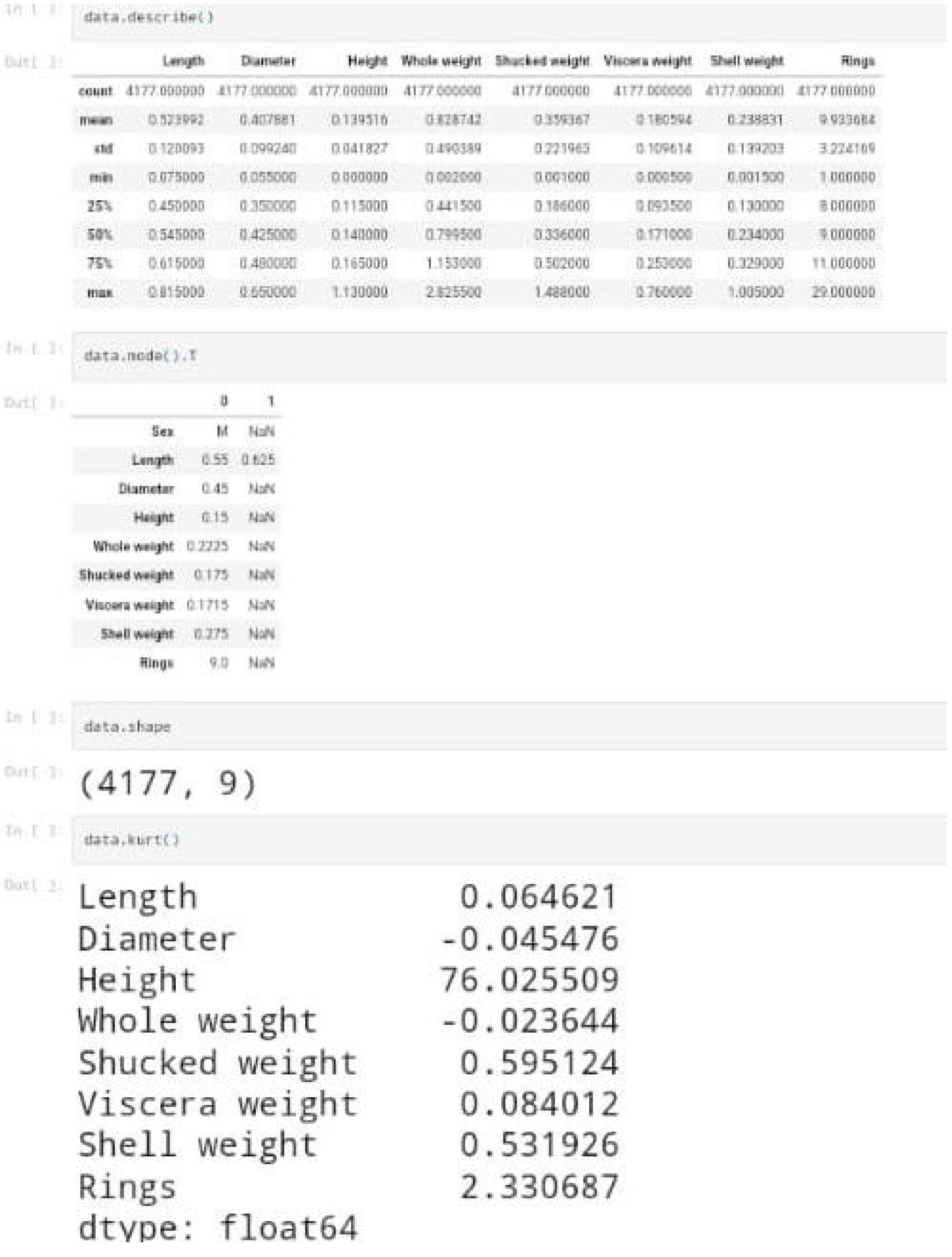
	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
4172	F	0.565	0.450	0.165	0.8870	0.3700	0.2390	0.2490	11
4173	M	0.590	0.440	0.135	0.9660	0.4390	0.2145	0.2605	10
4174	M	0.600	0.475	0.205	1.1760	0.5255	0.2875	0.3080	9
4175	F	0.625	0.485	0.150	1.0945	0.5310	0.2610	0.2960	10
4176	M	0.710	0.555	0.195	1.9485	0.9455	0.3765	0.4950	12

In [ ]:

```
data.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   float6
4
 2   Diameter        4177 non-null   float6
4
 3   Height          4177 non-null   float6
4
 4   Whole weight    4177 non-null   float6
4
 5   Shucked weight  4177 non-null   float6
4
 6   Viscera weight  4177 non-null   float6
4
 7   Shell weight    4177 non-null   float6
4
 8   Rings           4177 non-null   int64
dtypes: float64(7), int64(1), object(1)
memory usage: 293.8+ KB
```



In [ ]:

```
data.describe()
```

Out[ ]:

	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 [ ]:

```
data.mode().T
```

Out[ ]:

	0	1
Sex	M	NaN
Length	0.55	0.625
Diameter	0.45	NaN
Height	0.15	NaN
Whole weight	0.2225	NaN
Shucked weight	0.175	NaN
Viscera weight	0.1715	NaN
Shell weight	0.275	NaN
Rings	9.0	NaN

In [ ]:

```
data.shape
```

Out[ ]:

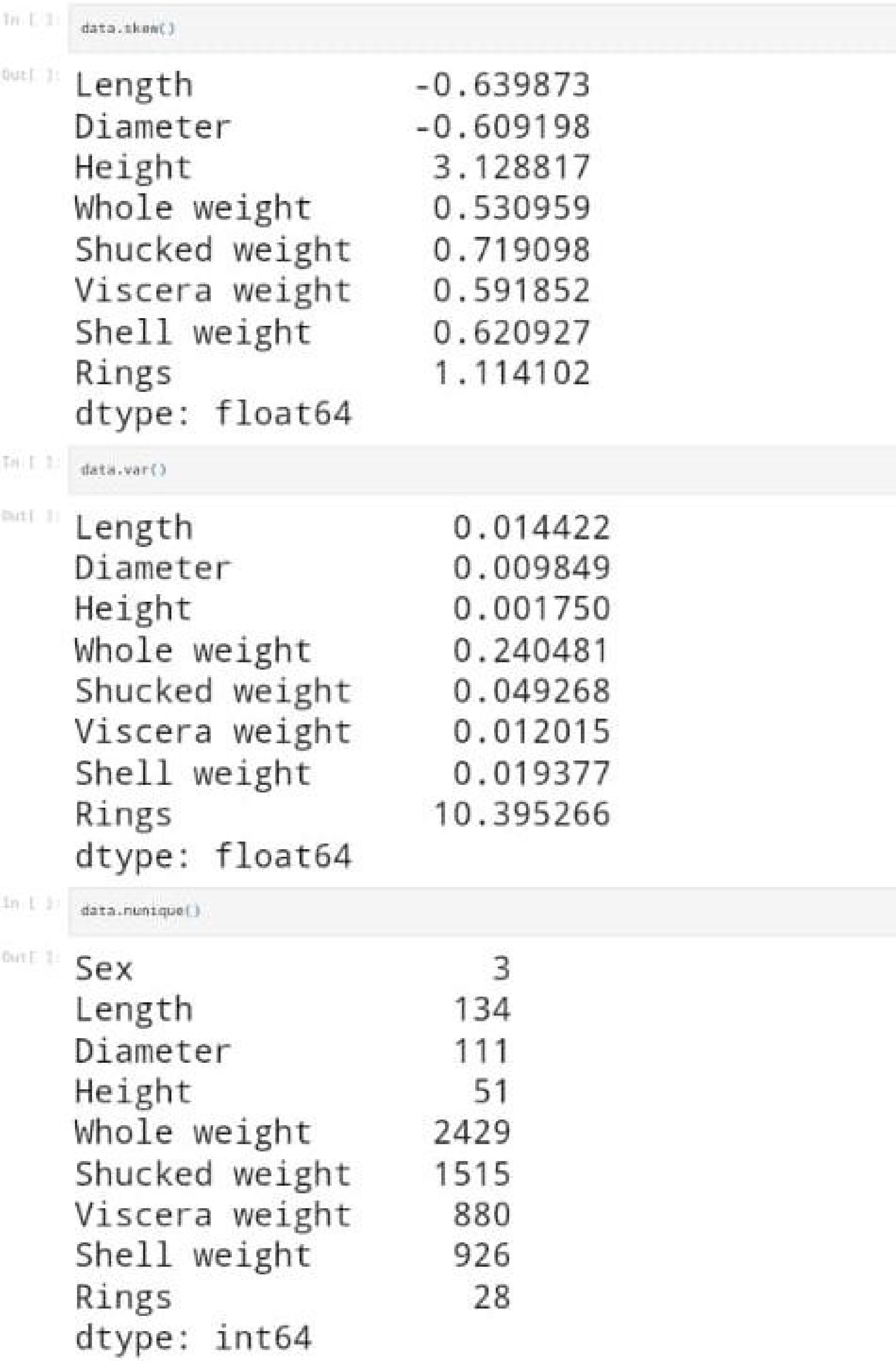
```
(4177, 9)
```

In [ ]:

```
data.kurt()
```

Out[ ]:

```
Length             0.064621
Diameter          -0.045476
Height            76.025509
Whole weight      -0.023644
Shucked weight     0.595124
Viscera weight     0.084012
Shell weight       0.531926
Rings              2.330687
dtype: float64
```



```
In [ ]: data.skew()
```

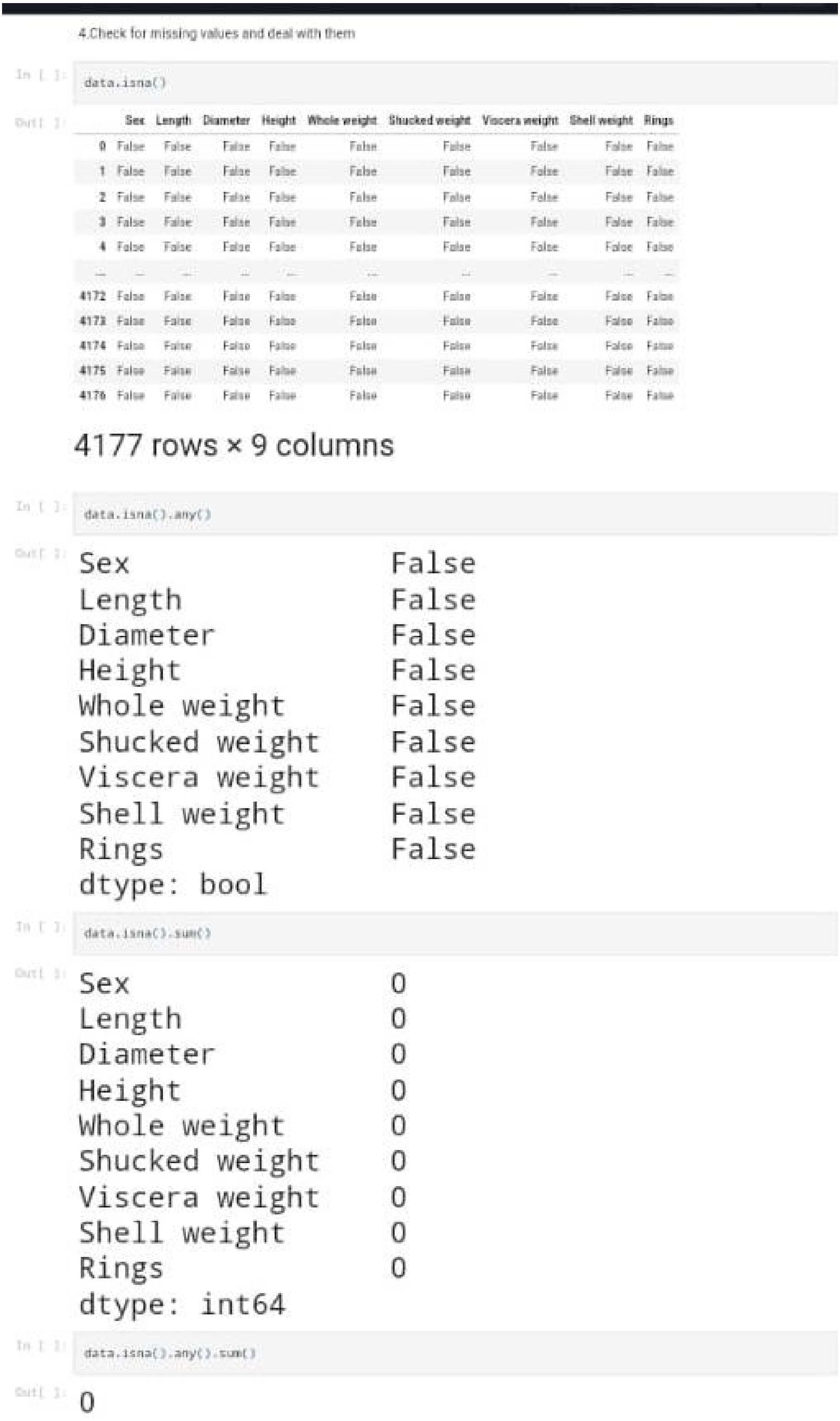
```
Out[ ]: Length            -0.639873
        Diameter          -0.609198
        Height             3.128817
        Whole weight       0.530959
        Shucked weight     0.719098
        Viscera weight     0.591852
        Shell weight       0.620927
        Rings              1.114102
        dtype: float64
```

```
In [ ]: data.var()
```

```
Out[ ]: Length             0.014422
        Diameter           0.009849
        Height             0.001750
        Whole weight       0.240481
        Shucked weight     0.049268
        Viscera weight     0.012015
        Shell weight       0.019377
        Rings             10.395266
        dtype: float64
```

```
In [ ]: data.nunique()
```

```
Out[ ]: Sex                  3
        Length             134
        Diameter           111
        Height              51
        Whole weight      2429
        Shucked weight    1515
        Viscera weight     880
        Shell weight       926
        Rings               28
        dtype: int64
```



4.Check for missing values and deal with them

In [ ]:

```
data.isna()
```

Out[ ]:

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	False	False	False	False	False	False	False	False	False
1	False	False	False	False	False	False	False	False	False
2	False	False	False	False	False	False	False	False	False
3	False	False	False	False	False	False	False	False	False
4	False	False	False	False	False	False	False	False	False
...	...	...	...	...	...	...	...	...	...
4172	False	False	False	False	False	False	False	False	False
4173	False	False	False	False	False	False	False	False	False
4174	False	False	False	False	False	False	False	False	False
4175	False	False	False	False	False	False	False	False	False
4176	False	False	False	False	False	False	False	False	False

4177 rows × 9 columns

In [ ]:

```
data.isna().any()
```

Out[ ]:

```
Sex               False
Length            False
Diameter          False
Height            False
Whole weight      False
Shucked weight    False
Viscera weight    False
Shell weight      False
Rings             False
dtype: bool
```

In [ ]:

```
data.isna().sum()
```

Out[ ]:

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

In [ ]:

```
data.isna().any().sum()
```

Out[ ]:

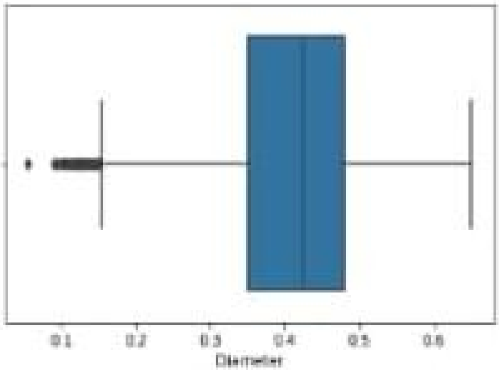
```
0
```

5.Find the outliers and replace them outliers

In [ ]:

```
sns.boxplot(data['Diameter'])
```

Out[ ]:



In [ ]:

```
quant=data.quantile(q=[0.25,0.75])
quant
```

Out[ ]:

	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0.25	0.450	0.35	0.115	0.4415	0.186	0.0935	0.130	8.0
0.75	0.615	0.48	0.165	1.1530	0.502	0.2530	0.329	11.0

In [ ]:

```
iqr=quant.loc[0.75]-quant.loc[0.25]
iqr
```

Out[ ]:

```
Length            0.1650
Diameter          0.1300
Height            0.0500
Whole weight      0.7115
Shucked weight    0.3160
Viscera weight    0.1595
Shell weight      0.1990
Rings             3.0000
dtype: float64
```

In [ ]:

```
low=quant.loc[0.25]-(1.5*iqr)
low
```

Out[ ]:

```
Length            0.20250
Diameter          0.15500
Height            0.04000
Whole weight     -0.62575
Shucked weight   -0.28800
Viscera weight   -0.14575
Shell weight     -0.16850
Rings             3.50000
dtype: float64
```

Out[ ]:

```
Length            0.20250
Diameter          0.15500
Height            0.04000
Whole weight     -0.62575
Shucked weight   -0.28800
Viscera weight   -0.14575
Shell weight     -0.16850
Rings             3.50000
dtype: float64
```

In [ ]:

```
up=quant.loc[0.75]+(1.5*iqr)
up
```

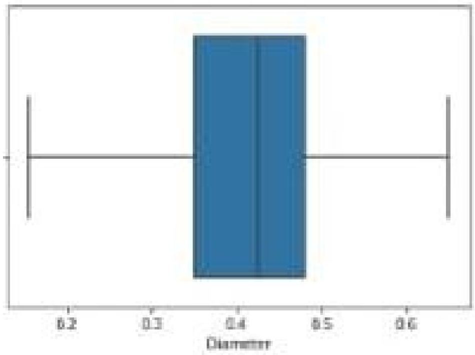
Out[ ]:

```
Length             0.86250
Diameter           0.67500
Height             0.24000
Whole weight       2.22025
Shucked weight     0.97600
Viscera weight     0.49225
Shell weight       0.62750
Rings             15.50000
dtype: float64
```

In [ ]:

```
data['Diameter']=np.where(data['Diameter']<0.155,0.4078,data['Diameter'])
sns.boxplot(data['Diameter'])
```

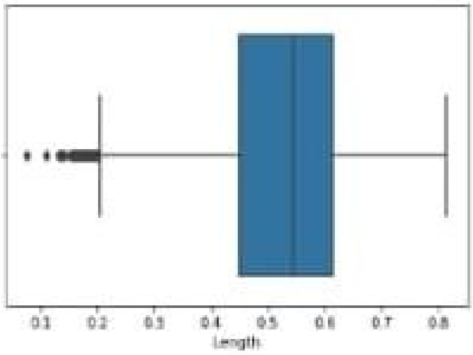
Out[ ]:



In [ ]:

```
sns.boxplot(data['Length'])
```

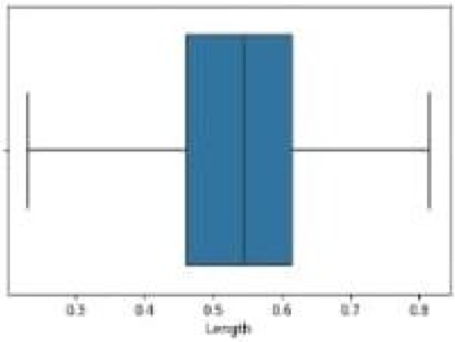
Out[ ]:



In [ ]:

```
data['Length']=np.where(data['Length']<0.23,0.52, data['Length'])
sns.boxplot(data['Length'])
```

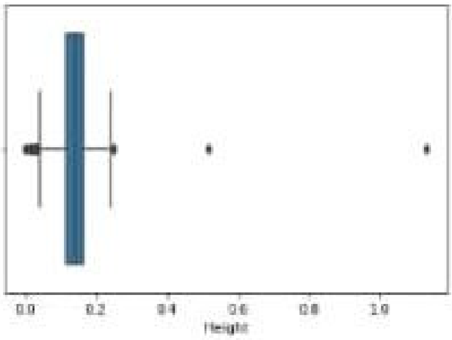
Out[ ]:



In [ ]:

```
sns.boxplot(data['Height'])
```

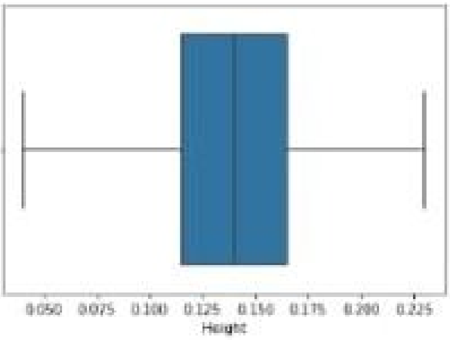
Out[ ]:



In [ ]:

```
data['Height']=np.where(data['Height']<0.04,0.139, data['Height'])
data['Height']=np.where(data['Height']>0.23,0.139, data['Height'])
sns.boxplot(data['Height'])
```

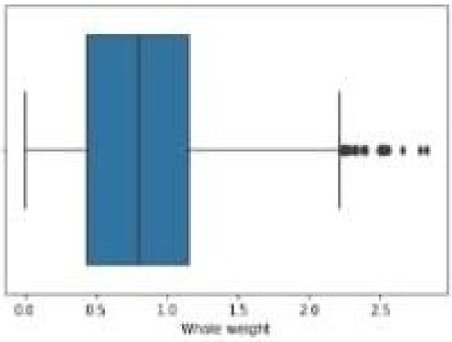
Out[ ]:



In [ ]:

```
sns.boxplot(data['Whole weight'])
```

Out[ ]:



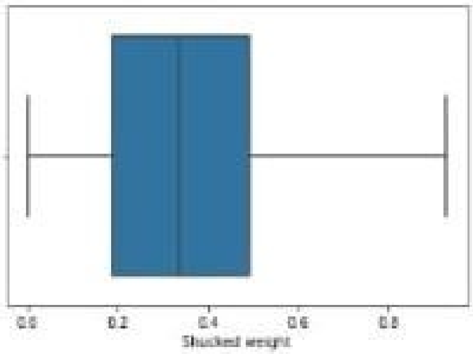
In [ ]:

```
data['Whole weight']=np.where(data['Whole weight']>0.9,0.82, data['Whole weight'])
sns.boxplot(data['Whole weight'])
```

In [ ]:

```
data['Shucked weight']=np.where(data['Shucked weight']>0.93,0.35, data['Shucked weight'])
sns.boxplot(data['Shucked weight'])
```

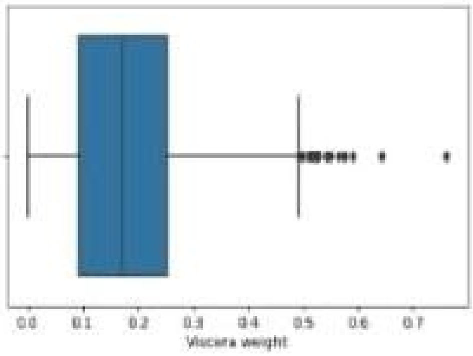
Out[ ]:



In [ ]:

```
sns.boxplot(data['Viscera weight'])
```

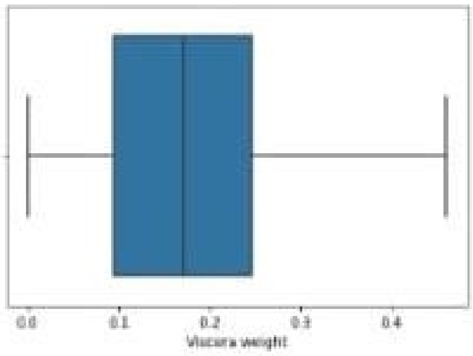
Out[ ]:



In [ ]:

```
data['Viscera weight']=np.where(data['Viscera weight']>0.46,0.18, data['Viscera weight'])
sns.boxplot(data['Viscera weight'])
```

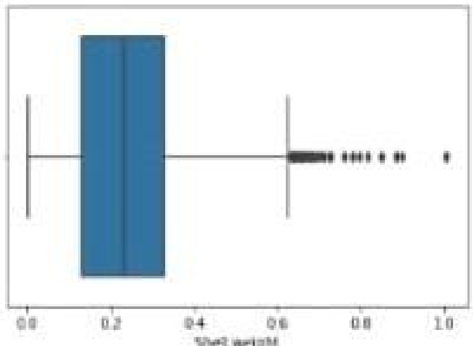
Out[ ]:



In [ ]:

```
sns.boxplot(data['Shell weight'])
```

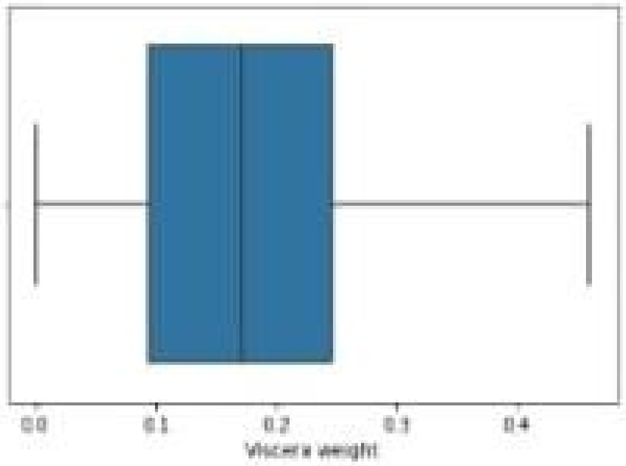
Out[ ]:



In [ ]:

```
data['Viscera weight']=np.where(data['Viscera weight']>0.46,0.18, data['Viscera weight'])
sns.boxplot(data['Viscera weight'])
```

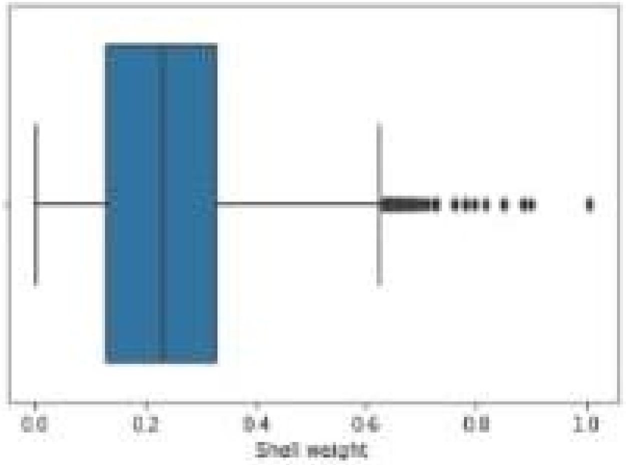
Out[ ]:



In [ ]:

```
sns.boxplot(data['Shell weight'])
```

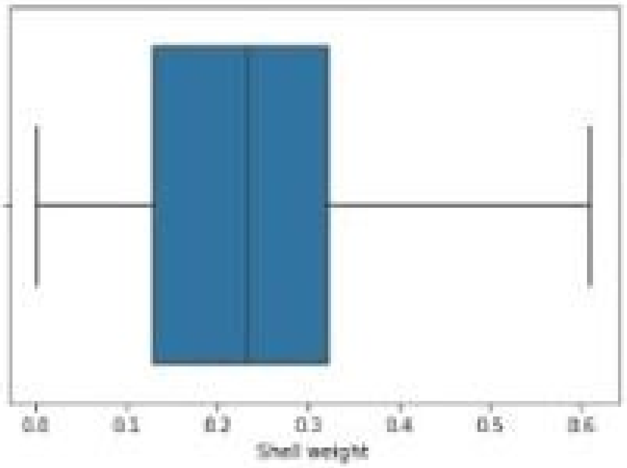
Out[ ]:



In [ ]:

```
data['Shell weight']=np.where(data['Shell weight']>0.61,0.2388, data['Shell weight'])
sns.boxplot(data['Shell weight'])
```

Out[ ]:



6.Check for Categorical columns and perform encoding.

In [ ]:

```
data['Sex'].replace({'M':1,'F':0,'I':2},inplace=True)
data
```

Out[ ]:

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	1	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.1500	15
1	1	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.0700	7
2	0	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.2100	9
3	1	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.1550	10
4	2	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.0550	7
...	...	...	...	...	...	...	...	...	...
4172	0	0.565	0.450	0.165	0.8870	0.3700	0.2390	0.2490	11
4173	1	0.590	0.440	0.135	0.8200	0.4390	0.2145	0.2605	10
4174	1	0.600	0.475	0.205	0.8200	0.5255	0.2875	0.3080	9
4175	0	0.625	0.485	0.150	0.8200	0.5310	0.2610	0.2960	10
4176	1	0.710	0.555	0.195	0.8200	0.3500	0.3765	0.4950	12

4177 rows × 9 columns

7.Split the data into dependent and independent variables.

In [ ]:

```
x=data.drop(columns= ['Rings'])
y=data['Rings']
x
```

Out[ ]:

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight
0	1	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.1500
1	1	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.0700
2	0	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.2100
3	1	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.1550
4	2	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.0550
...	...	...	...	...	...	...	...	...
4172	0	0.565	0.450	0.165	0.8870	0.3700	0.2390	0.2490
4173	1	0.590	0.440	0.135	0.8200	0.4390	0.2145	0.2605
4174	1	0.600	0.475	0.205	0.8200	0.5255	0.2875	0.3080
4175	0	0.625	0.485	0.150	0.8200	0.5310	0.2610	0.2960
4176	1	0.710	0.555	0.195	0.8200	0.3500	0.3765	0.4950

4177 rows × 8 columns

```
In [ ]: y
```

```
Out[ ]: 0       15
        1        7
        2        9
        3       10
        4        7
                ..
        4172    11
        4173    10
        4174     9
        4175    10
        4176    12
        Name: Rings, Length: 4177, dtype: int64
```

8.Scale the independent variables

```
In [ ]: from sklearn.preprocessing import scale
        x = scale(x)
        x
```

```
Out[ ]: array([[-0.0105225 , -0.67088921, -0.501796
        94, ..., -0.61037964,
                -0.7328165 , -0.64358742],
               [-0.0105225 , -1.61376082, -1.573044
        87, ..., -1.22513334,
                -1.24343929, -1.25742181],
               [-1.26630752,  0.00259051,  0.087389
        42, ..., -0.45300269,
                -0.33890749, -0.18321163],
               ...,
               [-0.0105225 ,  0.63117159,  0.676575
        77, ...,  0.86994729,
                 1.08111018,  0.56873549],
               [-1.26630752,  0.85566483,  0.783700
        57, ...,  0.89699645,
                 0.82336724,  0.47666033],
               [-0.0105225 ,  1.61894185,  1.533574
        12, ...,  0.00683308,
                 1.94673739,  2.00357336]])
```

9.Split the data into training and testing

```
In [ ]: from sklearn.model_selection import train_test_split
        x_train, x_test, y_train, y_test = train_test_split(x,y, test_size = 0.2)
        print(x_train.shape, x_test.shape)

        (3341, 8) (836, 8)
```

10.Build the Model

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

11.Train the model

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

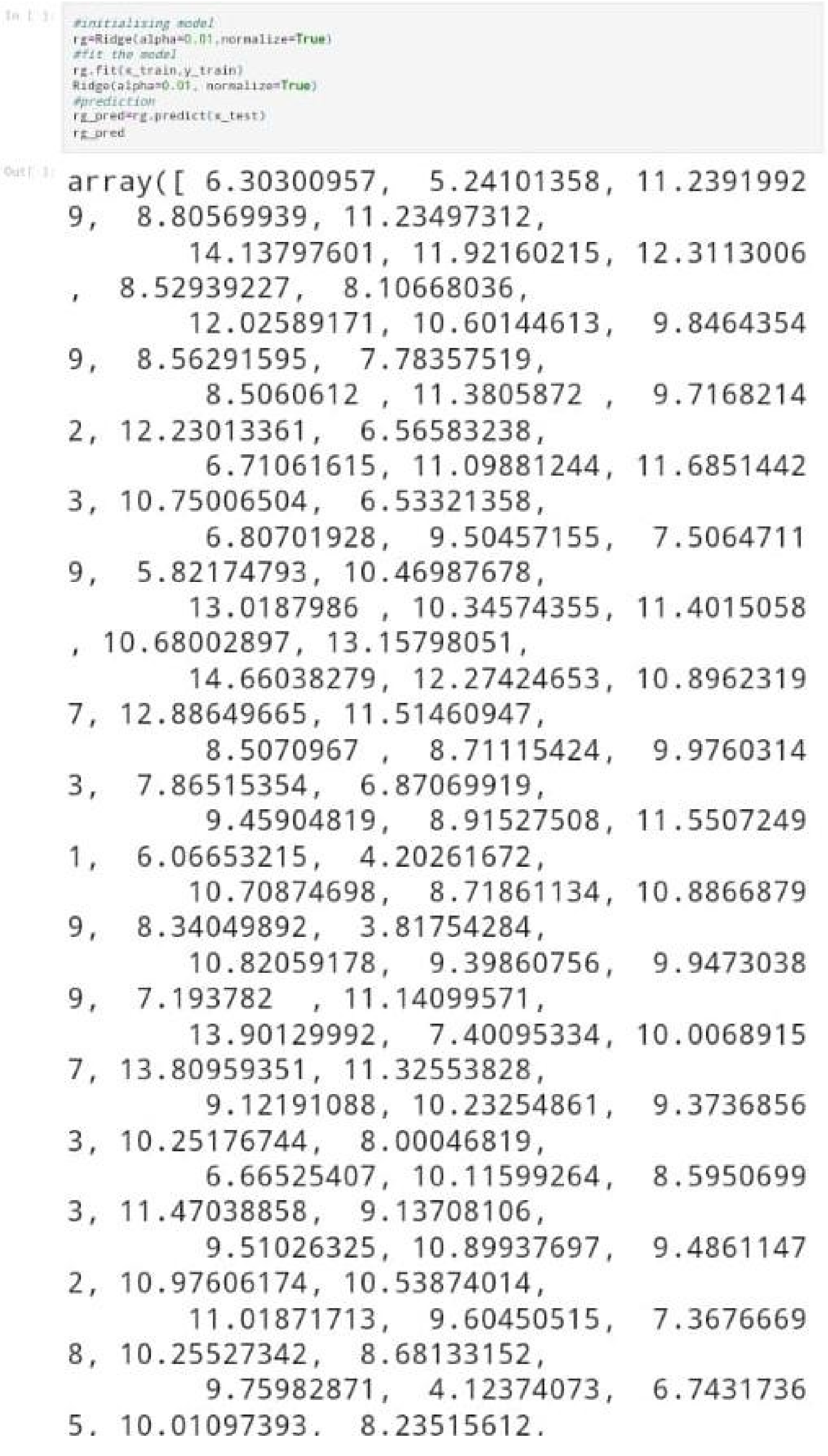
```
Out[ ]: LinearRegression()
```

12.Test the model

```
In [ ]:  y_pred=MLR.predict(x_test)
         y_pred
```

```
Out[ ]:  array([ 6.27730521,  5.11464173, 11.2906194
         7,  8.84719371, 11.31342551,
                14.27587505, 11.89677849, 12.3964822
         5,  8.55248601,  8.08961834,
                12.09449868, 10.56528709,  9.7895849
         9,  8.59686646,  7.76585939,
                 8.47357248, 11.36977123,  9.5280555
         6, 12.36997291,  6.51973298,
                 6.71785594, 11.05744841, 11.6901007
         4, 10.75739263,  6.5544077 ,
                 6.82824096,  9.5306839 ,  7.5119168
         9,  5.82377217, 10.47024617,
                13.13730038, 10.34700988, 11.4119617
         7, 10.59789269, 13.25077032,
                14.82997416, 12.28691696, 10.9214164
         , 12.87901037, 11.59049406,
                 8.5462146 ,  8.52536272,  9.9537730
         9,  7.94745203,  6.85150487,
                 9.45338836,  8.86394805, 11.5806935
         8,  6.06270743,  4.07194007,
                10.72813151,  8.62455986, 10.9224726
         4,  8.31707157,  3.31458267,
                10.83423943,  9.36311705,  9.9259695
         7,  7.17213853, 11.12938437,
                13.91273686,  7.42159167,  9.9633253
         4, 13.92006698, 11.33472246,
                 9.06493075, 10.20822237,  9.2684450
         5, 10.24458569,  8.00893436,
                 6.65277356,  9.9852585 ,  8.5866735
         2, 11.43900078,  9.16014079,
                 9.50575436, 10.974906  ,  9.3115556
         1, 10.85487744, 10.47876918,
                10.89867355,  9.57567238,  7.3775531
         6, 10.26968745,  8.68813991,
                 9.66582988,  3.98888101,  6.6801349
         2,  9.98844442,  8.20535208,
                14.65659649, 11.55465815, 10.8217179
         7,  6.76120381,  8.9003516 ,
                13.21613708, 10.1018605 ,  8.2471845
         3,  7.45995921, 10.21992407,
                11.59425676, 10.66513659, 13.3792795
         6, 10.94076906, 10.60418916,
                11.27500775,  9.12904033, 13.0246627
```

```
4, 10.73998470, 11.49138144,
        6.20410519,  8.62148935, 12.5795445
,  6.69882956, 12.00242043,
        9.3306056 ,  9.98680774,  8.9656372
5, 10.93545618,  6.79192911,
        9.70880805, 10.70932137,  8.9335340
2,  9.50496905,  8.07991477,
        8.95737614, 10.93209418,  7.7644968
,  8.13978903, 10.95470452,
       10.31933582, 13.16703248, 10.1301335
8,  9.83546825,  9.90633339,
        7.01510185,  7.90500802, 11.0718584
9,  9.29098045, 11.97645598,
       10.72209476,  8.01227134, 12.5263092
, 12.14710337,  7.46207783,
        6.40507134, 11.11733617,  7.3223731
3, 11.74140484, 10.62073403,
        6.7070387 ,  8.26673972,  8.0359016
5, 11.01898624,  6.86794371,
       10.81252025, 10.428314  ,  8.7164497
8, 11.55298684, 10.54060743,
        7.8005991 ,  7.77758003, 12.8386618
,  8.93468911, 11.39965158,
       14.96420885,  3.44108358, 12.1693500
9,  5.50036395, 11.35043959,
       11.89531817, 10.4970892 , 10.3551774
8, 12.2719997 ,  8.58613842,
       11.96040691,  7.91529244,  9.9775962
9, 12.80717361,  7.84490672,
       11.63929871, 10.9799557 , 13.2329783
9,  7.46809636,  8.32165892,
        7.57491949,  9.60052813,  9.3036159
3,  9.48560973,  9.0381744 ,
       11.86024904, 10.77236488, 10.1931920
8,  5.88606055,  8.97293908,
        9.02729706, 11.00195158, 10.7400269
1,  8.01759076, 13.44832209,
       11.04252635, 10.85167432,  6.9659662
5,  6.49943453, 11.22159222,
        8.02736878,  6.63174433, 10.2306847
1.  7.84382717. 11.44647106.
```



In [ ]:

```
#initializing model
rg=Ridge(alpha=0.01,normalize=True)
#fit the model
rg.fit(x_train,y_train)
Ridge(alpha=0.01, normalize=True)
#prediction
rg_pred=rg.predict(x_test)
rg_pred
```

Out[ ]:

```
array([ 6.30300957,  5.24101358, 11.2391992
9,  8.80569939, 11.23497312,
       14.13797601, 11.92160215, 12.3113006
,  8.52939227,  8.10668036,
       12.02589171, 10.60144613,  9.8464354
9,  8.56291595,  7.78357519,
        8.5060612 , 11.3805872 ,  9.7168214
2, 12.23013361,  6.56583238,
        6.71061615, 11.09881244, 11.6851442
3, 10.75006504,  6.53321358,
        6.80701928,  9.50457155,  7.5064711
9,  5.82174793, 10.46987678,
       13.0187986 , 10.34574355, 11.4015058
, 10.68002897, 13.15798051,
       14.66038279, 12.27424653, 10.8962319
7, 12.88649665, 11.51460947,
        8.5070967 ,  8.71115424,  9.9760314
3,  7.86515354,  6.87069919,
        9.45904819,  8.91527508, 11.5507249
1,  6.06653215,  4.20261672,
       10.70874698,  8.71861134, 10.8866879
9,  8.34049892,  3.81754284,
       10.82059178,  9.39860756,  9.9473038
9,  7.193782  , 11.14099571,
       13.90129992,  7.40095334, 10.0068915
7, 13.80959351, 11.32553828,
        9.12191088, 10.23254861,  9.3736856
3, 10.25176744,  8.00046819,
        6.66525407, 10.11599264,  8.5950699
3, 11.47038858,  9.13708106,
        9.51026325, 10.89937697,  9.4861147
2, 10.97606174, 10.53874014,
       11.01871713,  9.60450515,  7.3676669
8, 10.25527342,  8.68133152,
        9.75982871,  4.12374073,  6.7431736
5. 10.01097393.  8.23515612.
```

```
        11.23515880, 12.49279281, 10.9167993
9,  6.84011069, 12.48921874,
        7.81304895,  8.95960113, 10.3999996
2,  5.43945682, 10.50917718,
       12.07995019,  8.87089164, 10.2151565
, 12.71058466,  7.23101045,
        7.50114506,  9.58725943, 11.3352038
9, 11.7963565 , 11.35488843,
       13.01264902, 10.2918353 , 12.8157642
5,  7.07085019, 12.48308462,
       11.34631202,  8.28239564,  6.5224844
4, 10.25674811, 10.83809242,
       10.03350984,  7.88923102,  9.657072
,  7.05413921, 10.20044713,
        9.81331394,  9.69054416,  8.0905216
1, 12.74964657, 11.20405624,
        9.74627941, 11.47087059, 10.8641454
2,  7.95846639, 10.36850946,
       12.08673065,  5.60767597,  9.7008085
1,  8.63857986,  6.62962512,
       10.75725404,  6.67523629,  9.5239507
4, 12.82208937,  7.0549315 ,
        9.94693633, 11.17738827, 11.1924380
4, 10.21193312, 11.70131552,
        8.11838748,  9.96414209,  6.4883403
4, 10.00112698, 10.31351969,
        9.32608025, 10.23928034, 11.0186451
1, 10.69788454, 10.01110364,
        8.61391512, 11.67185473, 11.5202983
8, 11.52419116, 12.49302801,
        4.26263982])
```

In [ ]:

```
pred=NLR.predict(x_train)
pred
```

Out[ ]:

```
array([13.90916896,  7.94417688, 10.9917352
9, ...,  9.21077865,
        6.26813443,  9.88590822])
```

In [ ]:

```
from sklearn.metrics import r2_score
accuracy=r2_score(y_test,y_pred)
accuracy
```

Out[ ]:

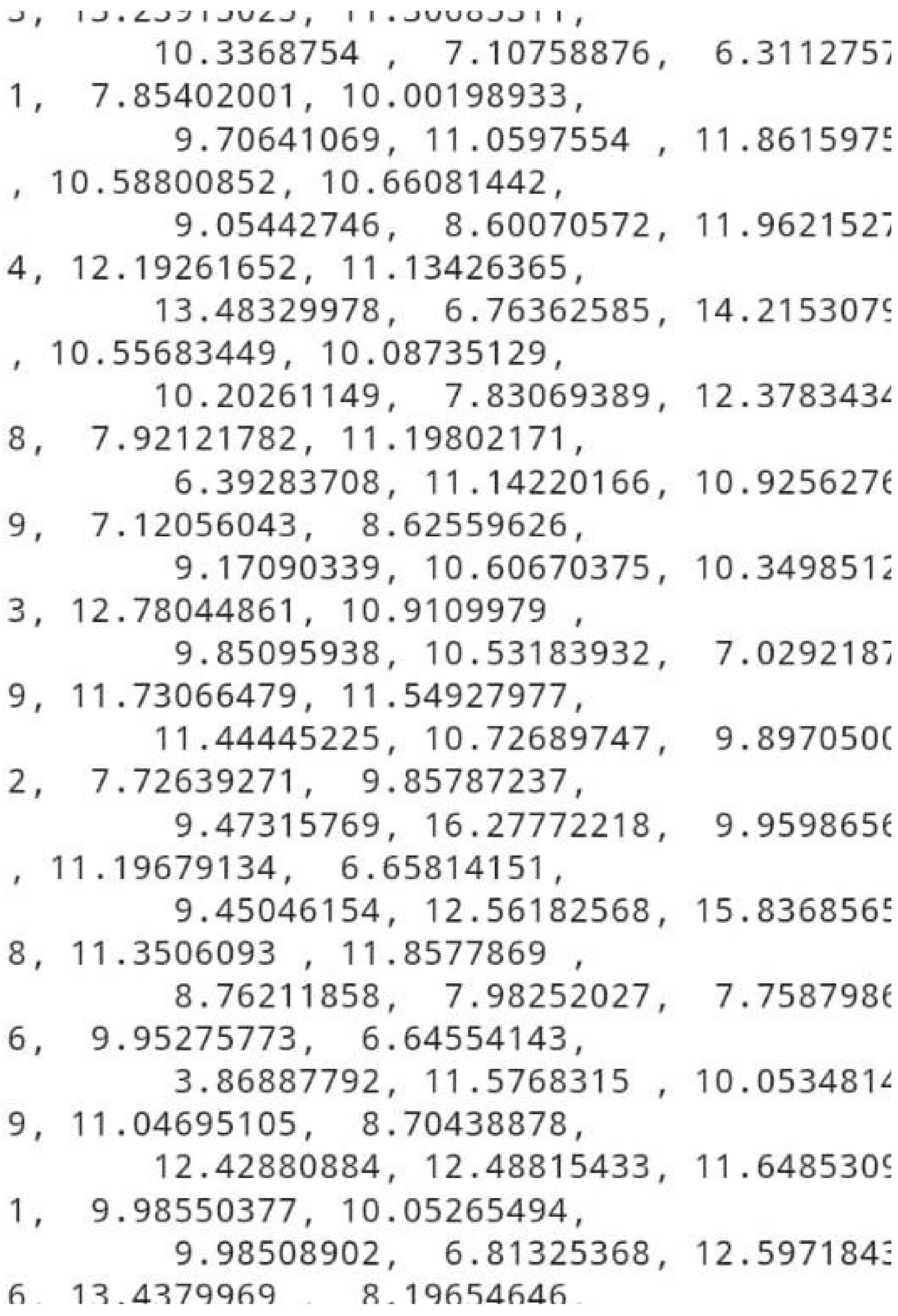
```
0.4482390430138421
```

In [ ]:

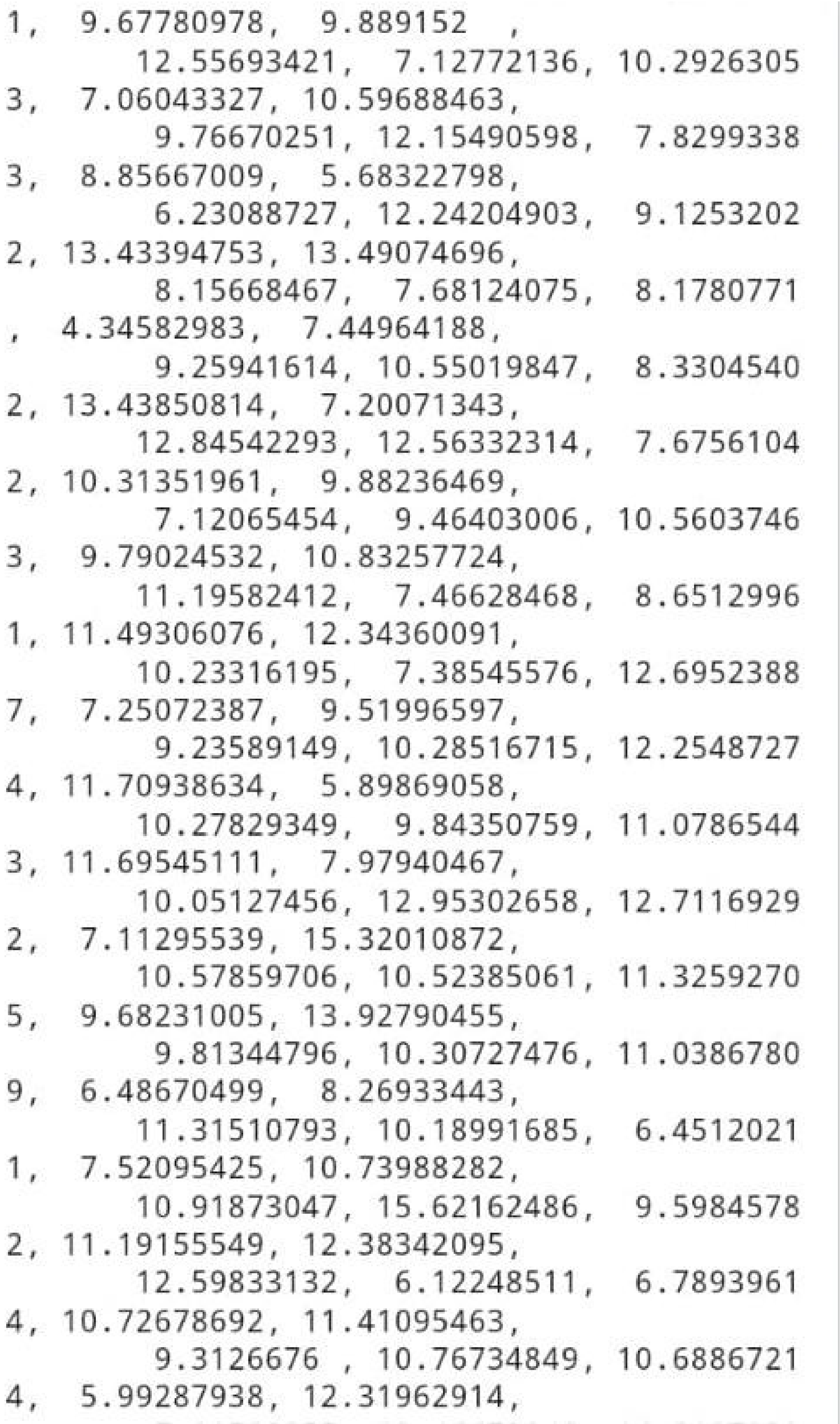
```
NLR.predict([[1,0.455,0.365,0.095,0.5140,0.2245,0.1010,0.150]])
```

Out[ ]:

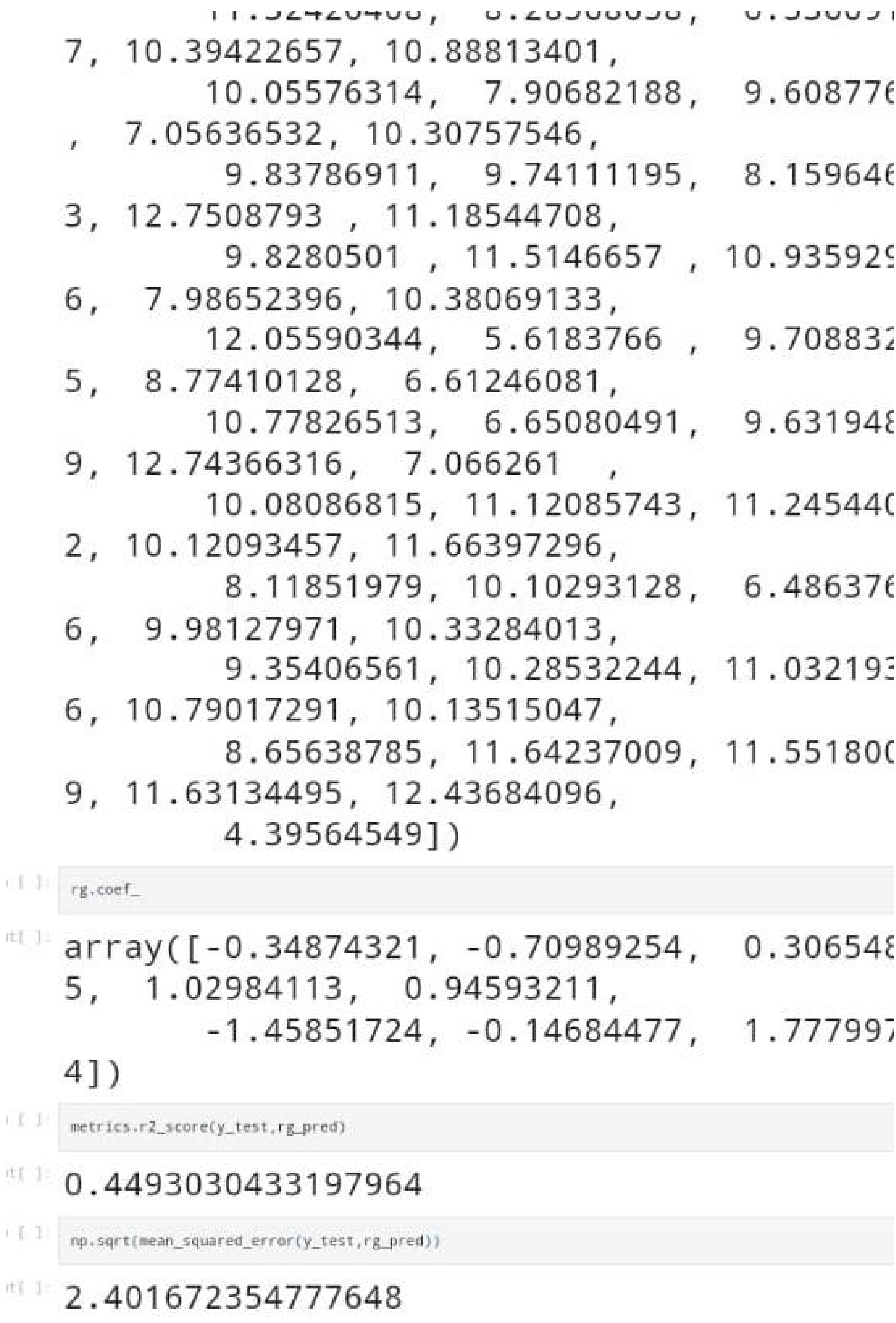
```
array([9.8732734])
```



```
3, 13.25915025, 11.50085311,
        10.3368754 ,  7.10758876,  6.311275
1,  7.85402001, 10.00198933,
         9.70641069, 11.0597554 , 11.861597
, 10.58800852, 10.66081442,
         9.05442746,  8.60070572, 11.962152
4, 12.19261652, 11.13426365,
        13.48329978,  6.76362585, 14.215307
, 10.55683449, 10.08735129,
        10.20261149,  7.83069389, 12.378343
8,  7.92121782, 11.19802171,
         6.39283708, 11.14220166, 10.925627
9,  7.12056043,  8.62559626,
         9.17090339, 10.60670375, 10.349851
3, 12.78044861, 10.9109979 ,
         9.85095938, 10.53183932,  7.029218
9, 11.73066479, 11.54927977,
        11.44445225, 10.72689747,  9.897050
2,  7.72639271,  9.85787237,
         9.47315769, 16.27772218,  9.959865
, 11.19679134,  6.65814151,
         9.45046154, 12.56182568, 15.836856
8, 11.3506093 , 11.8577869 ,
         8.76211858,  7.98252027,  7.758798
6,  9.95275773,  6.64554143,
         3.86887792, 11.5768315 , 10.053481
9, 11.04695105,  8.70438878,
        12.42880884, 12.48815433, 11.648530
1,  9.98550377, 10.05265494,
         9.98508902,  6.81325368, 12.597184
6, 13.4379969 ,  8.19654646,
```



```
1,  9.67780978,  9.889152  ,
       12.55693421,  7.12772136, 10.2926305
3,  7.06043327, 10.59688463,
        9.76670251, 12.15490598,  7.8299338
3,  8.85667009,  5.68322798,
        6.23088727, 12.24204903,  9.1253202
2, 13.43394753, 13.49074696,
        8.15668467,  7.68124075,  8.1780771
,  4.34582983,  7.44964188,
        9.25941614, 10.55019847,  8.3304540
2, 13.43850814,  7.20071343,
       12.84542293, 12.56332314,  7.6756104
2, 10.31351961,  9.88236469,
        7.12065454,  9.46403006, 10.5603746
3,  9.79024532, 10.83257724,
       11.19582412,  7.46628468,  8.6512996
1, 11.49306076, 12.34360091,
       10.23316195,  7.38545576, 12.6952388
7,  7.25072387,  9.51996597,
        9.23589149, 10.28516715, 12.2548727
4, 11.70938634,  5.89869058,
       10.27829349,  9.84350759, 11.0786544
3, 11.69545111,  7.97940467,
       10.05127456, 12.95302658, 12.7116929
2,  7.11295539, 15.32010872,
       10.57859706, 10.52385061, 11.3259270
5,  9.68231005, 13.92790455,
        9.81344796, 10.30727476, 11.0386780
9,  6.48670499,  8.26933443,
       11.31510793, 10.18991685,  6.4512021
1,  7.52095425, 10.73988282,
       10.91873047, 15.62162486,  9.5984578
2, 11.19155549, 12.38342095,
       12.59833132,  6.12248511,  6.7893961
4, 10.72678692, 11.41095463,
        9.3126676 , 10.76734849, 10.6886721
4,  5.99287938, 12.31962914,
```



```
       11.52420408,  8.28568658,  6.55069
7, 10.39422657, 10.88813401,
       10.05576314,  7.90682188,  9.60877(
,  7.05636532, 10.30757546,
        9.83786911,  9.74111195,  8.15964(
3, 12.7508793 , 11.18544708,
        9.8280501 , 11.5146657 , 10.93592(
6,  7.98652396, 10.38069133,
       12.05590344,  5.6183766 ,  9.70883Z
5,  8.77410128,  6.61246081,
       10.77826513,  6.65080491,  9.63194&
9, 12.74366316,  7.066261  ,
       10.08086815, 11.12085743, 11.24544(
2, 10.12093457, 11.66397296,
        8.11851979, 10.10293128,  6.48637(
6,  9.98127971, 10.33284013,
        9.35406561, 10.28532244, 11.03219(
6, 10.79017291, 10.13515047,
        8.65638785, 11.64237009, 11.55180(
9, 11.63134495, 12.43684096,
        4.39564549])
```

```
[ ]: rg.coef_
```

```
t[ ]: array([-0.34874321, -0.70989254,  0.30654&
5,  1.02984113,  0.94593211,
       -1.45851724, -0.14684477,  1.77799;
4])
```

```
[ ]: metrics.r2_score(y_test,rg_pred)
```

```
t[ ]: 0.4493030433197964
```

```
[ ]: np.sqrt(mean_squared_error(y_test,rg_pred))
```

```
t[ ]: 2.401672354777648
```

```
        8.70681169, 10.35531895, 11.821864
, 10.69012783, 10.40917452,
        9.00251064, 10.12524793,  8.008122
4,  7.01803139,  9.89605901,
       10.95301139, 10.11983309, 13.315613
9,  9.3845876 , 10.72954916,
        7.80515437,  8.7176603 ,  9.042729
9, 11.95110897,  6.27650075,
       11.19367599, 12.39295814, 10.909359
,  6.8782812 , 12.47837181,
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,  7.05636532, 10.30757546,
        9.83786911,  9.74111195,  8.159646
3, 12.7508793 , 11.18544708,
        9.8280501 , 11.5146657 , 10.935929
6,  7.98652396, 10.38069133,
       12.05590344,  5.6183766 ,  9.708832
5,  8.77410128,  6.61246081,
       10.77826513,  6.65080491,  9.631948
9, 12.74366316,  7.066261  ,
       10.08086815, 11.12085743, 11.245440
2, 10.12093457, 11.66397296,
        8.11851979, 10.10293128,  6.486376
6,  9.98127971, 10.33284013,
```

Out[ ]:
```
2.403991367956563
```

LASSO

In [ ]:
```python
from sklearn.linear_model import Lasso, Ridge
#intialising model
lso=Lasso(alpha=0.01,normalize=True)
#fit the model
lso.fit(x_train,y_train)
Lasso(alpha=0.01, normalize=True)
#prediction on test data
lso_pred=lso.predict(x_test)
#coef
coef=lso.coef_
coef
```

Out[ ]:
```
array([-0.01293987,  0.        ,  0.
,  0.50666281,  0.15925177,
        0.        ,  0.        ,  0.7739190
3])
```

In [ ]:
```python
from sklearn import metrics
from sklearn.metrics import mean_squared_error
metrics.r2_score(y_test,lso_pred)
```

Out[ ]:
```
0.36871210321772163
```

In [ ]:
```python
np.sqrt(mean_squared_error(y_test,lso_pred))
```

Out[ ]:
```
2.571408956644621
```

RIDGE

In [ ]:
```python
#initialising model
rg=Ridge(alpha=0.01,normalize=True)
#fit the model
rg.fit(x_train,y_train)
Ridge(alpha=0.01, normalize=True)
#prediction
rg_pred=rg.predict(x_test)
rg_pred
```

Out[ ]:
```
array([ 6.30300957,  5.24101358, 11.2391992
9,  8.80569939, 11.23497312,
       14.13797601, 11.92160215, 12.3113006
,  8.52939227,  8.10668036,
       12.02589171, 10.60144613,  9.8464354
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9,  5.82174793, 10.46987678,
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, 10.68002897, 13.15798051,
       14.66038279, 12.27424653, 10.8962319
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1,  6.06653215,  4.20261672,
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       14.30853246, 11.17685101,  6.3923162
6, 13.29016329, 11.38371139,
       10.23085817,  7.06496936,  6.2948497
6,  7.89811317, 10.02660635,
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       13.41804188,  6.7462837 , 14.3025865
7, 10.50088566, 10.14606343,
       10.07070828,  7.79519418, 12.3649476
5,  7.91204745, 11.19841461,
        6.30886416, 11.09355661, 10.9570427
3,  7.0782196 ,  8.56331832,
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, 12.87637462, 10.8709905 ,
        9.86989967, 10.53119798,  7.3565180
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9,  7.66885054,  9.85334605,
        9.42365792, 16.51180007,  9.9426521
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        9.42050294, 12.5832539 , 15.9618033
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8, 10.00735736,  6.64929106,
        3.36917219, 11.57092155, 10.1219976
7, 11.1501544 ,  8.73720749,
       12.53011009, 12.63591866, 11.6942705
4, 10.01649554,  9.97193676,
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, 10.28184012,  8.77071666,
```