1. Download the dataset

Data set link:[abalone]

from google.colab import drive

```
drive.mount('/content/drive')
Mounted at /content/drive
```

2. Load the dataset into the tool

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
#Load the dataset
df =
pd.read_csv('/content/drive/MyDrive/DataAnalyticsAssignment/abalone.csv')
df.head()
```

	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

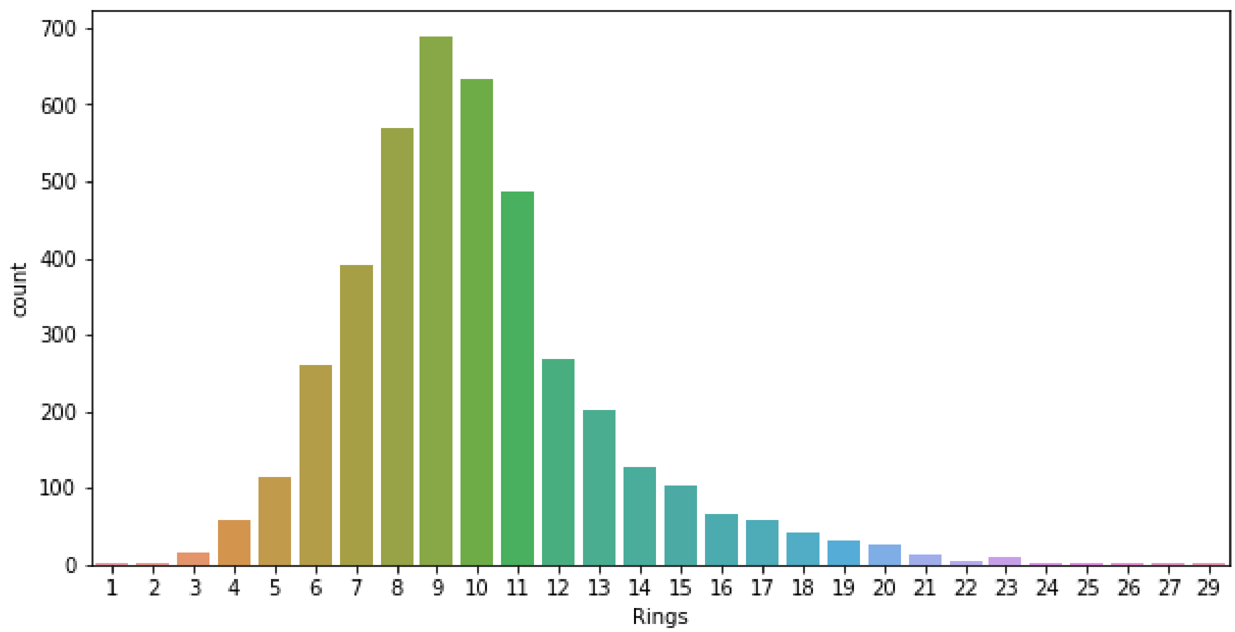
3. Perform Visualizations

List item

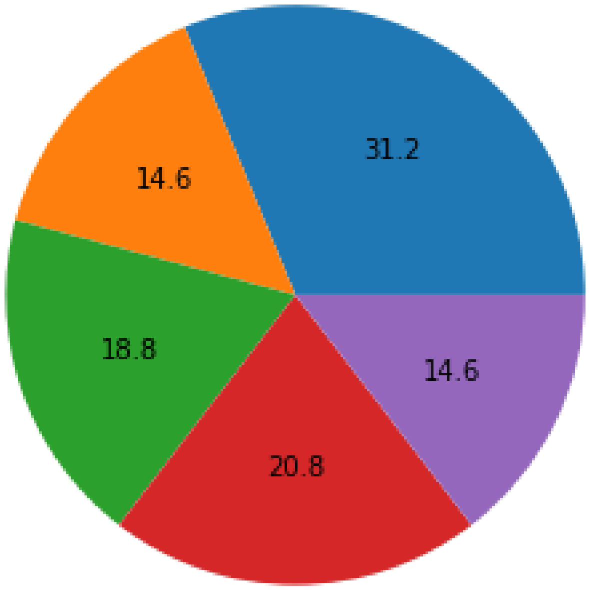
- List item
- List item

*italicized text*1 Univariate Analysi

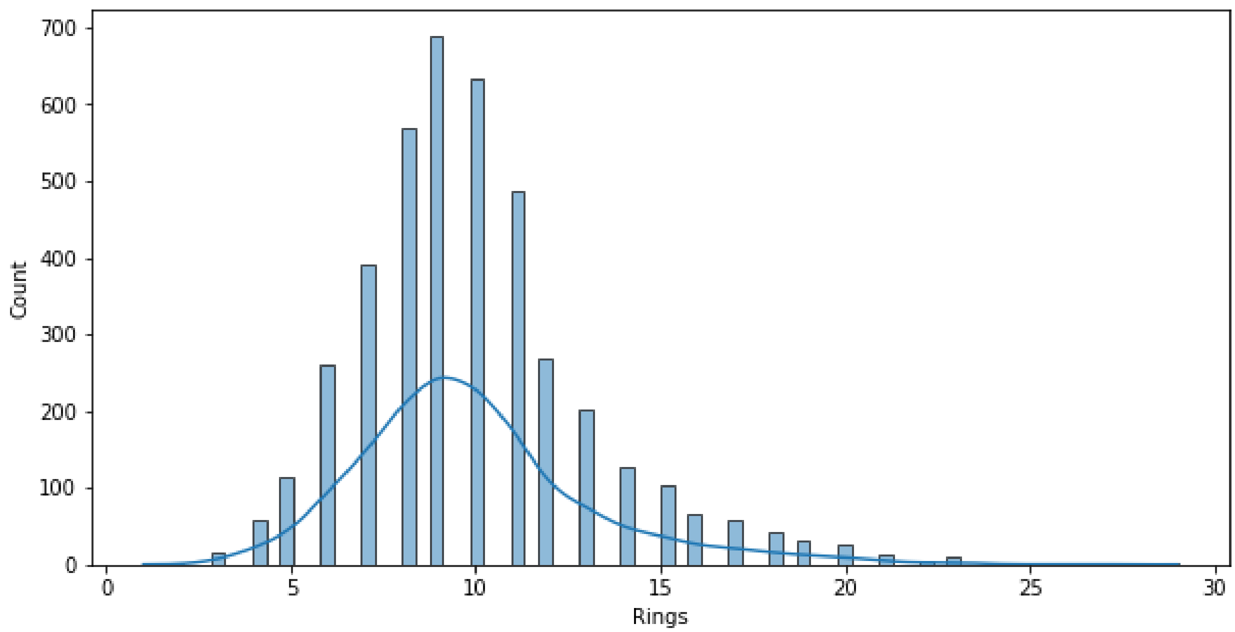
```
#change the size of the figures
plt.rcParams['figure.figsize'] = (10, 5)
# countplot
sns.countplot(data=df,x="Rings")
```



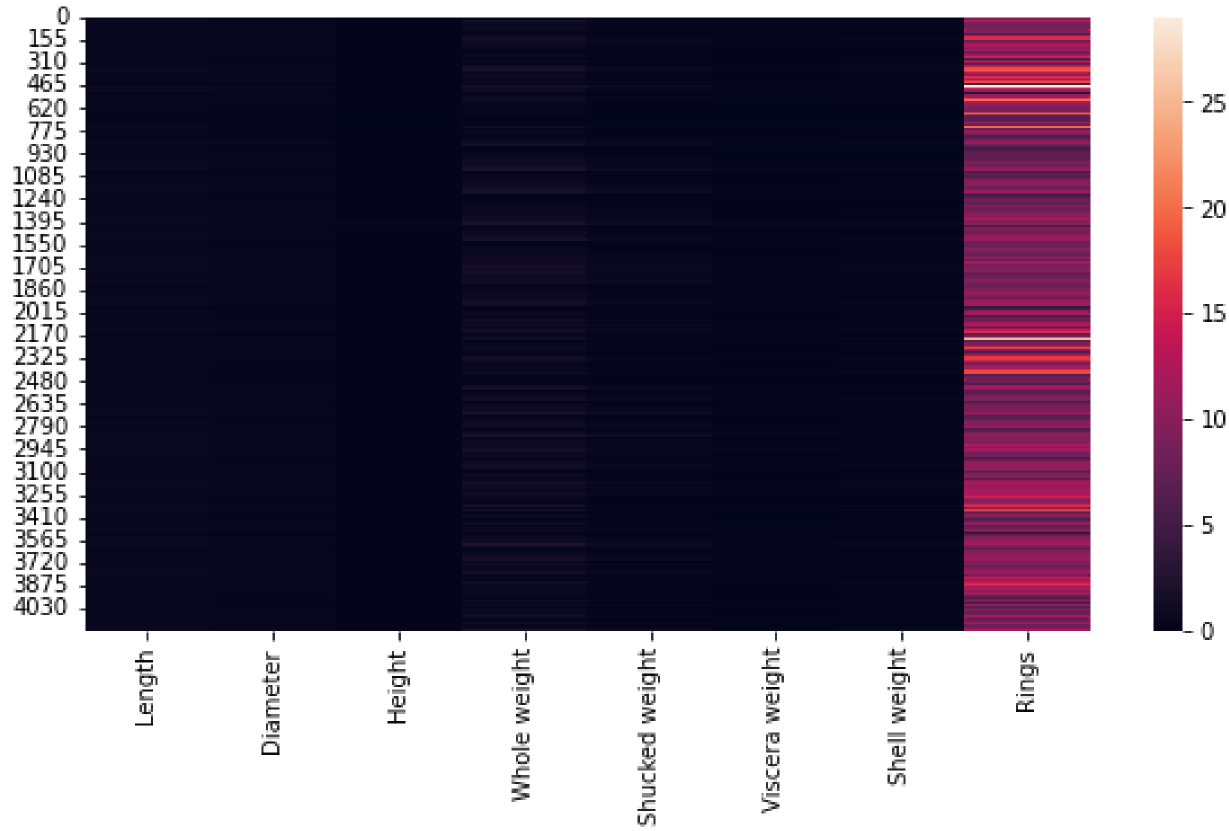

```
#piechart
plt.pie(df['Rings'].head(),autopct='%.1f')
([,
  ,
  ,
  ,
  ],
 [Text(0.6111272563215626, 0.9146165735327998, ''),
  Text(-0.8270237769092663, 0.725280409515335, ''),
  Text(-1.041623153479572, -0.35358337932554523, ''),
  Text(-5.149471704824549e-08, -1.0999999999999988, ''),
  Text(0.9865599777267362, -0.4865176362145796, '')],
 [Text(0.33334213981176136, 0.4988817673815271, '31.2'),
  Text(-0.4511038783141452, 0.39560749609927365, '14.6'),
  Text(-0.5681580837161301, -0.1928636614502974, '18.8'),
  Text(-2.8088027480861175e-08, -0.5999999999999993, '20.8'),
  Text(0.5381236242145833, -0.2653732561170434, '14.6')])
```



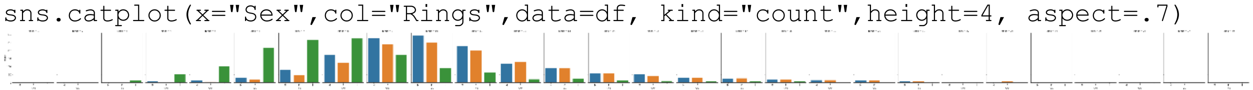

```
#histplot
sns.histplot(df.Rings,kde=True)
```



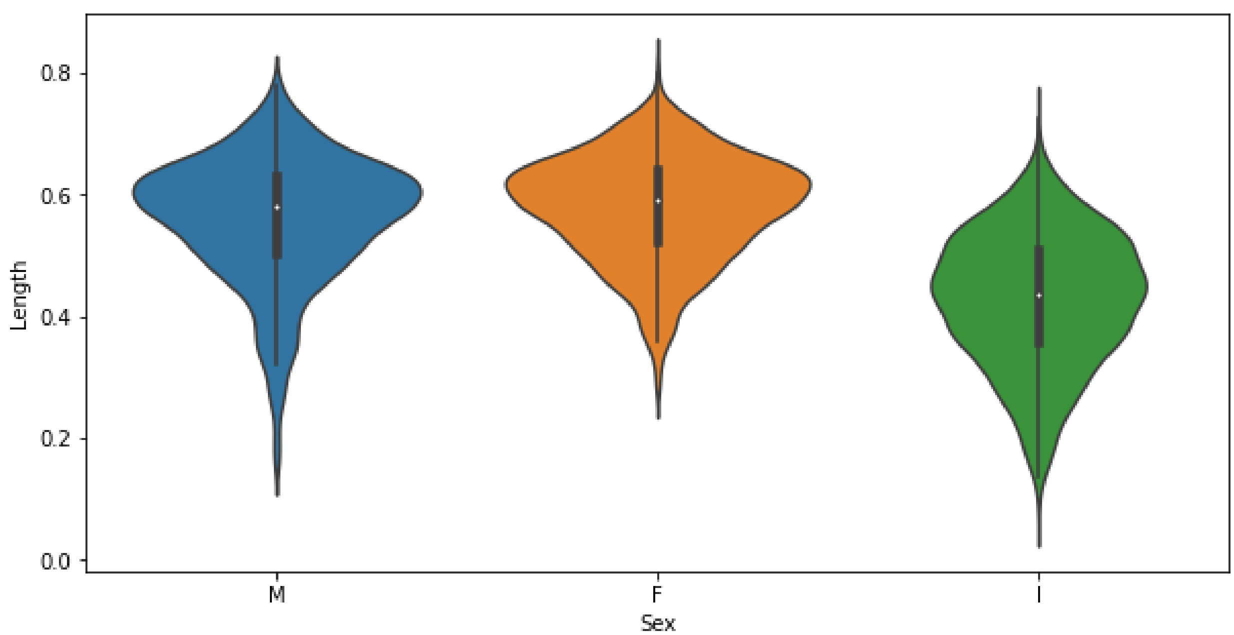

```
# heatmap

sns.heatmap(df[[ 'Length', 'Diameter', 'Height', 'Whole weight', 'Shucked
weight',
       'Viscera weight', 'Shell weight', 'Rings']])
```




```
#countplot
sns.catplot(x="Sex",col="Rings",data=df, kind="count",height=4, aspect=.7)
```

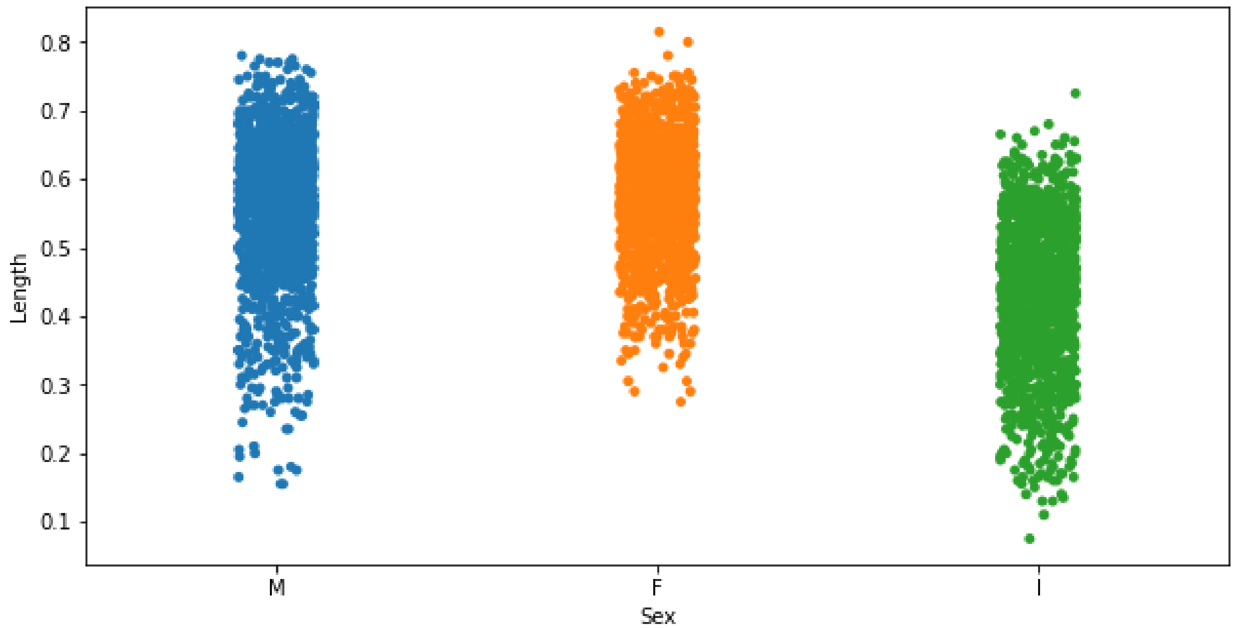


```
#violin plot
sns.violinplot(x="Sex", y="Length", data=df)
```

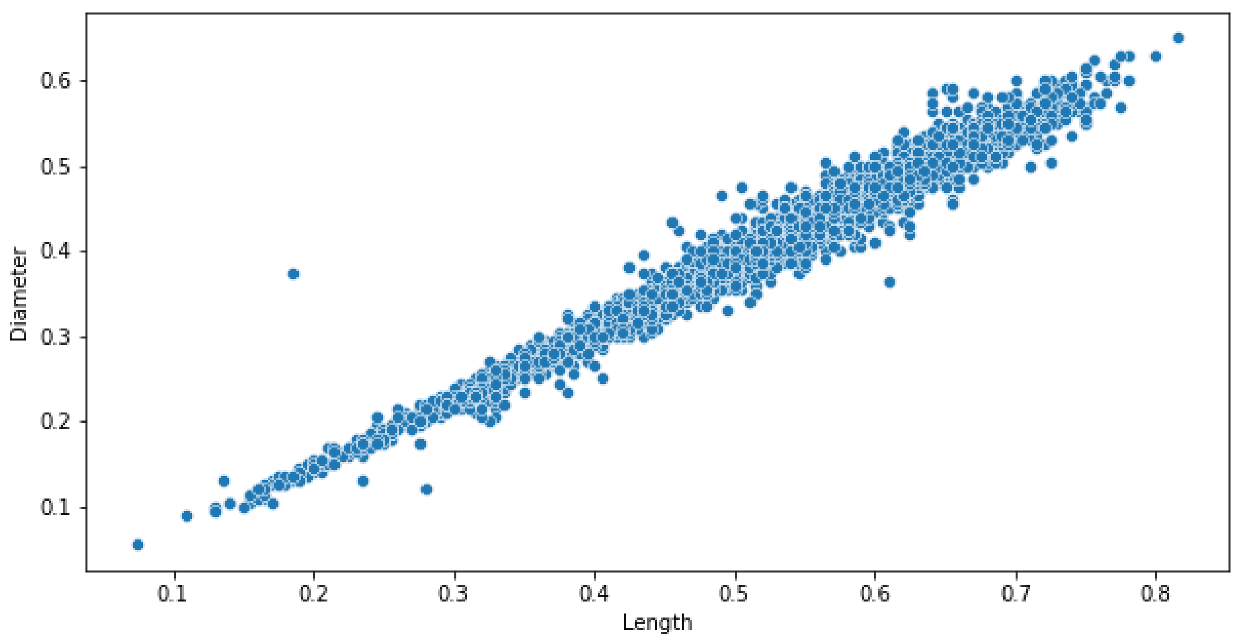



```
#strip plot
```

```
sns.stripplot(x="Sex", y="Length", data=df)
```

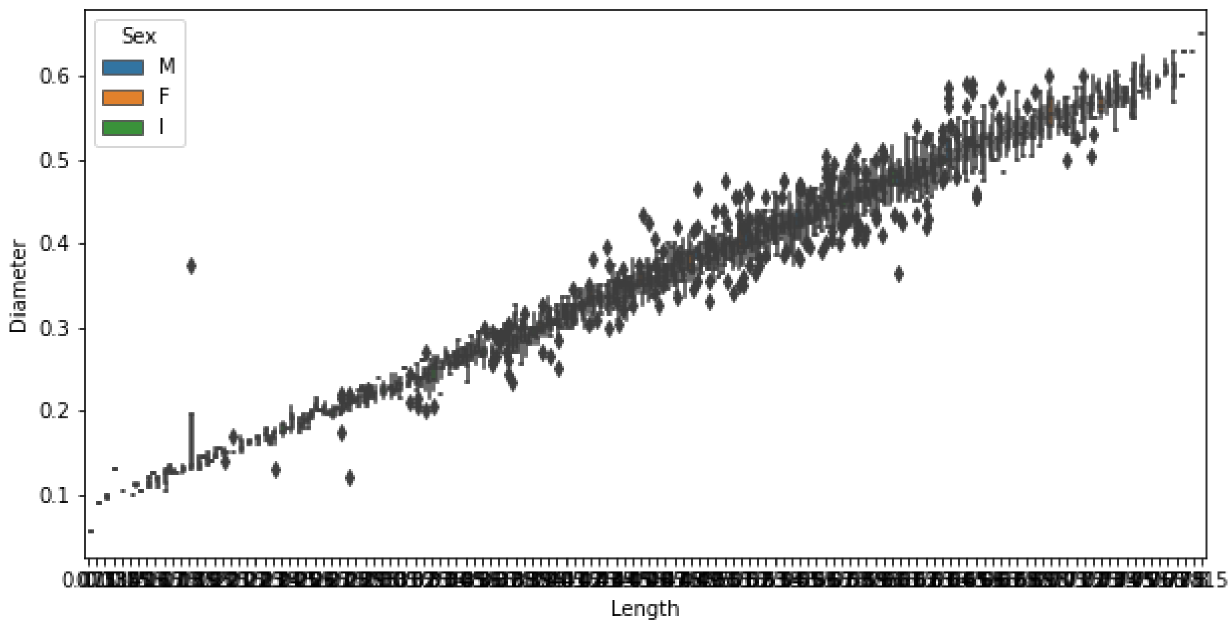



```
#scatter plot
sns.scatterplot(x = df["Length"],y = df["Diameter"])
```

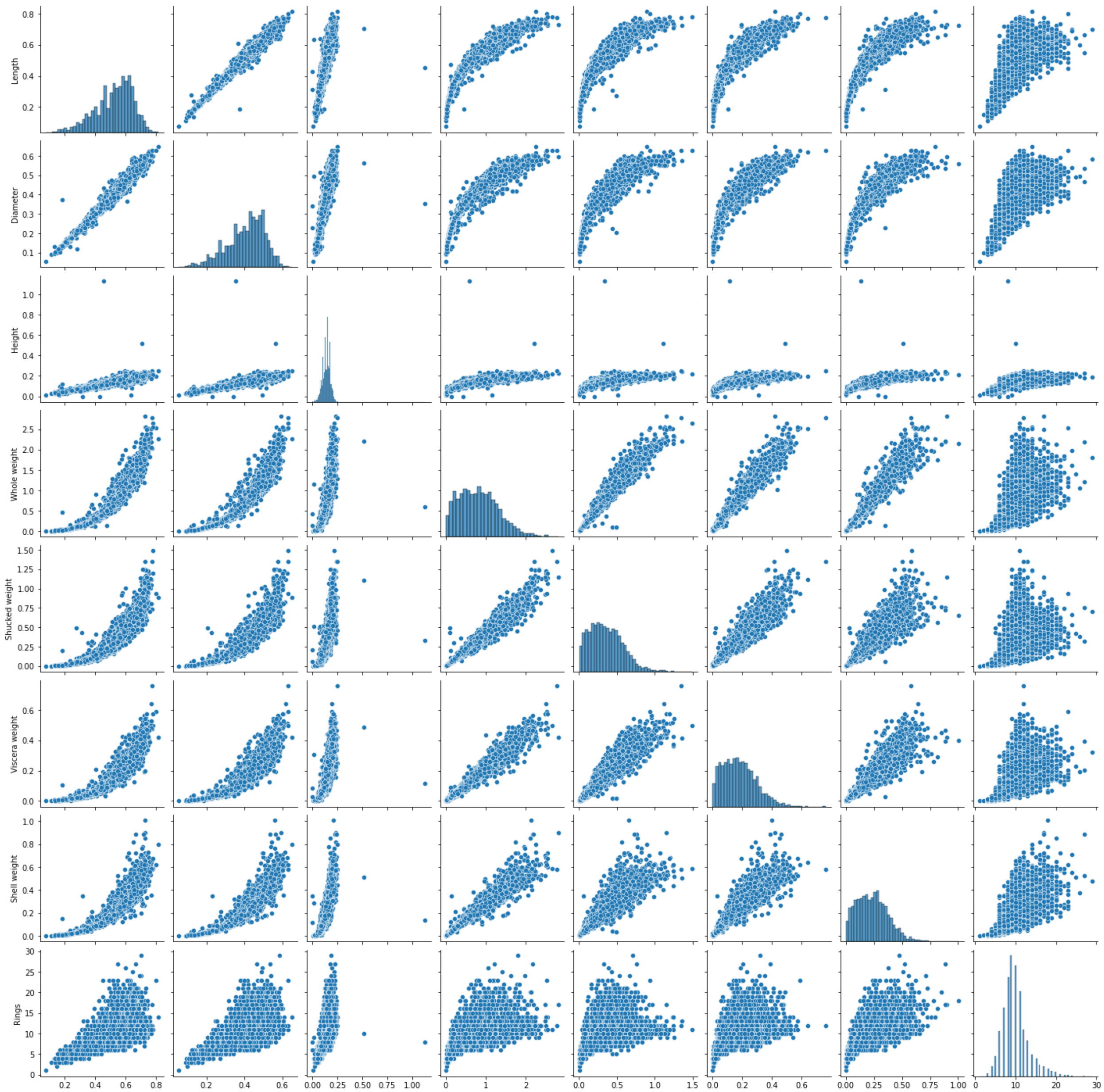


3.3 Multi-Variate Analysis

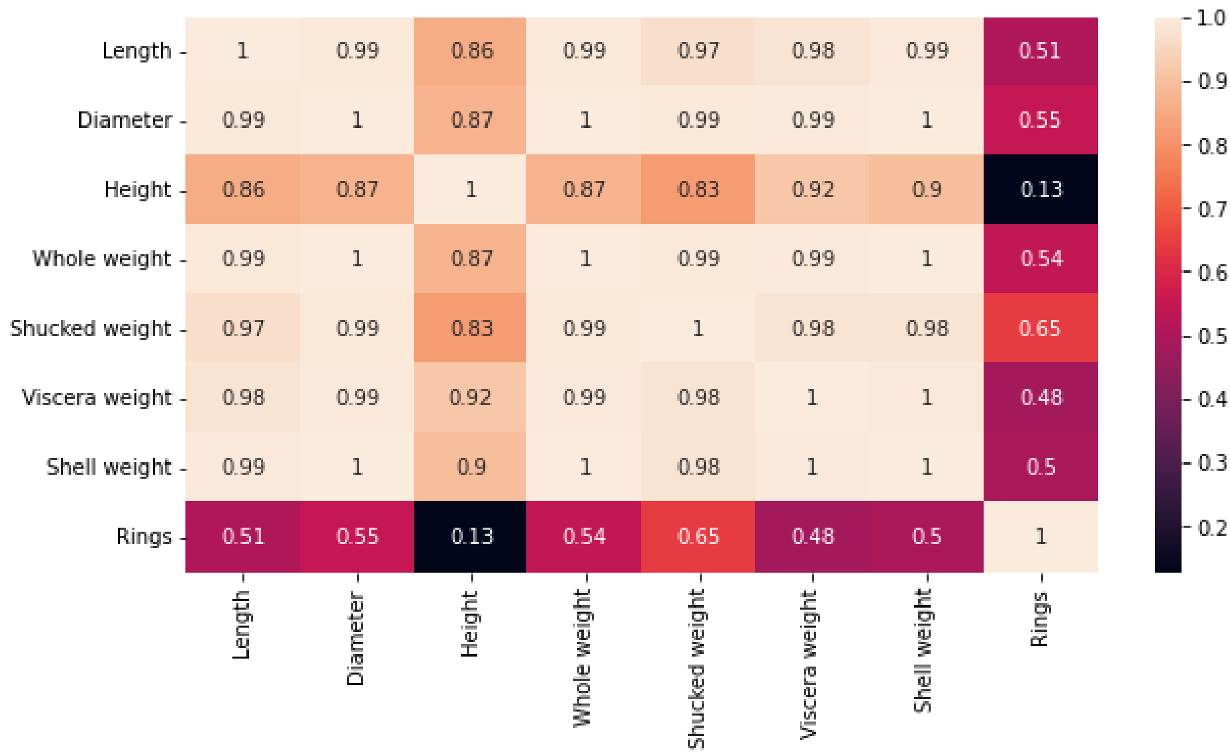
```
#boxplot
fig, ax1 = plt.subplots(figsize=(10,5))
testPlot = sns.boxplot(ax=ax1, x='Length', y='Diameter', hue='Sex', data=df)
```




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




```
fig=plt.figure(figsize=(10,5))
sns.heatmap(df.head().corr(),annot=True)
```



4. Perform descriptive statistics on the dataset

```
df
```

	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

```
df.head()
```

	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

```
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
df.describe()
```

	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

```
numerical_features = df.select_dtypes(include = [np.number]).columns
categorical_features = df.select_dtypes(include = [object]).columns
df[numerical_features].mean()
Length            0.523992
```

```
Diameter          0.407881
Height            0.139516
Whole weight      0.828742
Shucked weight    0.359367
Viscera weight    0.180594
Shell weight      0.238831
Rings             9.933684
dtype: float64
df[numerical_features].median()
Length            0.5450
Diameter          0.4250
Height            0.1400
Whole weight      0.7995
Shucked weight    0.3360
Viscera weight    0.1710
Shell weight      0.2340
Rings             9.0000
dtype: float64
percentage = [df[numerical_features].quantile(0),
             df[numerical_features].quantile(0.25),
             df[numerical_features].quantile(0.50),
             df[numerical_features].quantile(0.75),
             df[numerical_features].quantile(1)]
percentage
[Length            0.0750
 Diameter          0.0550
 Height            0.0000
 Whole weight      0.0020
 Shucked weight    0.0010
 Viscera weight    0.0005
 Shell weight      0.0015
 Rings             1.0000
 Name: 0.0, dtype: float64, Length            0.4500
 Diameter          0.3500
 Height            0.1150
 Whole weight      0.4415
 Shucked weight    0.1860
 Viscera weight    0.0935
 Shell weight      0.1300
 Rings             8.0000
 Name: 0.25, dtype: float64, Length            0.5450
 Diameter          0.4250
 Height            0.1400
 Whole weight      0.7995
 Shucked weight    0.3360
 Viscera weight    0.1710
 Shell weight      0.2340
 Rings             9.0000
 Name: 0.5, dtype: float64, Length            0.615
 Diameter           0.480
 Height             0.165
 Whole weight       1.153
 Shucked weight     0.502
 Viscera weight     0.253
 Shell weight       0.329
 Rings             11.000
 Name: 0.75, dtype: float64, Length             0.8150
```

```
 Diameter           0.6500
 Height             1.1300
 Whole weight       2.8255
 Shucked weight     1.4880
 Viscera weight     0.7600
 Shell weight       1.0050
 Rings             29.0000
 Name: 1.0, dtype: float64]
df[numerical_features].value_counts()
Length  Diameter  Height  Whole weight  Shucked weight  Viscera weight  Shell
weight  Rings
0.075   0.055     0.010   0.0020        0.0010          0.0005
0.0015        1        1
0.590   0.465     0.155   1.1360        0.5245          0.2615
0.2750        11       1
                  0.165   1.1150        0.5165          0.2730
0.2750        10       1
                  0.170   1.0425        0.4635          0.2400
0.2700        10       1
                  0.195   1.0885        0.3685          0.1870
0.3750        17       1

..
0.485   0.370     0.155   0.9680        0.4190          0.2455
0.2365        9        1
        0.375     0.110   0.4640        0.2015          0.0900
0.1490        8        1
                  0.125   0.5620        0.2505          0.1345
0.1525        8        1
                  0.130   0.5535        0.2660          0.1120
0.1570        8        1
0.815   0.650     0.250   2.2550        0.8905          0.4200
0.7975        14       1
Length: 4177, dtype: int64
df[numerical_features].mode()
```

	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	0.550	0.45	0.15	0.2225	0.175	0.1715	0.275	9.0
1	0.625	NaN	NaN	NaN	NaN	NaN	NaN	NaN

```
df[numerical_features].std()
Length            0.120093
Diameter          0.099240
Height            0.041827
Whole weight      0.490389
Shucked weight    0.221963
Viscera weight    0.109614
Shell weight      0.139203
Rings             3.224169
dtype: float64
df[numerical_features].var()
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
df[numerical_features].skew()
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
df[numerical_features].kurt()
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
```

5. Check for Missing values and deal with them

```
df.isnull()
```

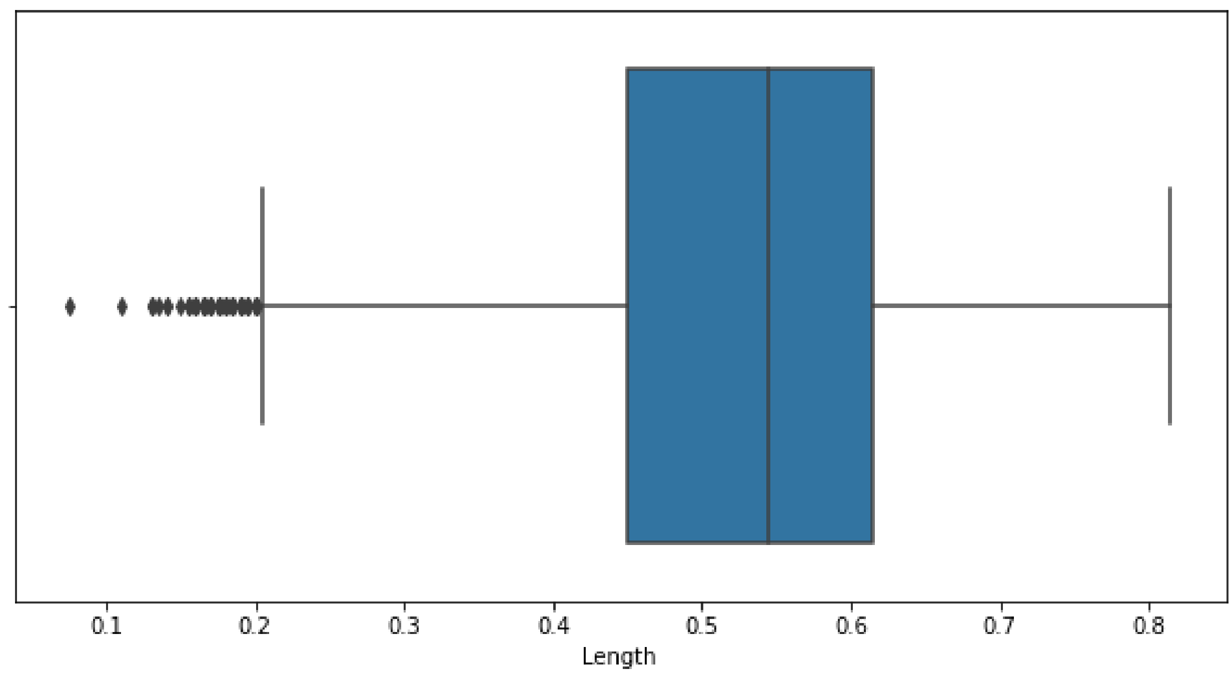
	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	False	False	False	False	False	False	False	False	False
1	False	False	False	False	False	False	False	False	False
2	False	False	False	False	False	False	False	False	False
3	False	False	False	False	False	False	False	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

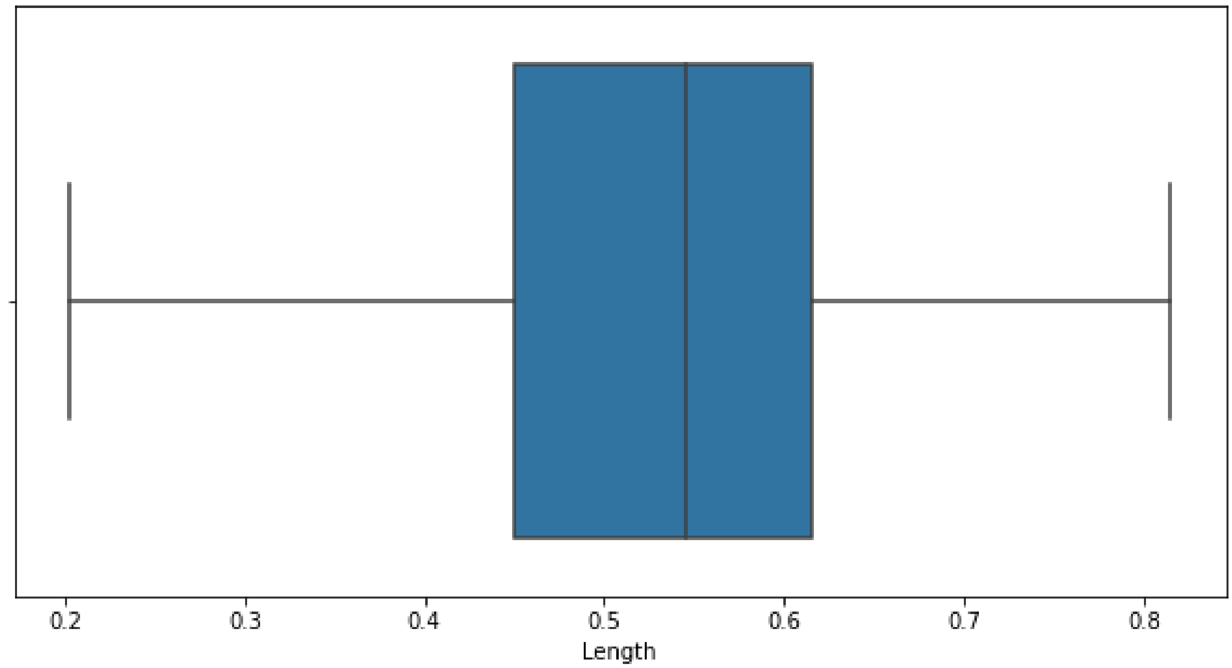
```
df.isnull().any()
Sex                  False
Length               False
Diameter             False
Height               False
Whole weight         False
Shucked weight       False
Viscera weight       False
Shell weight         False
Rings                False
dtype: bool
df.isnull().sum()
Sex                  0
Length               0
Diameter             0
Height               0
Whole weight         0
Shucked weight       0
Viscera weight       0
Shell weight         0
Rings                0
dtype: int64
df.isnull().sum()
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 them outliers

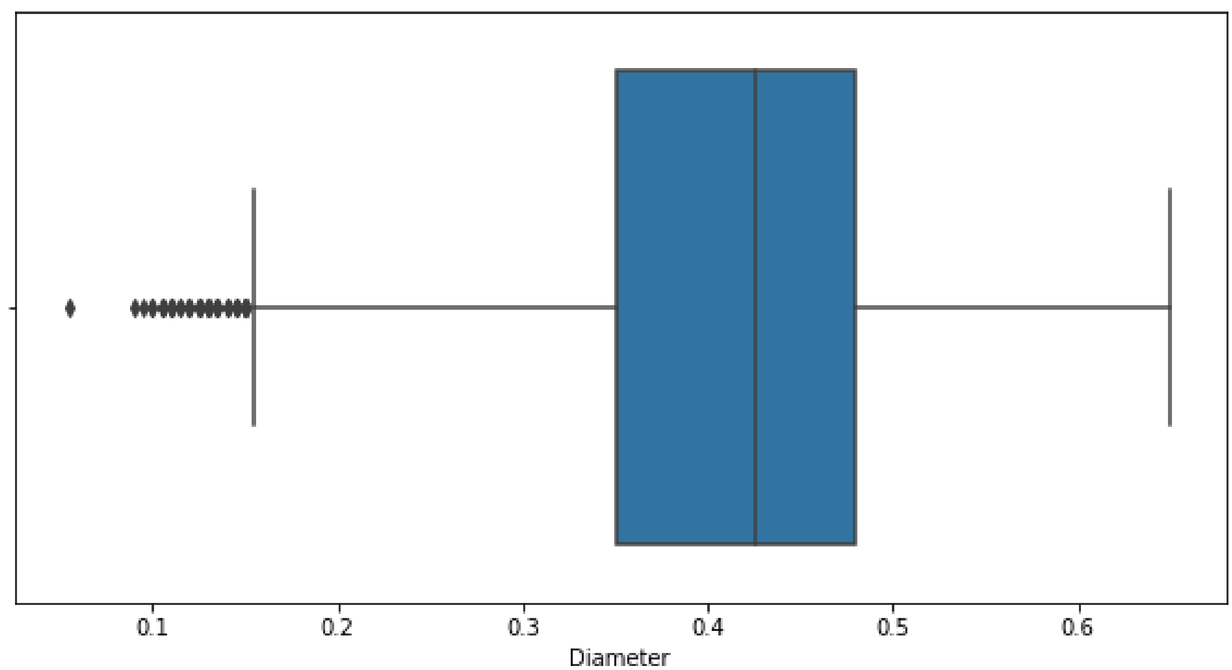
```
#length
sns.boxplot(x=df['Length'])
```




```
q1 = df['Length'].quantile(0.25)
q2 = df['Length'].quantile(0.75)
iqr = q2-q1
q1, q2, iqr
(0.45, 0.615, 0.16499999999999998)
upper_limit = q2 + (1.5 * iqr)
lower_limit = q1 - (1.5 * iqr)
lower_limit, upper_limit
(0.20250000000000004, 0.8624999999999999)
new_df = df.loc[(df['Length'] <= upper_limit) & (df['Length'] >=
lower_limit)]
print('before removing outliers:', len(df))
print('after removing outliers:',len(new_df))
print('outliers:', len(df)-len(new_df))
before removing outliers: 4177
after removing outliers: 4128
outliers: 49
new_df = df.copy()
new_df.loc[(new_df['Length']>upper_limit), 'Length'] = upper_limit
new_df.loc[(new_df['Length']<lower_limit), 'Length'] = lower_limit
sns.boxplot(x=new_df['Length'])
```

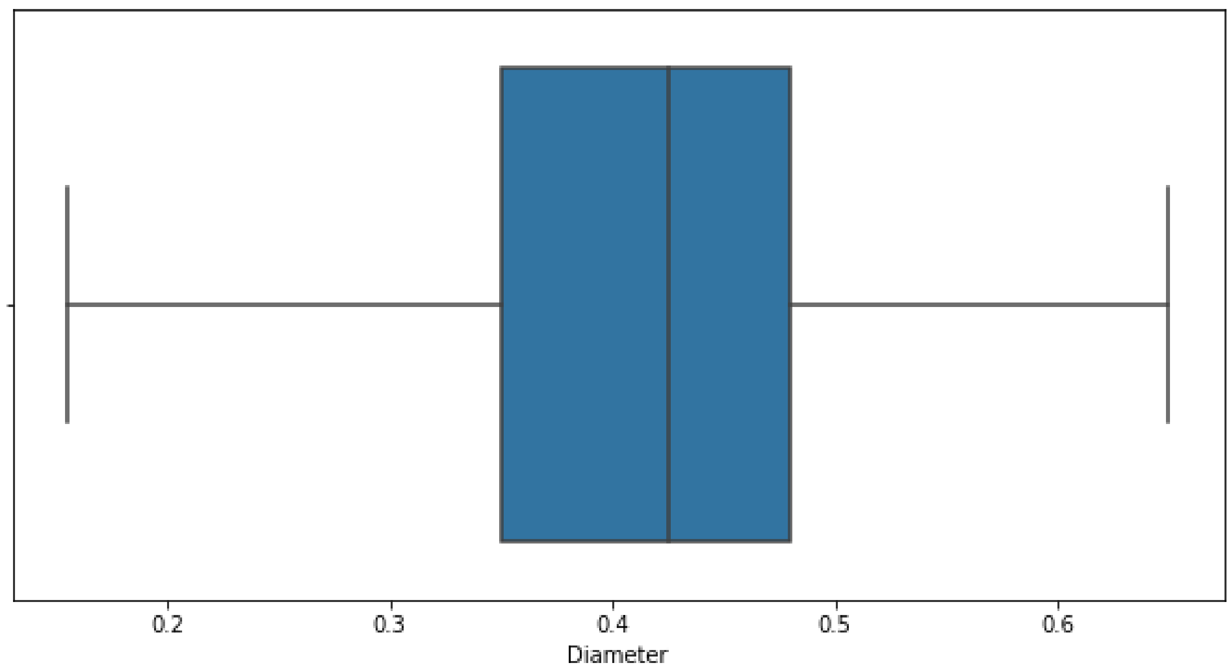



```
#Diameter
sns.boxplot(x=df['Diameter'])
```

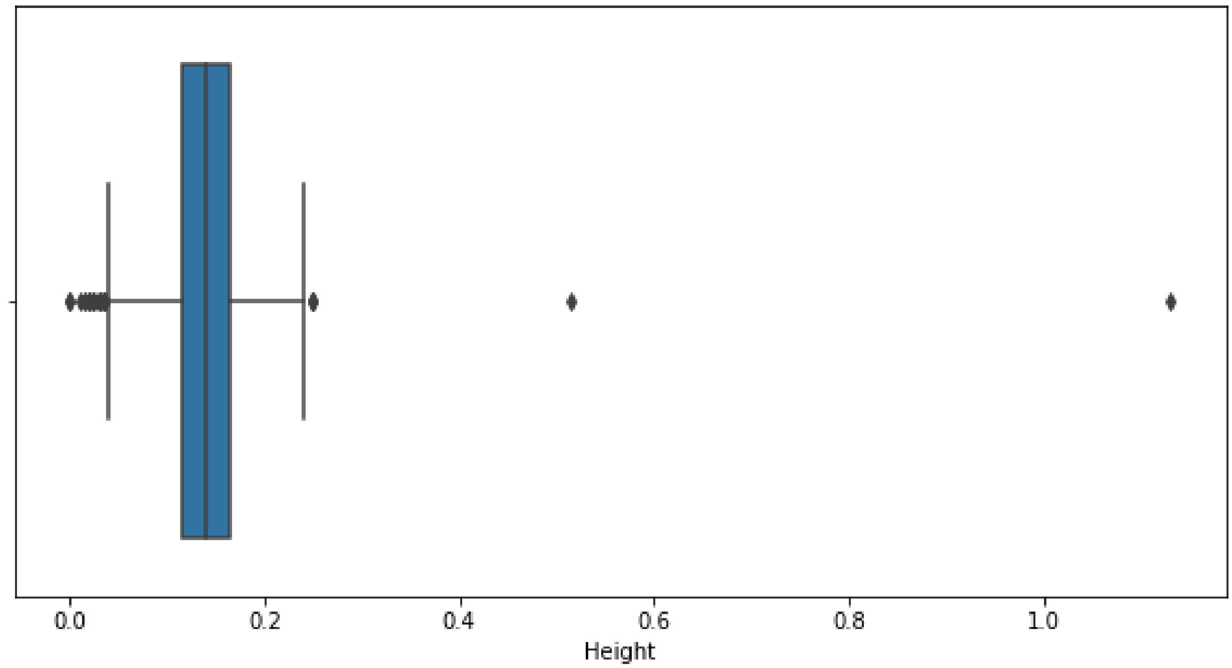



```
q1 = df['Diameter'].quantile(0.25)
q2 = df['Diameter'].quantile(0.75)
iqr = q2-q1
q1, q2, iqr
(0.35, 0.48, 0.13)
upper_limit = q2 + (1.5 * iqr)
lower_limit = q1 - (1.5 * iqr)
lower_limit, upper_limit
(0.15499999999999997, 0.675)
```

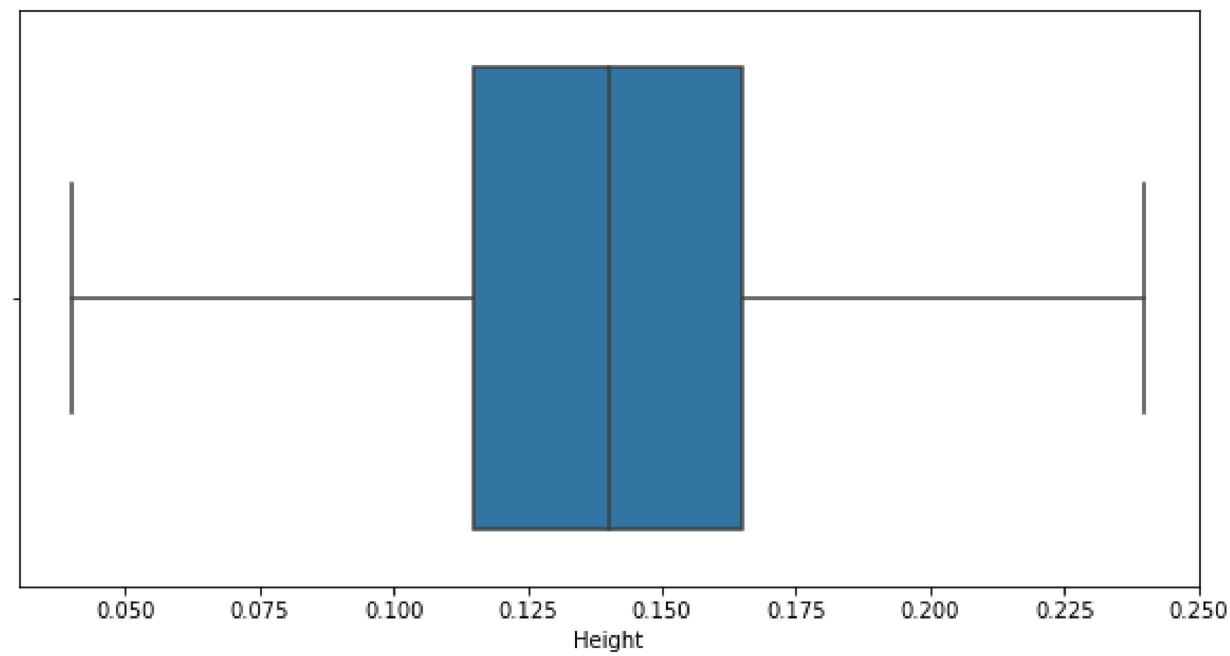
```
new_df = df.loc[(df['Diameter'] <= upper_limit) & (df['Diameter'] >=
lower_limit)]
print('before removing outliers:', len(df))
print('after removing outliers:',len(new_df))
print('outliers:', len(df)-len(new_df))
before removing outliers: 4177
after removing outliers: 4118
outliers: 59
new_df = df.copy()
new_df.loc[(new_df['Diameter']>upper_limit), 'Diameter'] = upper_limit
new_df.loc[(new_df['Diameter']<lower_limit), 'Diameter'] = lower_limit
sns.boxplot(x=new_df['Diameter'])
```



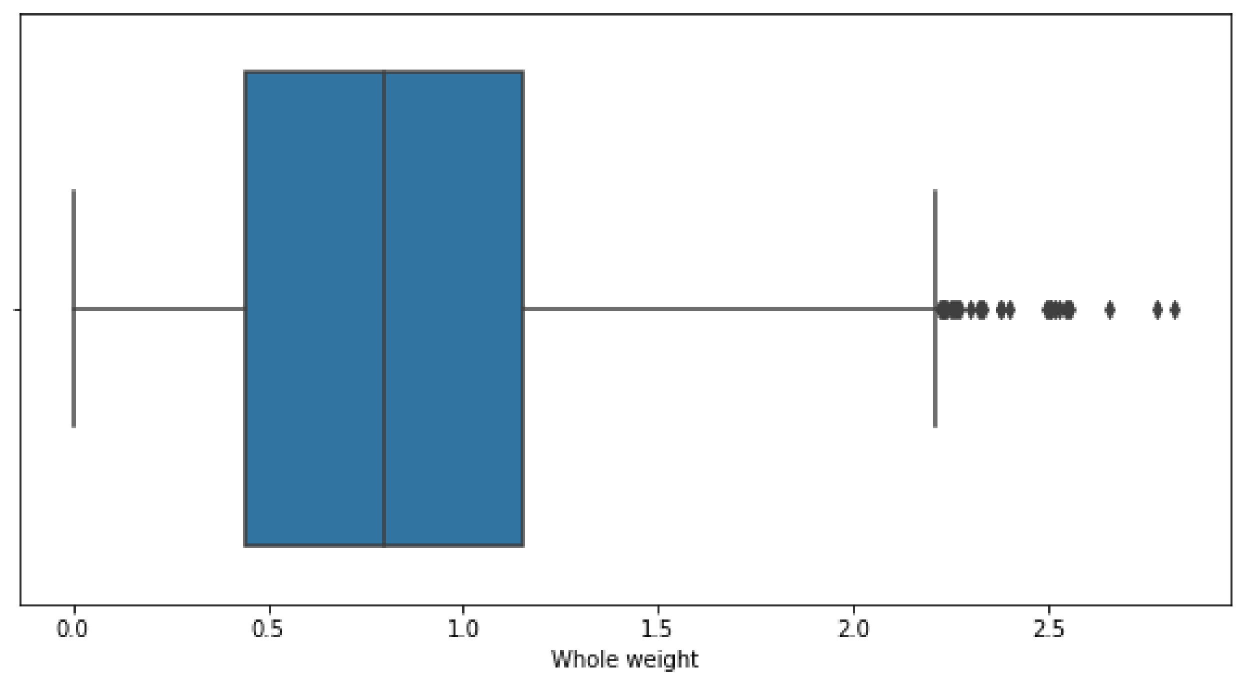

```
#Height
sns.boxplot(x=df['Height'])
```




```
q1 = df['Height'].quantile(0.25)
q2 = df['Height'].quantile(0.75)
iqr = q2-q1
q1, q2, iqr
(0.115, 0.165, 0.05)
upper_limit = q2 + (1.5 * iqr)
lower_limit = q1 - (1.5 * iqr)
lower_limit, upper_limit
(0.039999999999999994, 0.24000000000000002)
new_df = df.loc[(df['Height'] <= upper_limit) & (df['Height'] >=
lower_limit)]
print('before removing outliers:', len(df))
print('after removing outliers:',len(new_df))
print('outliers:', len(df)-len(new_df))
before removing outliers: 4177
after removing outliers: 4148
outliers: 29
new_df = df.copy()
new_df.loc[(new_df['Height']>upper_limit), 'Height'] = upper_limit
new_df.loc[(new_df['Height']<lower_limit), 'Height'] = lower_limit
sns.boxplot(x=new_df['Height'])
```

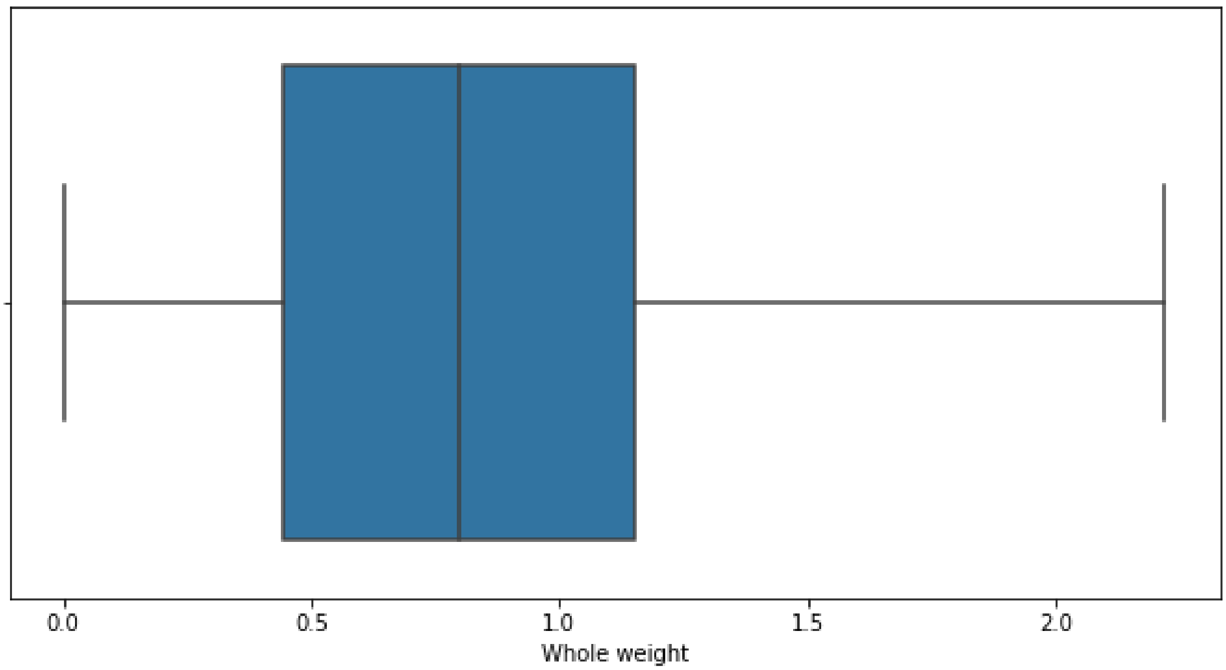



```
#Whole Weight
sns.boxplot(x=df['Whole weight'])
```

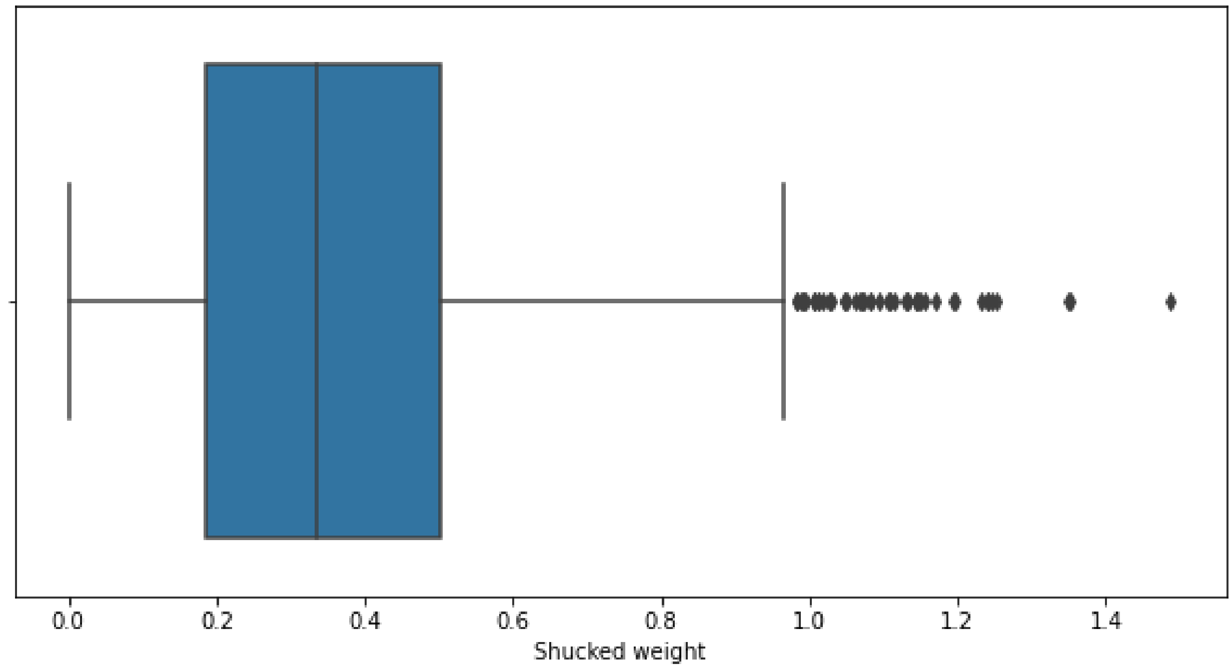



```
q1 = df['Whole weight'].quantile(0.25)
q2 = df['Whole weight'].quantile(0.75)
iqr = q2-q1
q1, q2, iqr
(0.4415, 1.153, 0.7115)
upper_limit = q2 + (1.5 * iqr)
lower_limit = q1 - (1.5 * iqr)
lower_limit, upper_limit
(-0.62575, 2.22025)
```

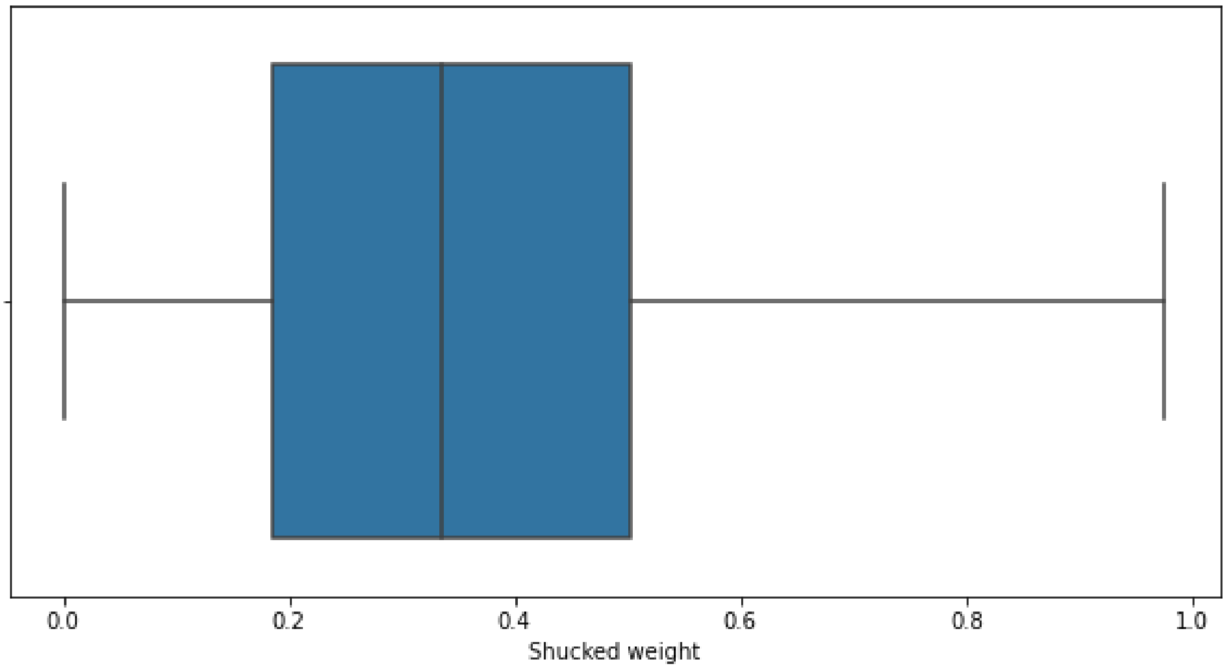
```
new_df = df.loc[(df['Whole weight'] <= upper_limit) & (df['Whole weight'] >=
lower_limit)]
print('before removing outliers:', len(df))
print('after removing outliers:',len(new_df))
print('outliers:', len(df)-len(new_df))
before removing outliers: 4177
after removing outliers: 4147
outliers: 30
new_df = df.copy()
new_df.loc[(new_df['Whole weight']>upper_limit), 'Whole weight'] =
upper_limit
new_df.loc[(new_df['Whole weight']<lower_limit), 'Whole weight'] =
lower_limit
sns.boxplot(x=new_df['Whole weight'])
```



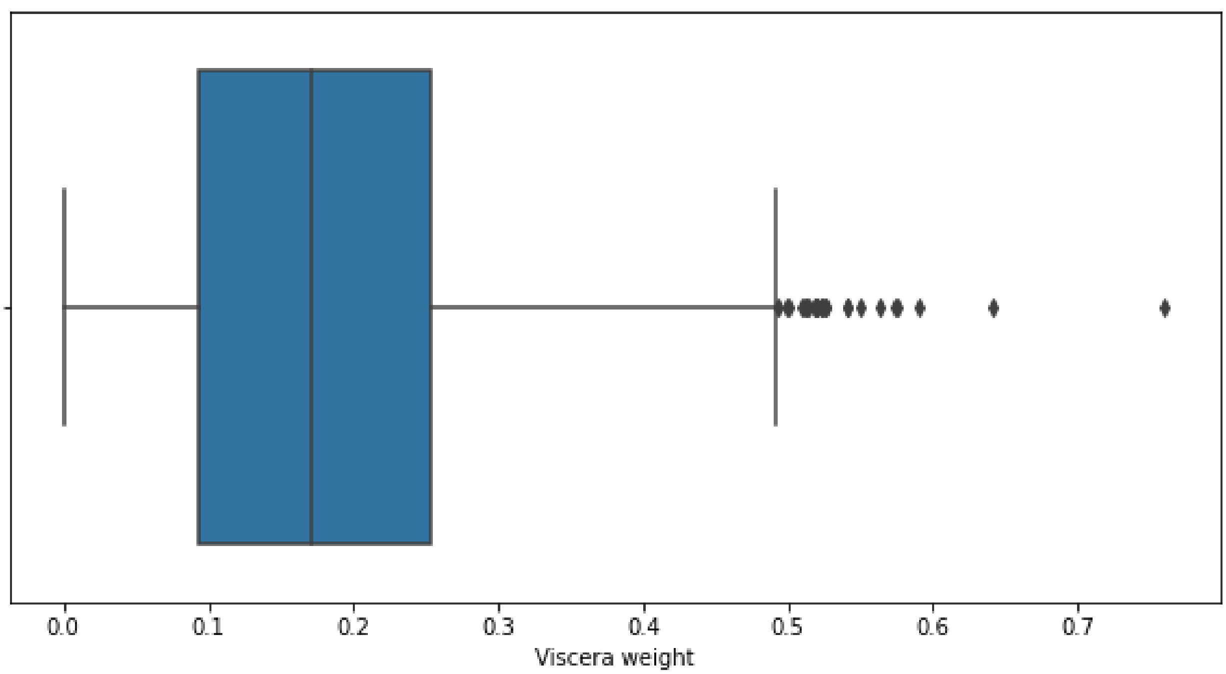

```
#Shucked weight
sns.boxplot(x=df['Shucked weight'])
```




```
q1 = df['Shucked weight'].quantile(0.25)
q2 = df['Shucked weight'].quantile(0.75)
iqr = q2-q1
q1, q2, iqr
(0.186, 0.502, 0.316)
upper_limit = q2 + (1.5 * iqr)
lower_limit = q1 - (1.5 * iqr)
lower_limit, upper_limit
(-0.288, 0.976)
new_df = df.loc[(df['Shucked weight'] <= upper_limit) & (df['Shucked weight']
>= lower_limit)]
print('before removing outliers:', len(df))
print('after removing outliers:',len(new_df))
print('outliers:', len(df)-len(new_df))
before removing outliers: 4177
after removing outliers: 4129
outliers: 48
new_df = df.copy()
new_df.loc[(new_df['Shucked weight']>upper_limit), 'Shucked weight'] =
upper_limit
new_df.loc[(new_df['Shucked weight']<lower_limit), 'Shucked weight'] =
lower_limit
sns.boxplot(x=new_df['Shucked weight'])
```

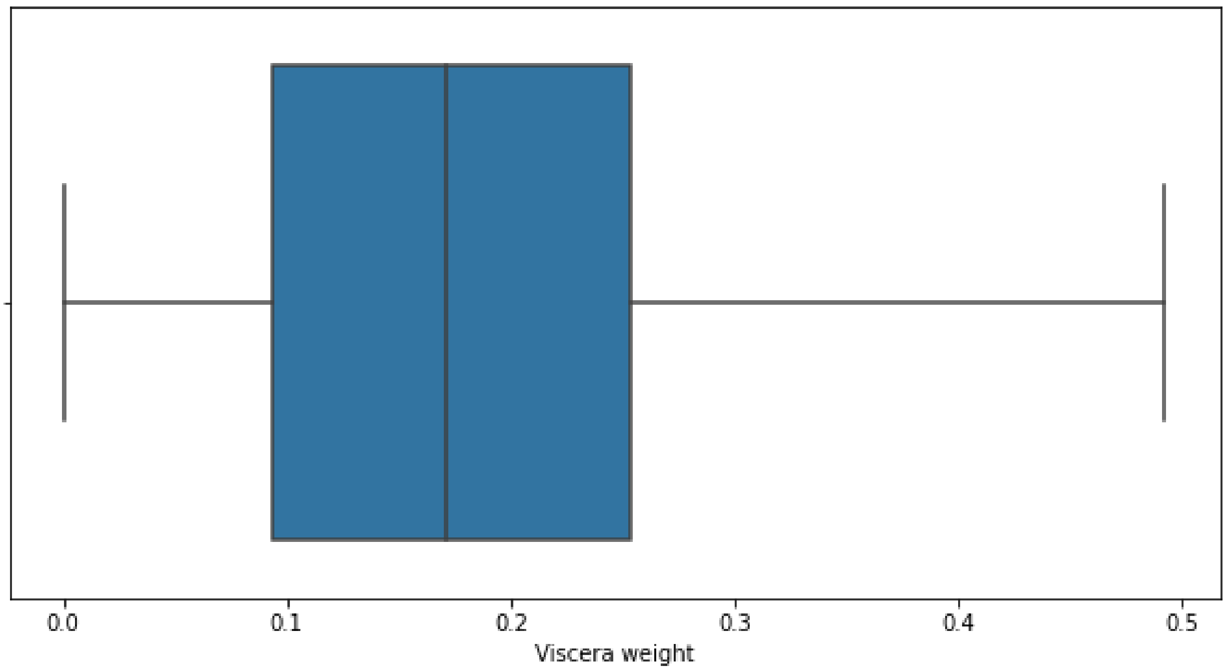



```
#Viscera weight
sns.boxplot(x=df['Viscera weight'])
```

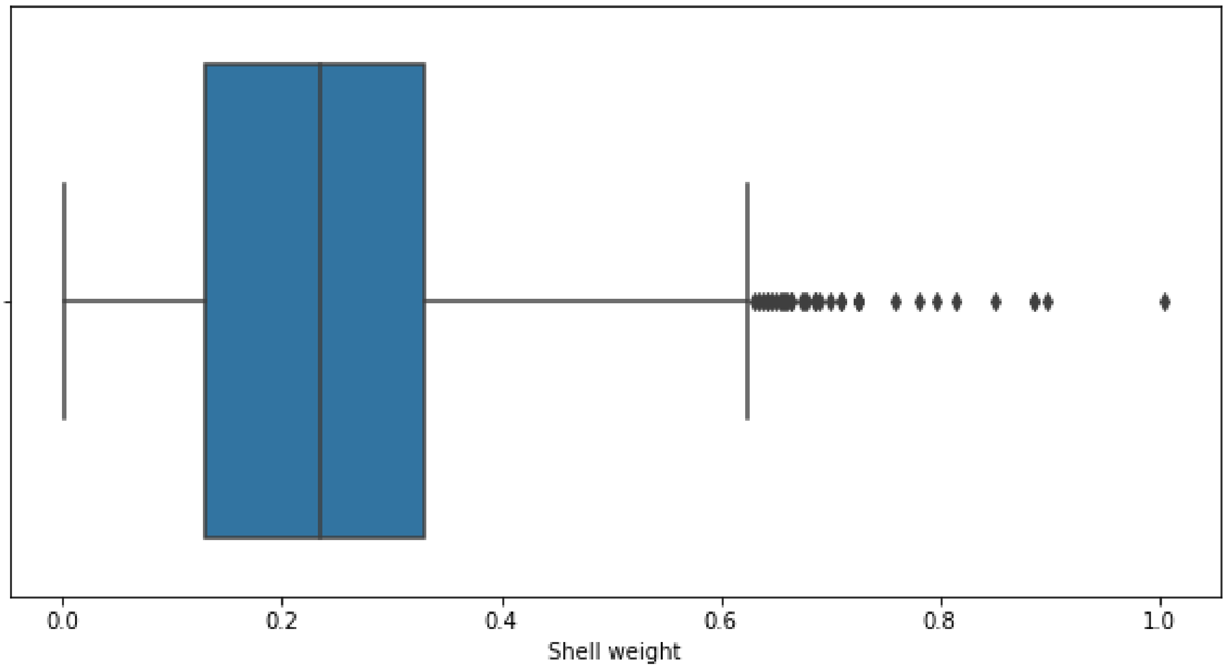



```
q1 = df['Viscera weight'].quantile(0.25)
q2 = df['Viscera weight'].quantile(0.75)
iqr = q2-q1
q1, q2, iqr
(0.0935, 0.253, 0.1595)
upper_limit = q2 + (1.5 * iqr)
lower_limit = q1 - (1.5 * iqr)
lower_limit, upper_limit
(-0.14575000000000002, 0.49225)
```

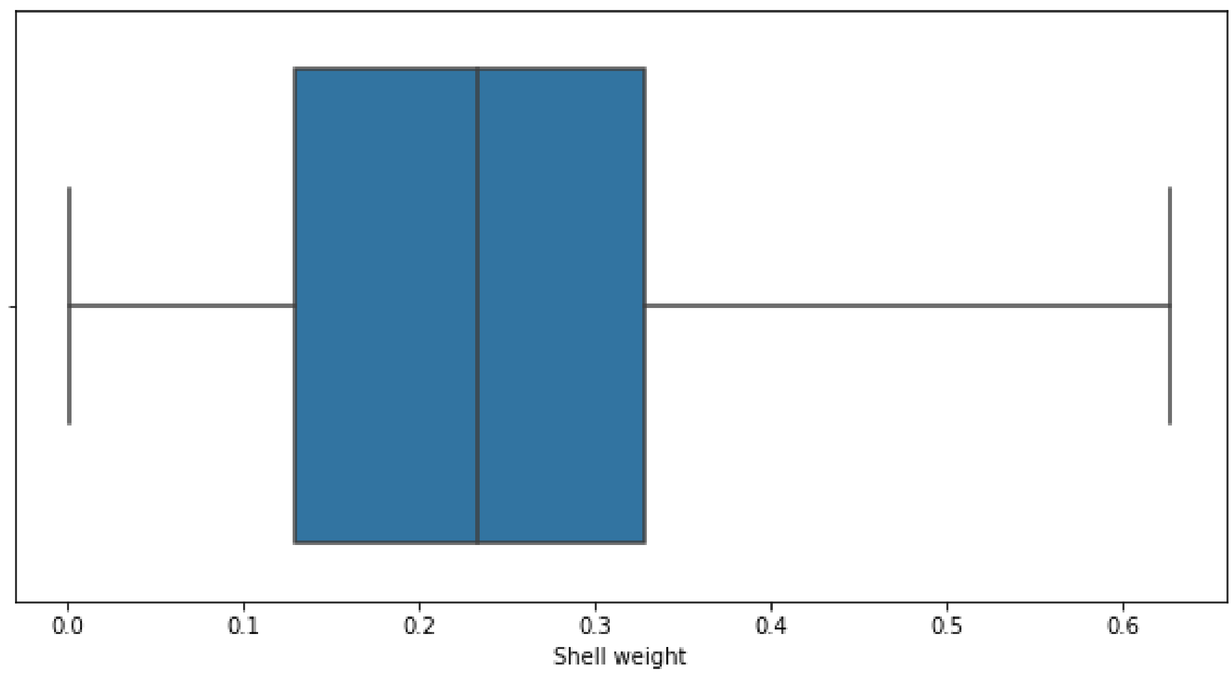
```
new_df = df.loc[(df['Viscera weight'] <= upper_limit) & (df['Viscera weight']
>= lower_limit)]
print('before removing outliers:', len(df))
print('after removing outliers:',len(new_df))
print('outliers:', len(df)-len(new_df))
before removing outliers: 4177
after removing outliers: 4151
outliers: 26
new_df = df.copy()
new_df.loc[(new_df['Viscera weight']>upper_limit), 'Viscera weight'] =
upper_limit
new_df.loc[(new_df['Viscera weight']<lower_limit), 'Viscera weight'] =
lower_limit
sns.boxplot(x=new_df['Viscera weight'])
```



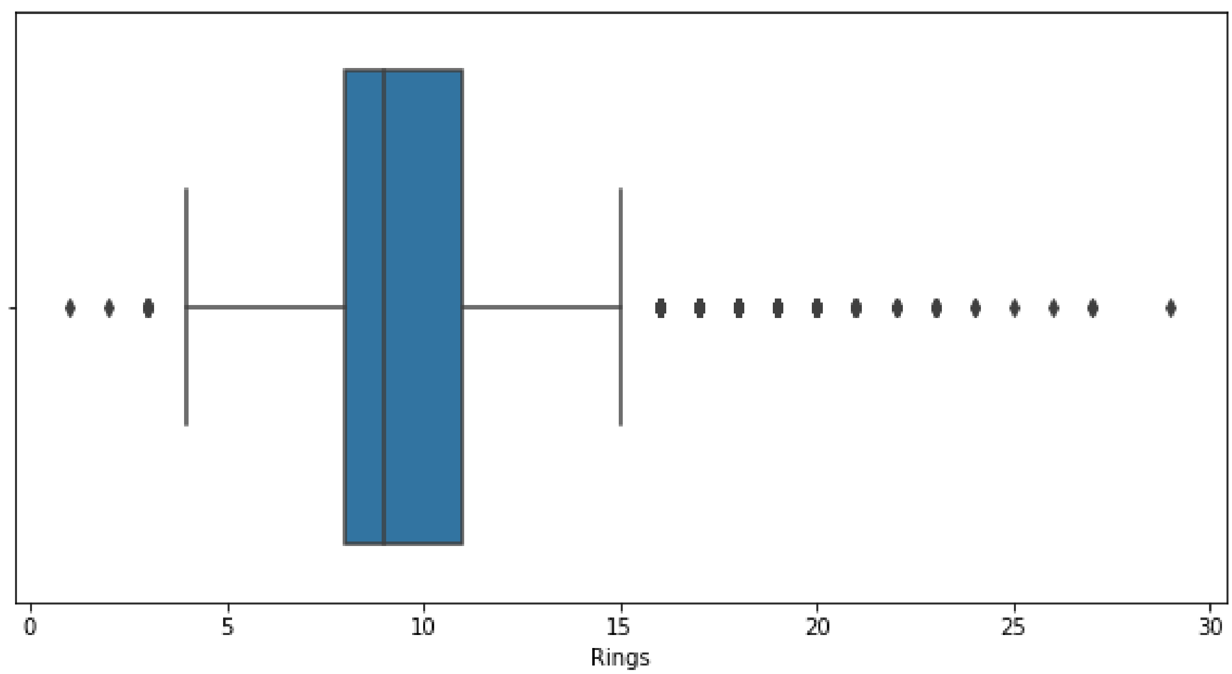

```
#shell weight
sns.boxplot(x=df['Shell weight'])
```




```
q1 = df['Shell weight'].quantile(0.25)
q2 = df['Shell weight'].quantile(0.75)
iqr = q2-q1
q1, q2, iqr
(0.13, 0.329, 0.199)
upper_limit = q2 + (1.5 * iqr)
lower_limit = q1 - (1.5 * iqr)
lower_limit, upper_limit
(-0.16849999999999998, 0.6275)
new_df = df.loc[(df['Shell weight'] <= upper_limit) & (df['Shell weight'] >=
lower_limit)]
print('before removing outliers:', len(df))
print('after removing outliers:',len(new_df))
print('outliers:', len(df)-len(new_df))
before removing outliers: 4177
after removing outliers: 4142
outliers: 35
new_df = df.copy()
new_df.loc[(new_df['Shell weight']>upper_limit), 'Shell weight'] =
upper_limit
new_df.loc[(new_df['Shell weight']<lower_limit), 'Shell weight'] =
lower_limit
sns.boxplot(x=new_df['Shell weight'])
```

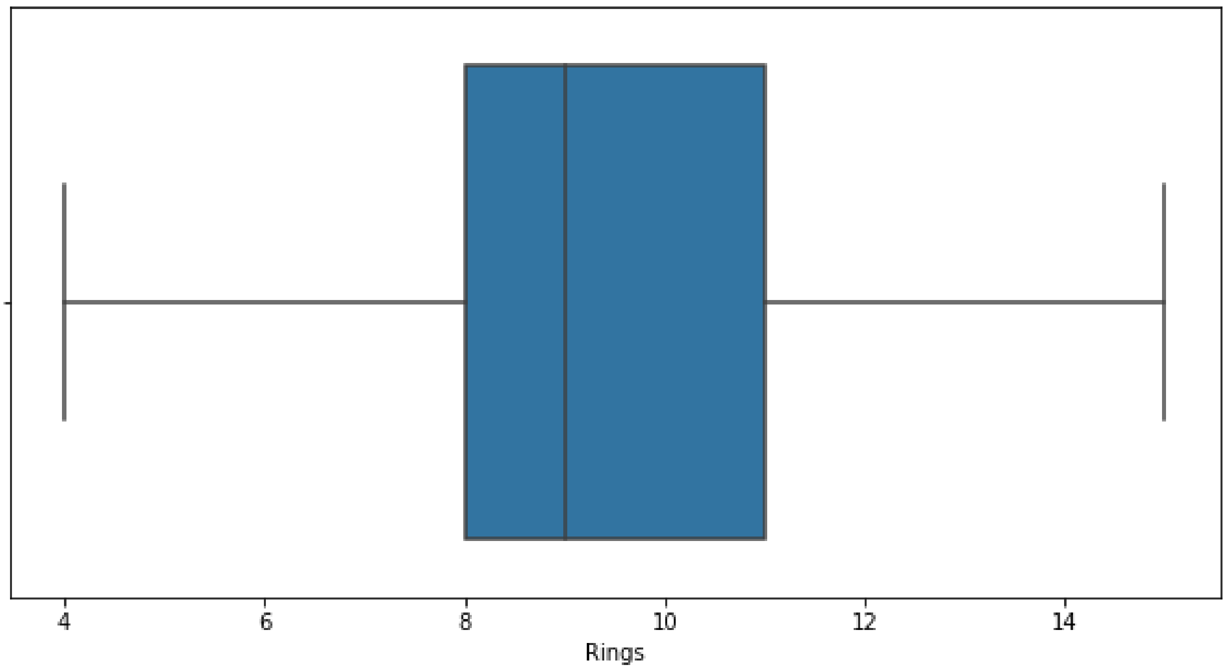



```
#Rings
sns.boxplot(x=df['Rings'])
```




```
q1 = df['Rings'].quantile(0.25)
q2 = df['Rings'].quantile(0.75)
iqr = q2-q1
q1, q2, iqr
(8.0, 11.0, 3.0)
upper_limit = q2 + (1.5 * iqr)
lower_limit = q1 - (1.5 * iqr)
lower_limit, upper_limit
(3.5, 15.5)
```

```
new_df = df.loc[(df['Rings'] <= upper_limit) & (df['Rings'] >= lower_limit)]
print('before removing outliers:', len(df))
print('after removing outliers:',len(new_df))
print('outliers:', len(df)-len(new_df))
before removing outliers: 4177
after removing outliers: 3899
outliers: 278
new_df = df.loc[(df['Rings'] <= upper_limit) & (df['Rings'] >= lower_limit)]
print('before removing outliers:', len(df))
print('after removing outliers:',len(new_df))
print('outliers:', len(df)-len(new_df))
before removing outliers: 4177
after removing outliers: 3899
outliers: 278
sns.boxplot(x=new_df['Rings'])
```



7. Check for Categorical columns and perform encoding

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

	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

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
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	0.9660	0.4390	0.2145	0.2605	10
4174	1	0.600	0.475	0.205	1.1760	0.5255	0.2875	0.3080	9
4175	0	0.625	0.485	0.150	1.0945	0.5310	0.2610	0.2960	10
4176	1	0.710	0.555	0.195	1.9485	0.9455	0.3765	0.4950	12

4177 rows × 9 columns

```
from sklearn.preprocessing import LabelEncoder,OneHotEncoder,StandardScaler
label_encoder =LabelEncoder()
df['Sex']= label_encoder.fit_transform(df['Sex'])
df
```

	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	0.9660	0.4390	0.2145	0.2605	10
4174	1	0.600	0.475	0.205	1.1760	0.5255	0.2875	0.3080	9
4175	0	0.625	0.485	0.150	1.0945	0.5310	0.2610	0.2960	10
4176	1	0.710	0.555	0.195	1.9485	0.9455	0.3765	0.4950	12

4177 rows × 9 columns

```
enc = OneHotEncoder(drop='first')

enc_df = pd.DataFrame(enc.fit_transform(df[['Sex']]).toarray())

df =df.join(enc_df)
df.head()
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings	0	1
0	1	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15	1.0	0.0
1	1	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7	1.0	0.0
2	0	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9	0.0	0.0
3	1	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10	1.0	0.0
4	2	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7	0.0	1.0

8. Split the data into dependent and independent variables

```
x= df.iloc[:,1:8]
x
```

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

4177 rows × 7 columns

```
y=df.iloc[:,8]
y
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
```

9. Scale the independent variables

```
scale = StandardScaler()
scaledX = scale.fit_transform(x)

print(scaledX)
[[-0.57455813 -0.43214879 -1.06442415 ... -0.60768536 -0.72621157
  -0.63821689]
 [-1.44898585 -1.439929   -1.18397831 ... -1.17090984 -1.20522124
  -1.21298732]
 [ 0.05003309  0.12213032 -0.10799087 ... -0.4634999  -0.35668983
  -0.20713907]
 ...
 [ 0.6329849   0.67640943  1.56576738 ...  0.74855917  0.97541324
   0.49695471]
 [ 0.84118198  0.77718745  0.25067161 ...  0.77334105  0.73362741
   0.41073914]
 [ 1.54905203  1.48263359  1.32665906 ...  2.64099341  1.78744868
   1.84048058]]
```

10. Split the data into training and testing

```
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.shape, x_train.shape, x_test.shape,y_train.shape, y_test.shape)
(4177, 7) (3341, 7) (836, 7) (3341,) (836,)
```

11. Build the Model

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

12. Train the Model

```
linearmodel.fit(x_train, y_train)
LinearRegression()
```

13. Test the Model

```
y_train_pred = linearmodel.predict(x_train)
y_test_pred = linearmodel.predict(x_test)
y_test_pred
array([10.17397542, 10.07068143,  8.67134702, 12.71828702,  8.86787867,
       10.75020563, 13.81975514,  9.3096892 ,  5.87779411,  7.63321116,
```

```
10.3846552 , 10.97183695,  9.08525726,  9.41456742,  7.03254741,
 9.26266303,  7.98789822,  9.58057684,  6.90047509, 13.20121889,
12.31827093,  6.32982348,  6.93276273,  9.82100727,  6.89363451,
11.75279639, 12.40782101, 11.42741142,  6.17935212, 10.58353429,
 5.73047254, 10.13685152,  8.2577295 , 10.50566987, 13.35578547,
11.97989071,  8.10446134,  9.39036207, 14.94288966,  9.48787719,
 6.84291307,  8.72349593, 11.15558658,  7.91090618,  7.56937702,
10.81845142, 11.45602571,  6.52755349,  7.54769416, 13.37564367,
11.21365421, 11.33219466, 10.33833187,  8.97306333,  7.64224419,
12.34919834, 11.23908478,  8.29052292,  9.61979896, 12.16774129,
 8.14726141,  7.86928166,  8.379765  ,  8.21480518, 10.67368872,
 9.08489685, 10.30109851,  9.61691359, 16.38370773, 10.38658295,
 7.60433846,  8.91135057, 10.23679762,  9.68643202, 10.58887912,
14.09672862,  7.75396252,  9.38286525,  8.09019702,  6.70653863,
14.13250104, 10.94701043,  8.60106706, 10.55121131, 10.79580376,
 8.62721105, 10.11423972,  9.80501137, 11.84720976,  8.86276973,
 9.44337233, 11.75612497,  7.78851464,  7.50147585, 11.47768384,
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10.04964164, 12.34827063,  7.92254209,  9.74825822,  9.24864352,
11.27226984,  7.60364506,  9.23331985,  9.56454156, 10.64353064,
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11.07711147, 10.85882985, 16.31228355, 10.09815977,  6.99977395,
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```

```
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10.08955103,  6.07584093, 12.16137614, 13.98070402,  7.50574666,
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10.48476882,  5.59038454,  8.40947994, 17.62563803,  6.81638847,
 7.21469929, 12.84101012,  9.32876132, 18.90467618, 11.63015657,
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```

```
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13.51888784,  9.10029217,  9.42349388,  9.04886862,  8.52978087,
10.72524213])
```

14. Measure the performance using Metrics

```
from sklearn.metrics import mean_absolute_error, mean_squared_error
s = mean_squared_error(y_train, y_train_pred)
print('Mean Squared error of training set :%2f'%s)

p = mean_squared_error(y_test, y_test_pred)
print('Mean Squared error of testing set :%2f'%p)
Mean Squared error of training set :4.949028
Mean Squared error of testing set :4.785948
# Build the Model
from sklearn.ensemble import RandomForestRegressor
rfr = RandomForestRegressor(max_depth=2, random_state=0,
                              n_estimators=100)
#Train the model
rfr.fit(x_train, y_train)
rfr.fit(x_test, y_test)
RandomForestRegressor(max_depth=2, random_state=0)
#Test the model
y_train_pred = rfr.predict(x_train)
y_test_pred = rfr.predict(x_test)
#measure the performance using metrics
rfr.score(x_test, y_test)
0.41877128928053997
```

K Neighbors Regression

```
#Build the model
from sklearn.neighbors import KNeighborsRegressor
knr = KNeighborsRegressor(n_neighbors =4 )
#Train the model
knr.fit(x_train, y_train)
knr.fit(x_test, y_test)
KNeighborsRegressor(n_neighbors=4)
#Test the model
y_train_pred = knr.predict(x_train)
y_test_pred = knr.predict(x_test)
#Measure the performance using Metrics
knr.score(x_train, y_train)
0.48693687494342397
```

Decision Tree Regression

```
#Build the model
from sklearn.tree import DecisionTreeRegressor
dtr = DecisionTreeRegressor(random_state=0)
#Train the model
dtr.fit(x_test,y_test)
DecisionTreeRegressor(random_state=0)
#Test the model
y_train_pred = dtr.predict(x_train)
y_test_pred = dtr.predict(x_test)
#Mesure the performance using Metrics
dtr.score(x_train, y_train)
0.07943400002124779
```

Lasso Regression

```
#Build the model
from sklearn.linear_model import Lasso
lr=Lasso(alpha=0.01)
#Train the model
lr.fit(x_train,y_train)
Lasso(alpha=0.01)
y_train_pred = lr.predict(x_train)
y_test_pred = lr.predict(x_test)
#Measure the performance using Metrics
lr.score(x_train, y_train)
0.512187188782296
```

1. Download the dataset

Data set link:abalone

```
from google.colab import drive
drive.mount('/content/drive')
Mounted at /content/drive
```

2. Load the dataset into the tool

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
#Load the dataset
df =
pd.read_csv('/content/drive/MyDrive/DataAnalyticsAssignment/abalone.csv')
df.head()
```

	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

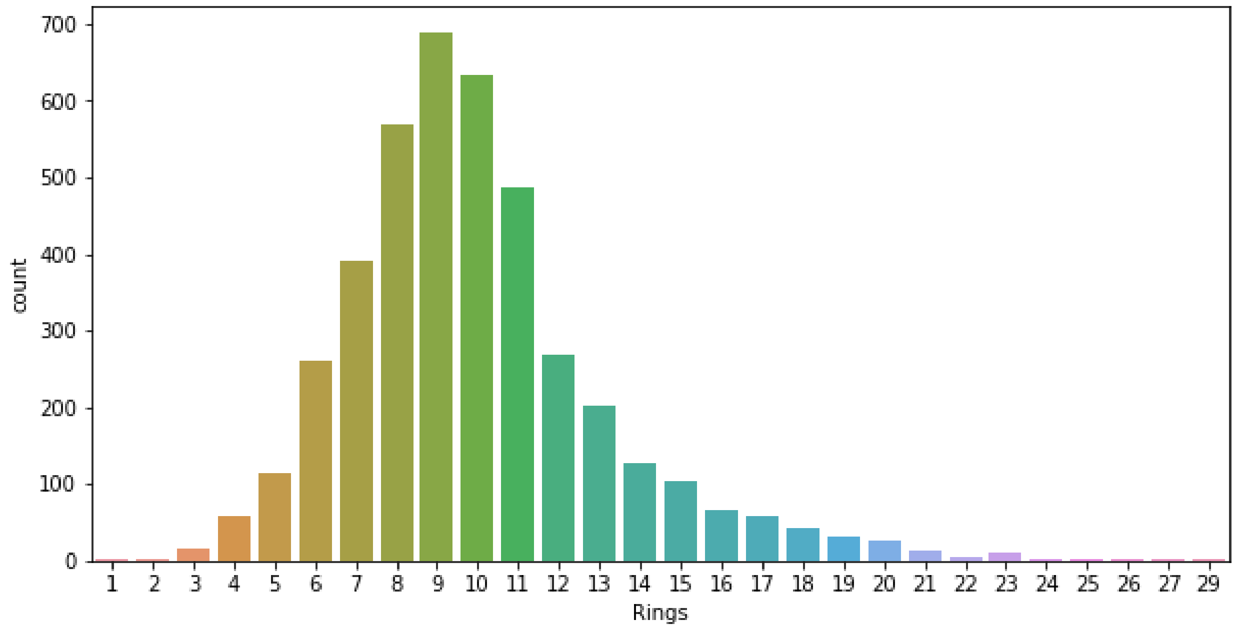
3. Perform Visualizations

List item

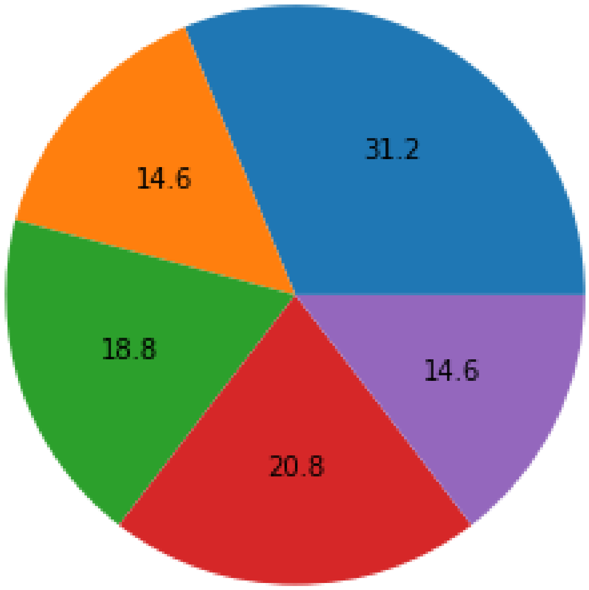
- List item
- List item

*italicized text*1 Univariate Analysi

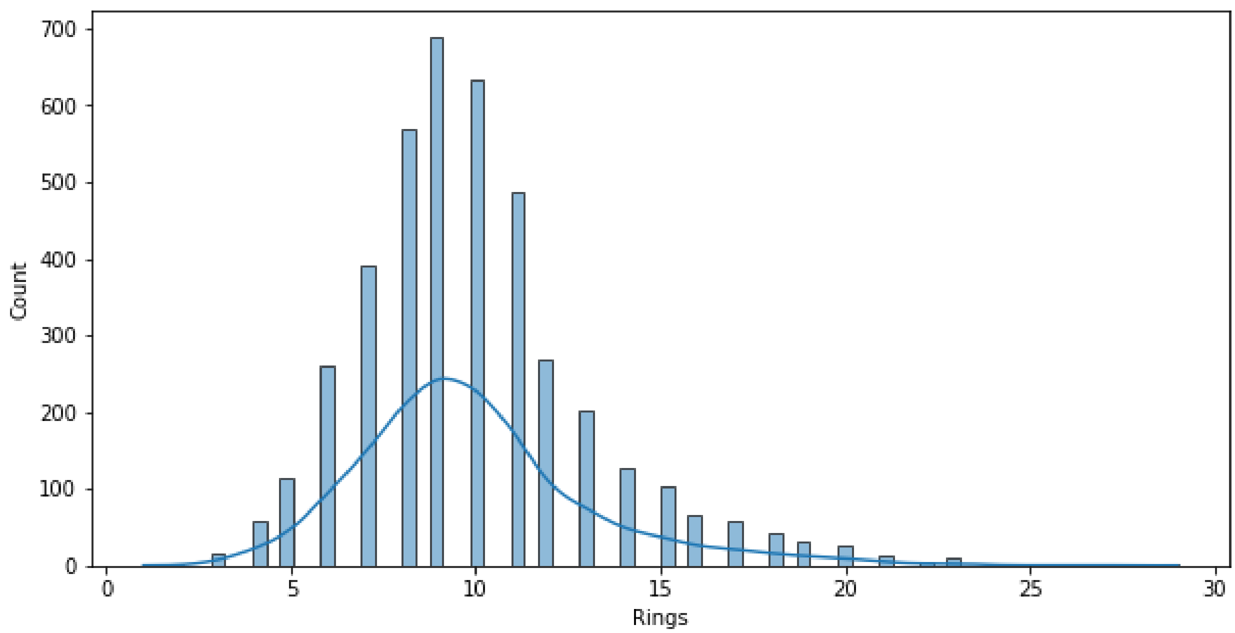
```
#change the size of the figures
plt.rcParams['figure.figsize'] = (10, 5)
# countplot
sns.countplot(data=df,x="Rings")
```



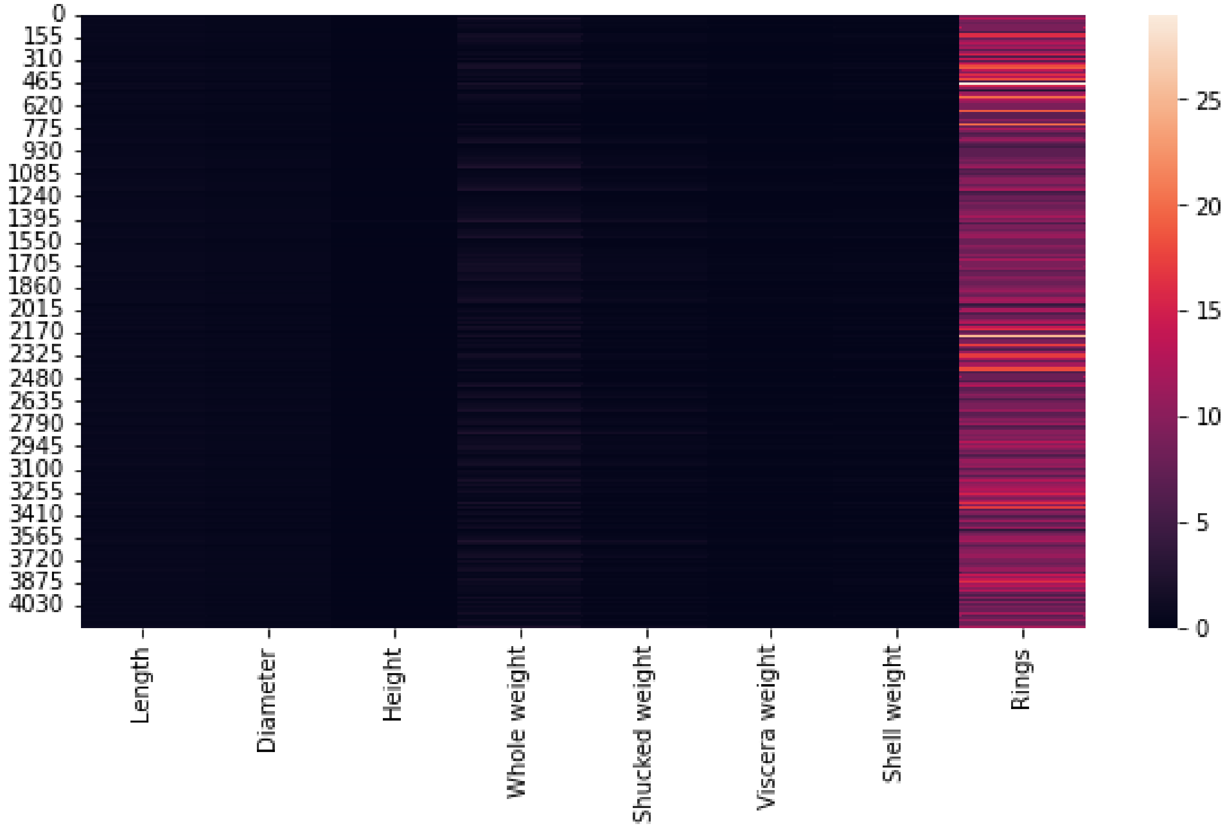

```
#piechart
plt.pie(df['Rings'].head(),autopct='%.1f')
([,
  ,
  ,
  ,
  ],
 [Text(0.6111272563215626, 0.9146165735327998, ''),
  Text(-0.8270237769092663, 0.725280409515335, ''),
  Text(-1.041623153479572, -0.35358337932554523, ''),
  Text(-5.149471704824549e-08, -1.0999999999999988, ''),
  Text(0.9865599777267362, -0.4865176362145796, '')],
 [Text(0.33334213981176136, 0.4988817673815271, '31.2'),
  Text(-0.4511038783141452, 0.39560749609927365, '14.6'),
  Text(-0.5681580837161301, -0.1928636614502974, '18.8'),
  Text(-2.8088027480861175e-08, -0.5999999999999993, '20.8'),
  Text(0.5381236242145833, -0.2653732561170434, '14.6')])
```



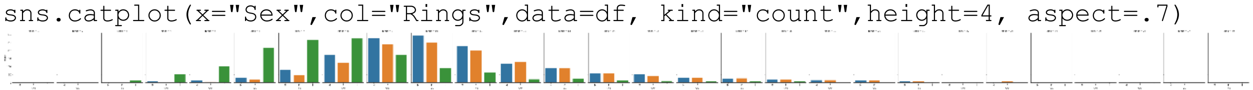

```
#histplot
sns.histplot(df.Rings,kde=True)
```



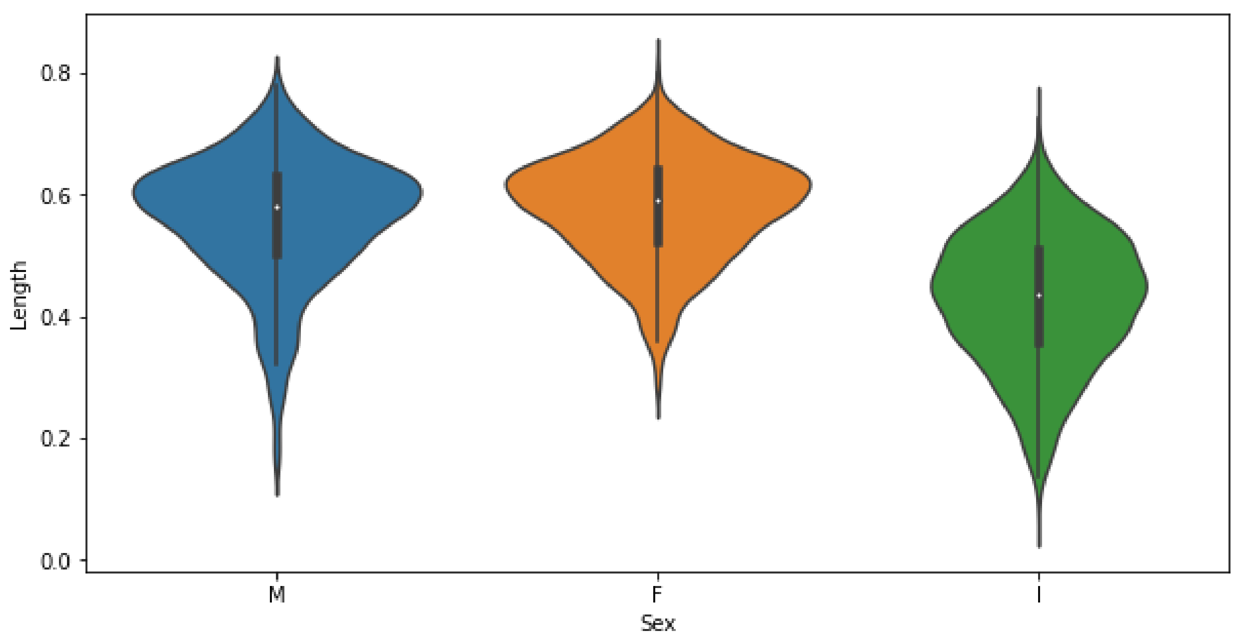

```
# heatmap

sns.heatmap(df[[ 'Length', 'Diameter', 'Height', 'Whole weight', 'Shucked
weight',
       'Viscera weight', 'Shell weight', 'Rings']])
```




```
#countplot
sns.catplot(x="Sex",col="Rings",data=df, kind="count",height=4, aspect=.7)
```

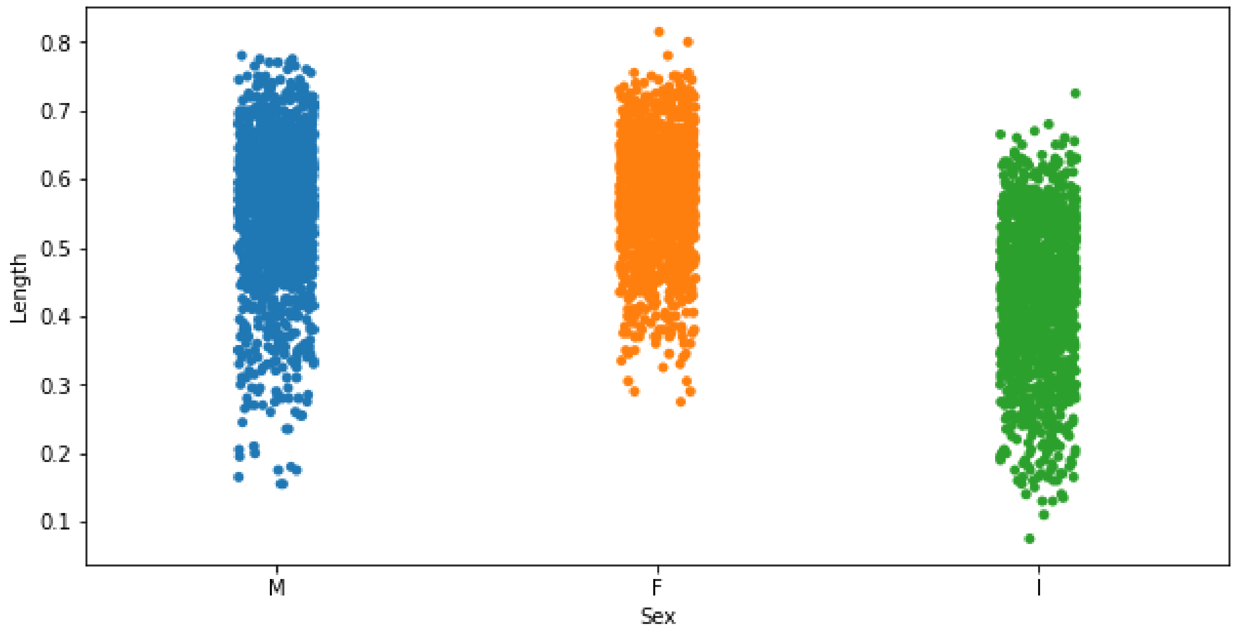


```
#violin plot
sns.violinplot(x="Sex", y="Length", data=df)
```

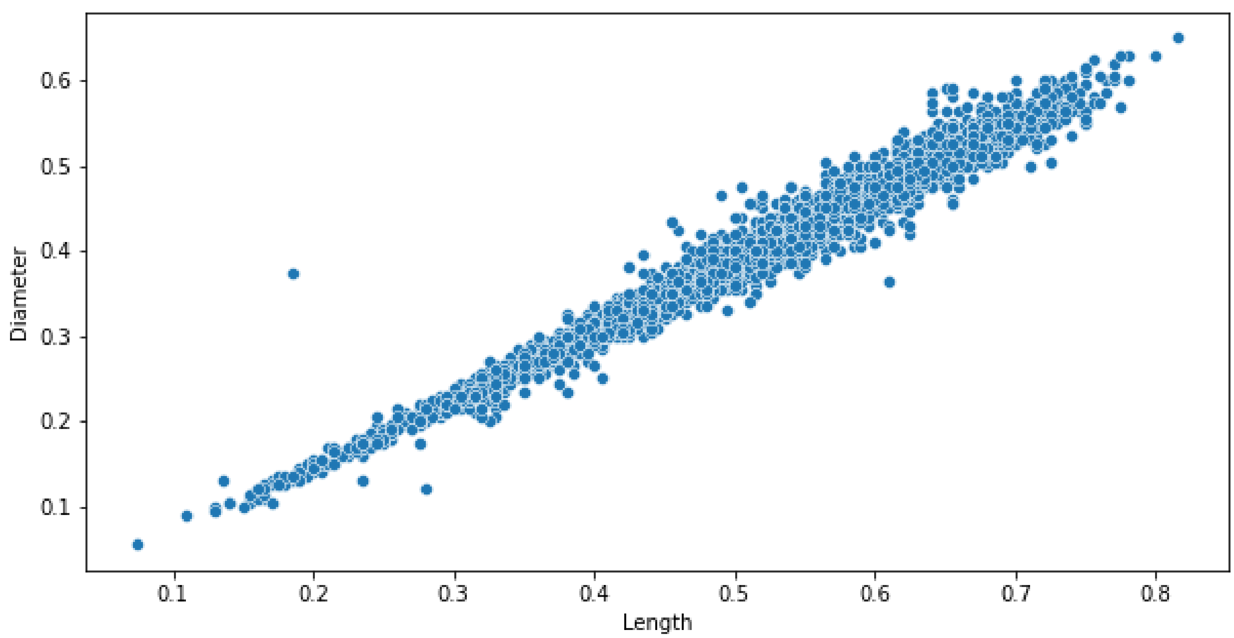



```
#strip plot
```

```
sns.stripplot(x="Sex", y="Length", data=df)
```

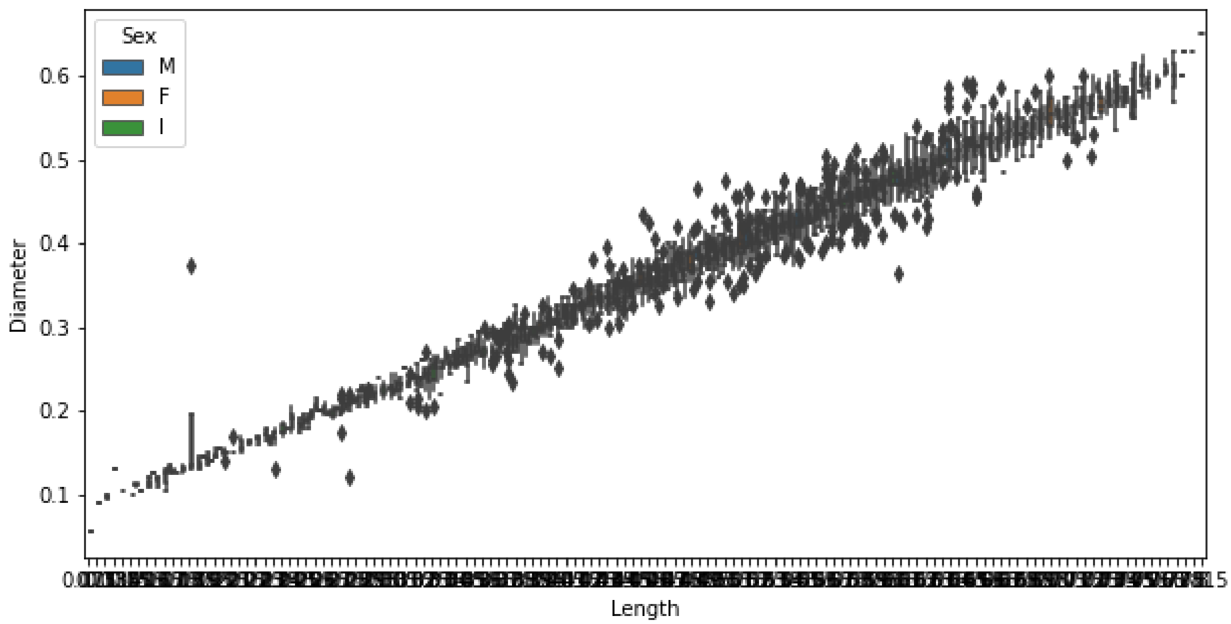



```
#scatter plot
sns.scatterplot(x = df["Length"],y = df["Diameter"])
```

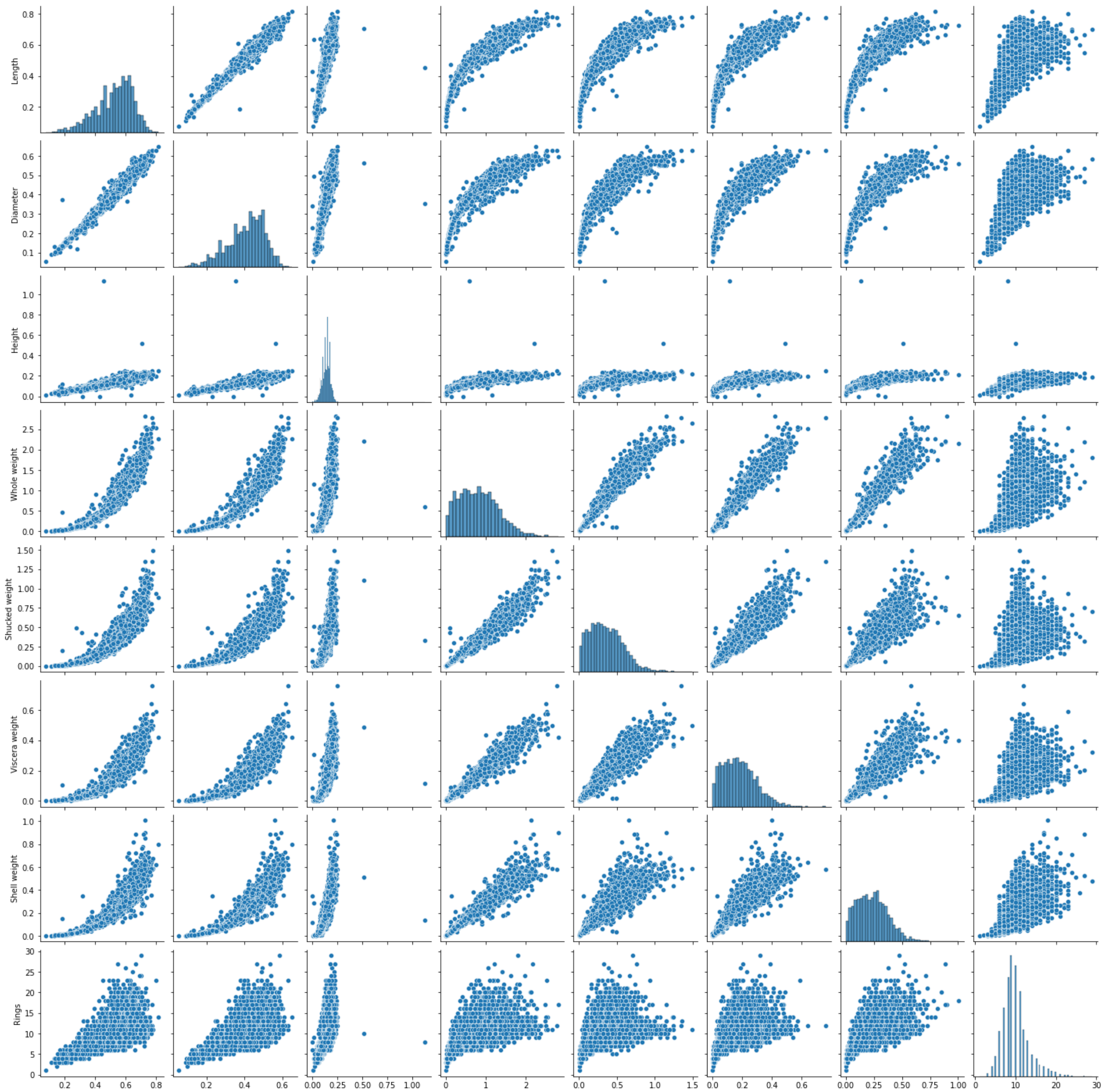


3.3 Multi-Variate Analysis

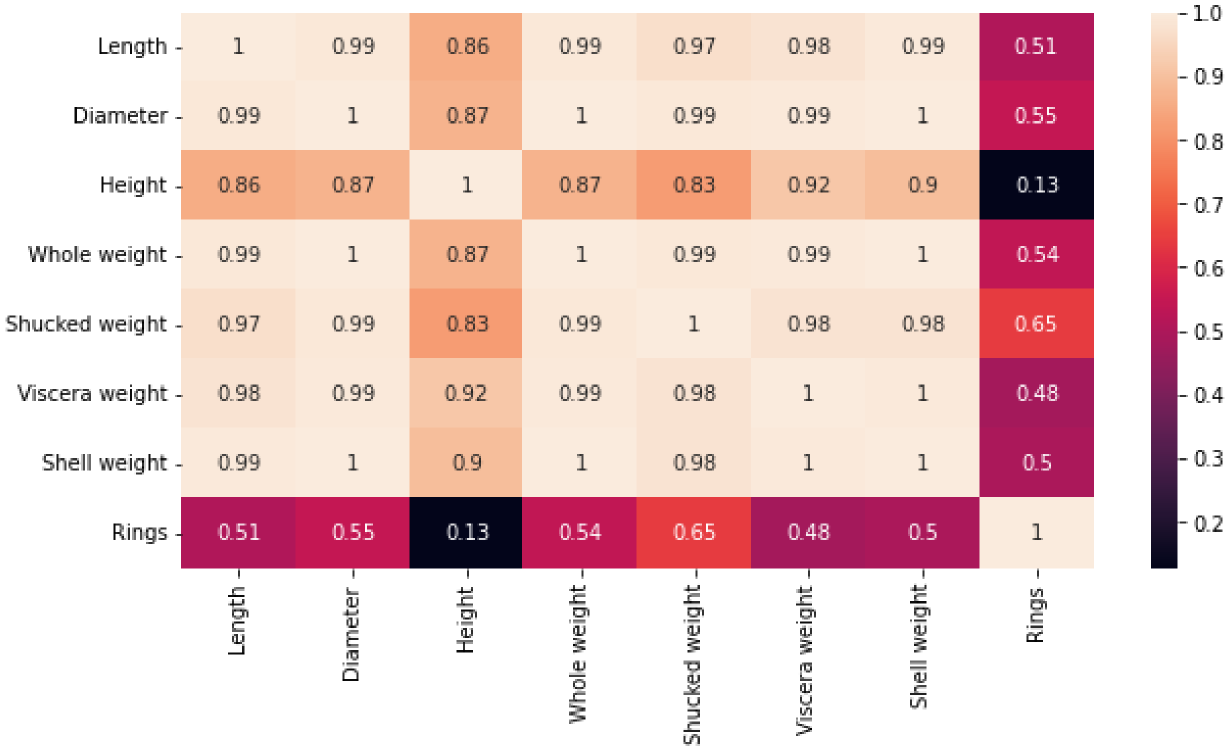
```
#boxplot
fig, ax1 = plt.subplots(figsize=(10,5))
testPlot = sns.boxplot(ax=ax1, x='Length', y='Diameter', hue='Sex', data=df)
```




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




```
fig=plt.figure(figsize=(10,5))
sns.heatmap(df.head().corr(),annot=True)
```



4. Perform descriptive statistics on the dataset

```
df
```

	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

```
df.head()
```

	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

```
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
df.describe()
```

	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

```
numerical_features = df.select_dtypes(include = [np.number]).columns
categorical_features = df.select_dtypes(include = [object]).columns
df[numerical_features].mean()
Length            0.523992
```

```
Diameter          0.407881
Height            0.139516
Whole weight      0.828742
Shucked weight    0.359367
Viscera weight    0.180594
Shell weight      0.238831
Rings             9.933684
dtype: float64
df[numerical_features].median()
Length            0.5450
Diameter          0.4250
Height            0.1400
Whole weight      0.7995
Shucked weight    0.3360
Viscera weight    0.1710
Shell weight      0.2340
Rings             9.0000
dtype: float64
percentage = [df[numerical_features].quantile(0),
             df[numerical_features].quantile(0.25),
             df[numerical_features].quantile(0.50),
             df[numerical_features].quantile(0.75),
             df[numerical_features].quantile(1)]
percentage
[Length            0.0750
 Diameter          0.0550
 Height            0.0000
 Whole weight      0.0020
 Shucked weight    0.0010
 Viscera weight    0.0005
 Shell weight      0.0015
 Rings             1.0000
 Name: 0.0, dtype: float64, Length            0.4500
 Diameter          0.3500
 Height            0.1150
 Whole weight      0.4415
 Shucked weight    0.1860
 Viscera weight    0.0935
 Shell weight      0.1300
 Rings             8.0000
 Name: 0.25, dtype: float64, Length            0.5450
 Diameter          0.4250
 Height            0.1400
 Whole weight      0.7995
 Shucked weight    0.3360
 Viscera weight    0.1710
 Shell weight      0.2340
 Rings             9.0000
 Name: 0.5, dtype: float64, Length            0.615
 Diameter           0.480
 Height             0.165
 Whole weight       1.153
 Shucked weight     0.502
 Viscera weight     0.253
 Shell weight       0.329
 Rings             11.000
 Name: 0.75, dtype: float64, Length             0.8150
```

```
 Diameter           0.6500
 Height             1.1300
 Whole weight       2.8255
 Shucked weight     1.4880
 Viscera weight     0.7600
 Shell weight       1.0050
 Rings             29.0000
 Name: 1.0, dtype: float64]
df[numerical_features].value_counts()
Length  Diameter  Height  Whole weight  Shucked weight  Viscera weight  Shell
weight  Rings
0.075   0.055     0.010   0.0020        0.0010          0.0005
0.0015        1        1
0.590   0.465     0.155   1.1360        0.5245          0.2615
0.2750        11       1
                  0.165   1.1150        0.5165          0.2730
0.2750        10       1
                  0.170   1.0425        0.4635          0.2400
0.2700        10       1
                  0.195   1.0885        0.3685          0.1870
0.3750        17       1

..
0.485   0.370     0.155   0.9680        0.4190          0.2455
0.2365        9        1
        0.375     0.110   0.4640        0.2015          0.0900
0.1490        8        1
                  0.125   0.5620        0.2505          0.1345
0.1525        8        1
                  0.130   0.5535        0.2660          0.1120
0.1570        8        1
0.815   0.650     0.250   2.2550        0.8905          0.4200
0.7975        14       1
Length: 4177, dtype: int64
df[numerical_features].mode()
```

	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	0.550	0.45	0.15	0.2225	0.175	0.1715	0.275	9.0
1	0.625	NaN	NaN	NaN	NaN	NaN	NaN	NaN

```
df[numerical_features].std()
Length             0.120093
Diameter           0.099240
Height             0.041827
Whole weight       0.490389
Shucked weight     0.221963
Viscera weight     0.109614
Shell weight       0.139203
Rings              3.224169
dtype: float64
df[numerical_features].var()
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
df[numerical_features].skew()
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
df[numerical_features].kurt()
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
```

5. Check for Missing values and deal with them

```
df.isnull()
```

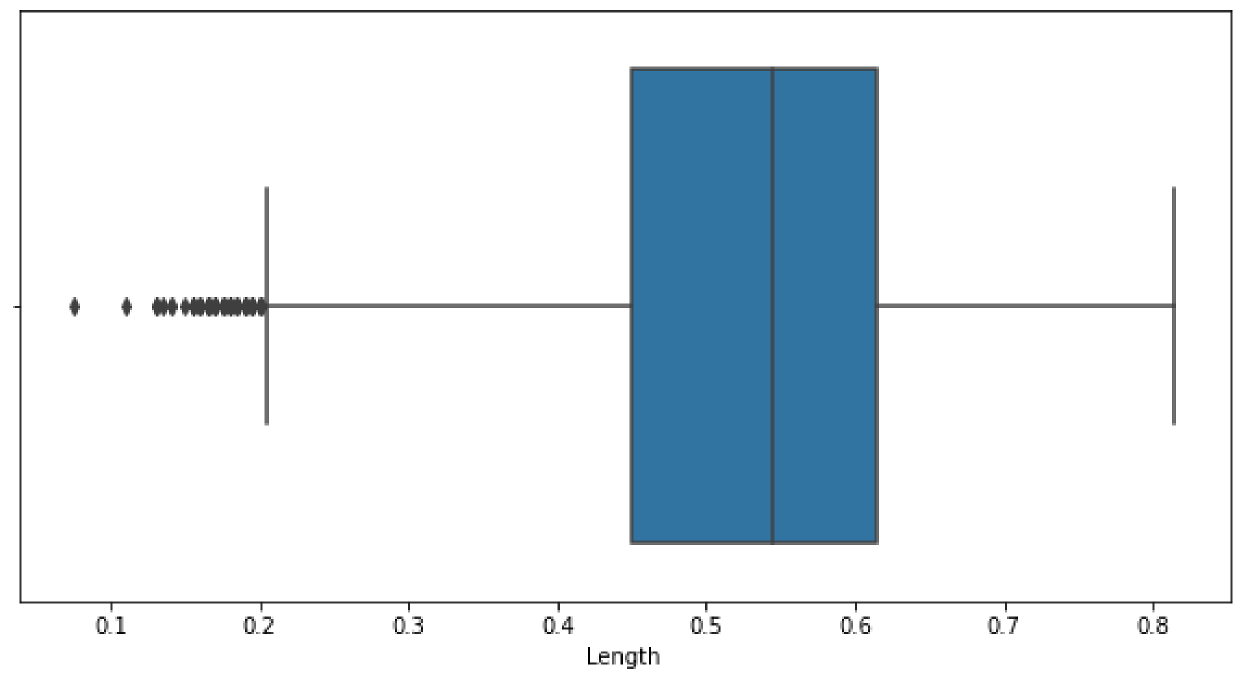
	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	False	False	False	False	False	False	False	False	False
1	False	False	False	False	False	False	False	False	False
2	False	False	False	False	False	False	False	False	False
3	False	False	False	False	False	False	False	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

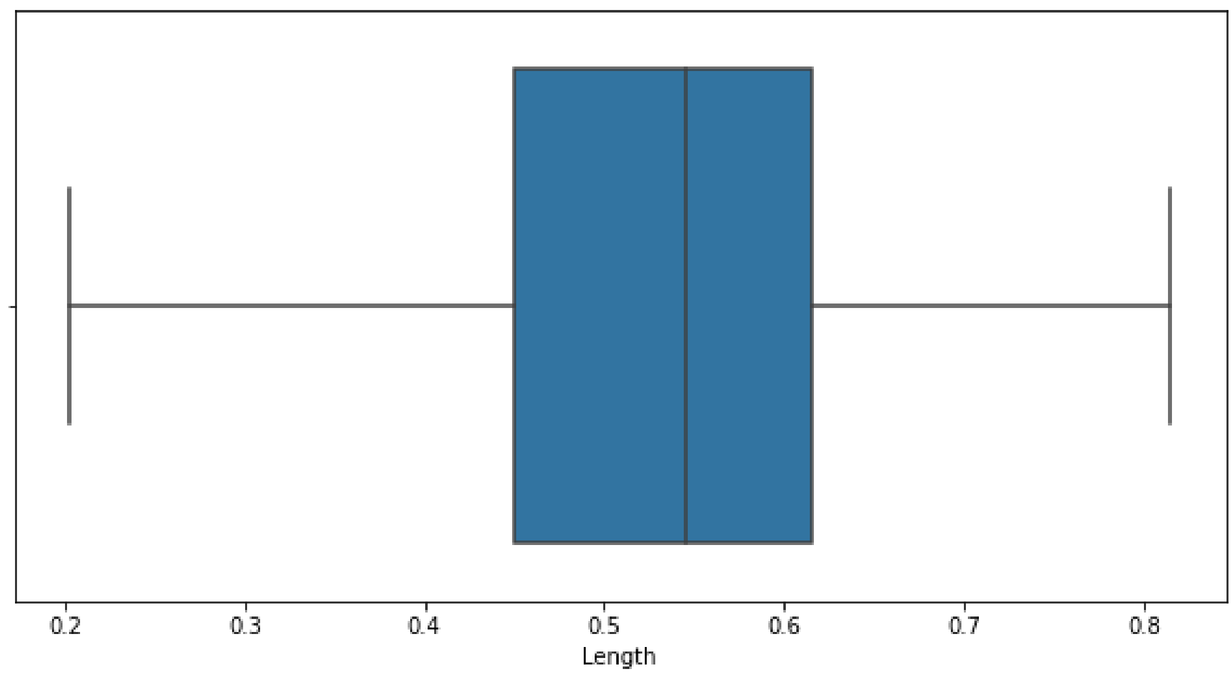
```
df.isnull().any()
Sex                 False
Length              False
Diameter            False
Height              False
Whole weight        False
Shucked weight      False
Viscera weight      False
Shell weight        False
Rings               False
dtype: bool
df.isnull().sum()
Sex                 0
Length              0
Diameter            0
Height              0
Whole weight        0
Shucked weight      0
Viscera weight      0
Shell weight        0
Rings               0
dtype: int64
df.isnull().sum()
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 them outliers

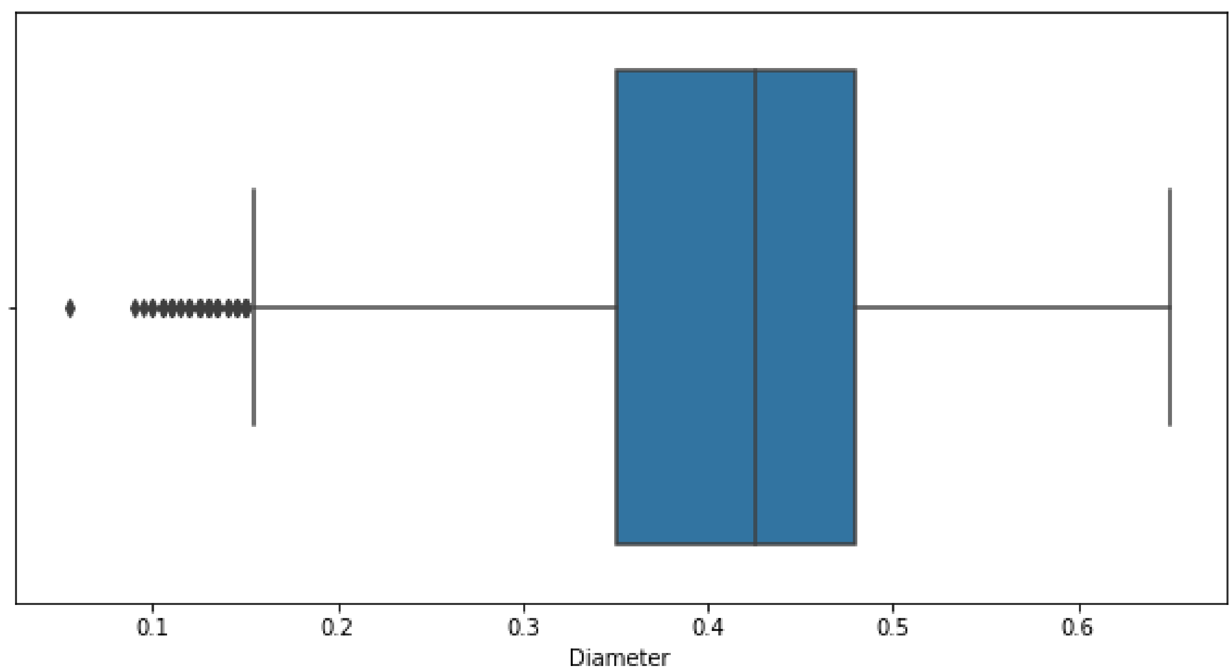
```
#length
sns.boxplot(x=df['Length'])
```




```
q1 = df['Length'].quantile(0.25)
q2 = df['Length'].quantile(0.75)
iqr = q2-q1
q1, q2, iqr
(0.45, 0.615, 0.16499999999999998)
upper_limit = q2 + (1.5 * iqr)
lower_limit = q1 - (1.5 * iqr)
lower_limit, upper_limit
(0.20250000000000004, 0.8624999999999999)
new_df = df.loc[(df['Length'] <= upper_limit) & (df['Length'] >=
lower_limit)]
print('before removing outliers:', len(df))
print('after removing outliers:',len(new_df))
print('outliers:', len(df)-len(new_df))
before removing outliers: 4177
after removing outliers: 4128
outliers: 49
new_df = df.copy()
new_df.loc[(new_df['Length']>upper_limit), 'Length'] = upper_limit
new_df.loc[(new_df['Length']<lower_limit), 'Length'] = lower_limit
sns.boxplot(x=new_df['Length'])
```

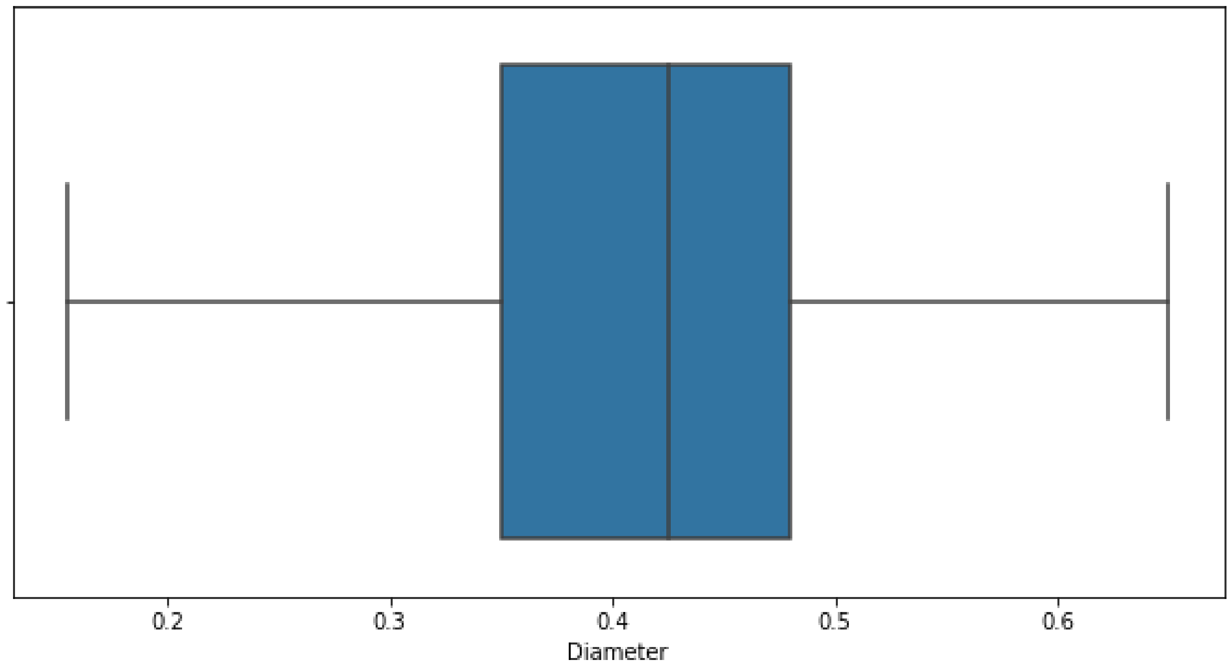



```
#Diameter
sns.boxplot(x=df['Diameter'])
```

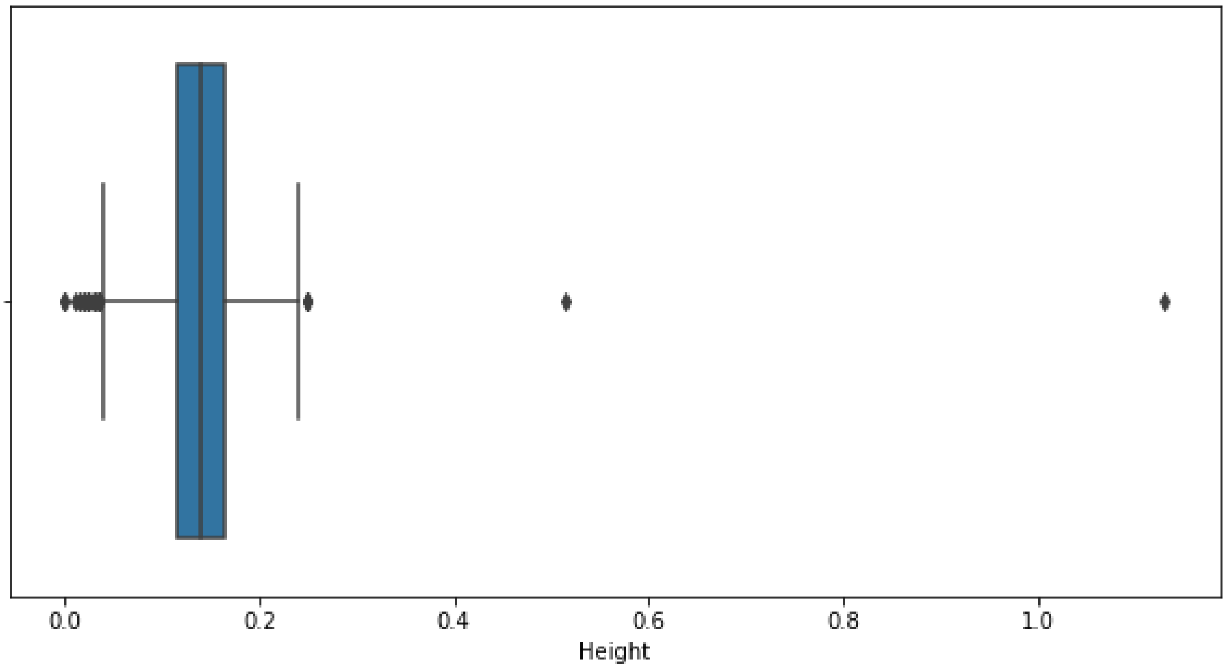



```
q1 = df['Diameter'].quantile(0.25)
q2 = df['Diameter'].quantile(0.75)
iqr = q2-q1
q1, q2, iqr
(0.35, 0.48, 0.13)
upper_limit = q2 + (1.5 * iqr)
lower_limit = q1 - (1.5 * iqr)
lower_limit, upper_limit
(0.15499999999999997, 0.675)
```

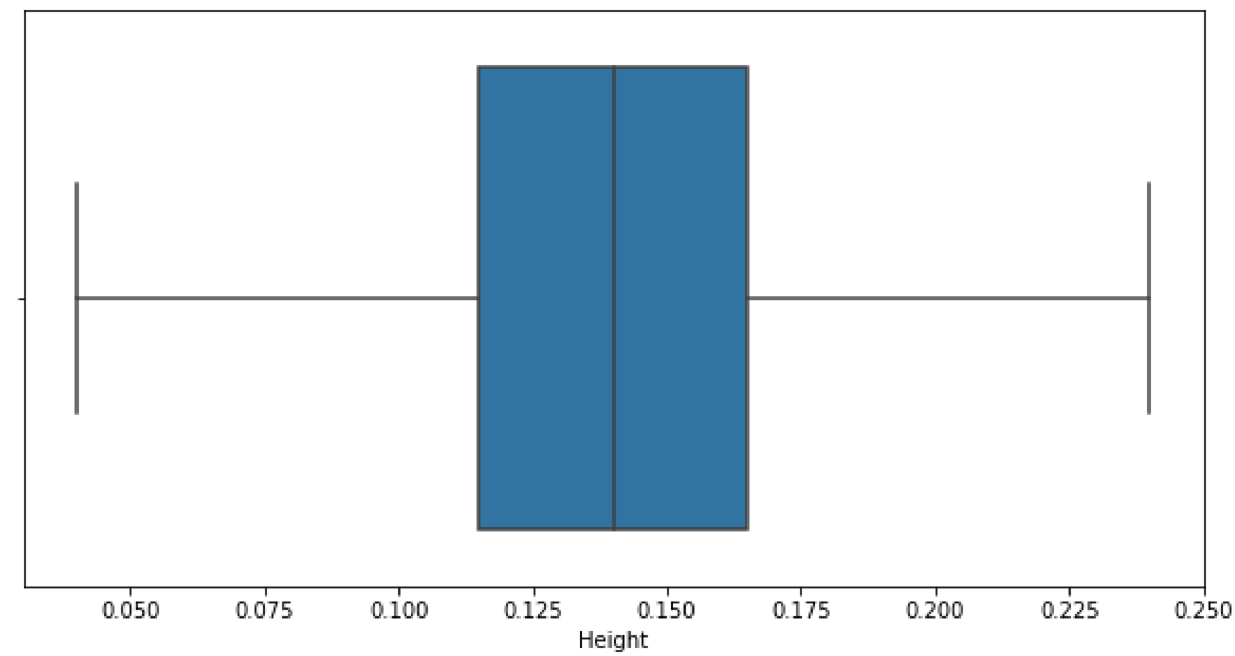
```
new_df = df.loc[(df['Diameter'] <= upper_limit) & (df['Diameter'] >=
lower_limit)]
print('before removing outliers:', len(df))
print('after removing outliers:',len(new_df))
print('outliers:', len(df)-len(new_df))
before removing outliers: 4177
after removing outliers: 4118
outliers: 59
new_df = df.copy()
new_df.loc[(new_df['Diameter']>upper_limit), 'Diameter'] = upper_limit
new_df.loc[(new_df['Diameter']<lower_limit), 'Diameter'] = lower_limit
sns.boxplot(x=new_df['Diameter'])
```



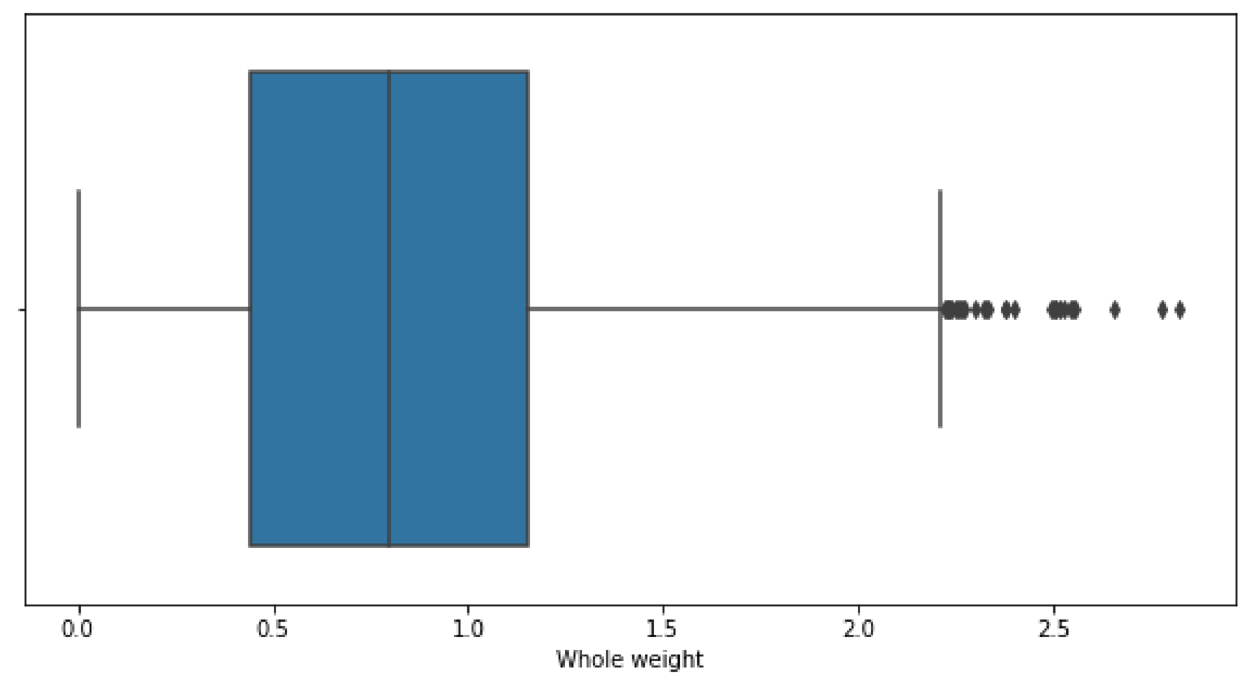

```
#Height
sns.boxplot(x=df['Height'])
```




```
q1 = df['Height'].quantile(0.25)
q2 = df['Height'].quantile(0.75)
iqr = q2-q1
q1, q2, iqr
(0.115, 0.165, 0.05)
upper_limit = q2 + (1.5 * iqr)
lower_limit = q1 - (1.5 * iqr)
lower_limit, upper_limit
(0.039999999999999994, 0.24000000000000002)
new_df = df.loc[(df['Height'] <= upper_limit) & (df['Height'] >=
lower_limit)]
print('before removing outliers:', len(df))
print('after removing outliers:',len(new_df))
print('outliers:', len(df)-len(new_df))
before removing outliers: 4177
after removing outliers: 4148
outliers: 29
new_df = df.copy()
new_df.loc[(new_df['Height']>upper_limit), 'Height'] = upper_limit
new_df.loc[(new_df['Height']<lower_limit), 'Height'] = lower_limit
sns.boxplot(x=new_df['Height'])
```

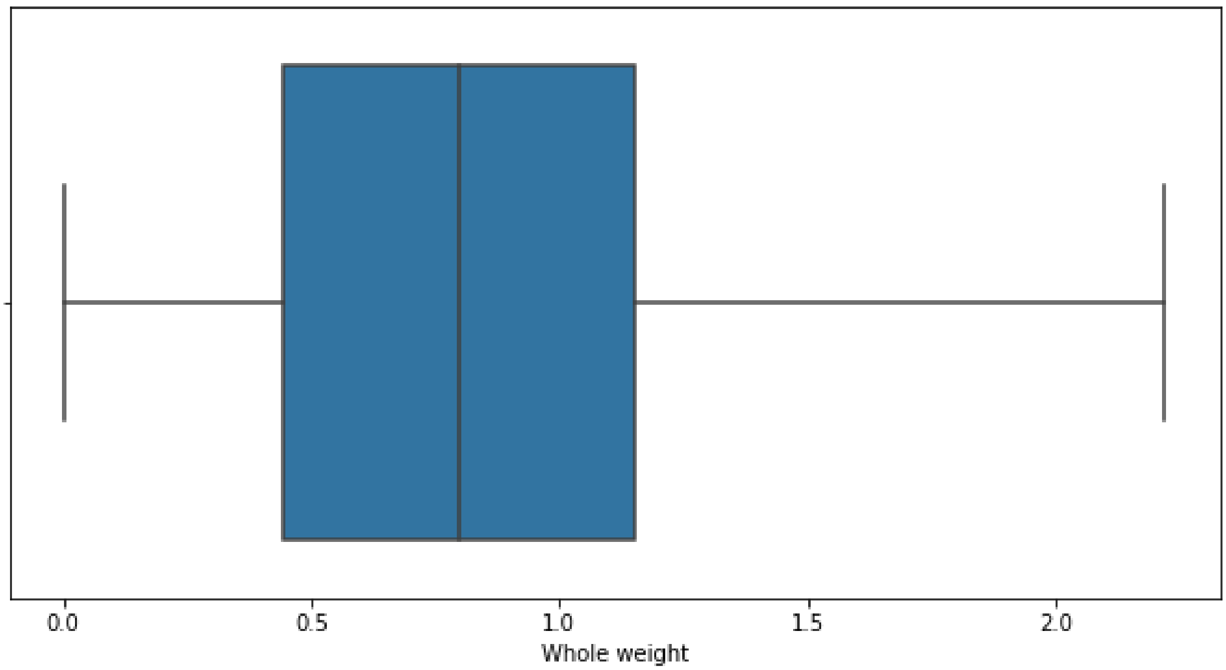



```
#Whole Weight
sns.boxplot(x=df['Whole weight'])
```

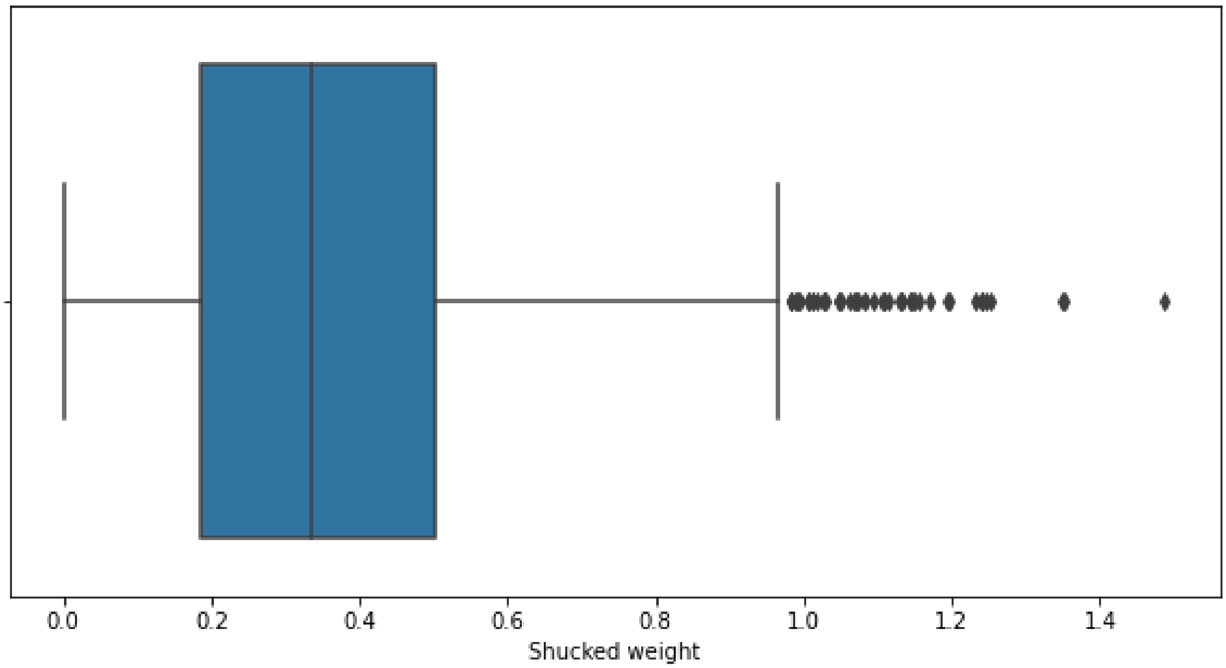



```
q1 = df['Whole weight'].quantile(0.25)
q2 = df['Whole weight'].quantile(0.75)
iqr = q2-q1
q1, q2, iqr
(0.4415, 1.153, 0.7115)
upper_limit = q2 + (1.5 * iqr)
lower_limit = q1 - (1.5 * iqr)
lower_limit, upper_limit
(-0.62575, 2.22025)
```

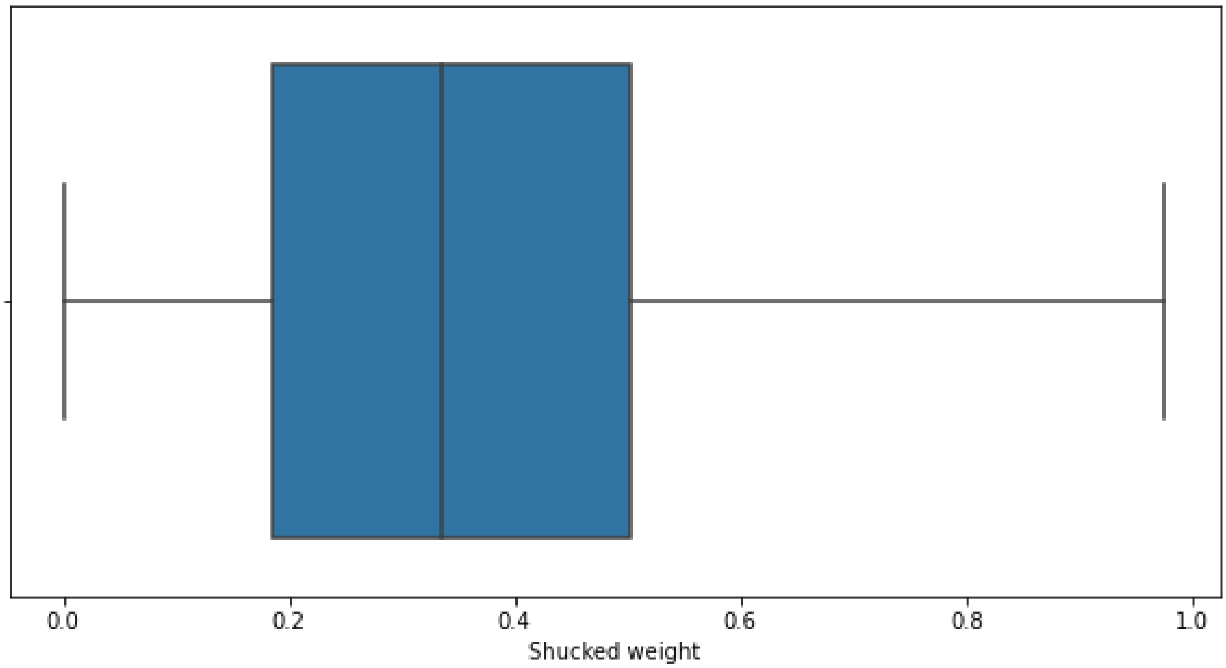
```
new_df = df.loc[(df['Whole weight'] <= upper_limit) & (df['Whole weight'] >=
lower_limit)]
print('before removing outliers:', len(df))
print('after removing outliers:',len(new_df))
print('outliers:', len(df)-len(new_df))
before removing outliers: 4177
after removing outliers: 4147
outliers: 30
new_df = df.copy()
new_df.loc[(new_df['Whole weight']>upper_limit), 'Whole weight'] =
upper_limit
new_df.loc[(new_df['Whole weight']<lower_limit), 'Whole weight'] =
lower_limit
sns.boxplot(x=new_df['Whole weight'])
```



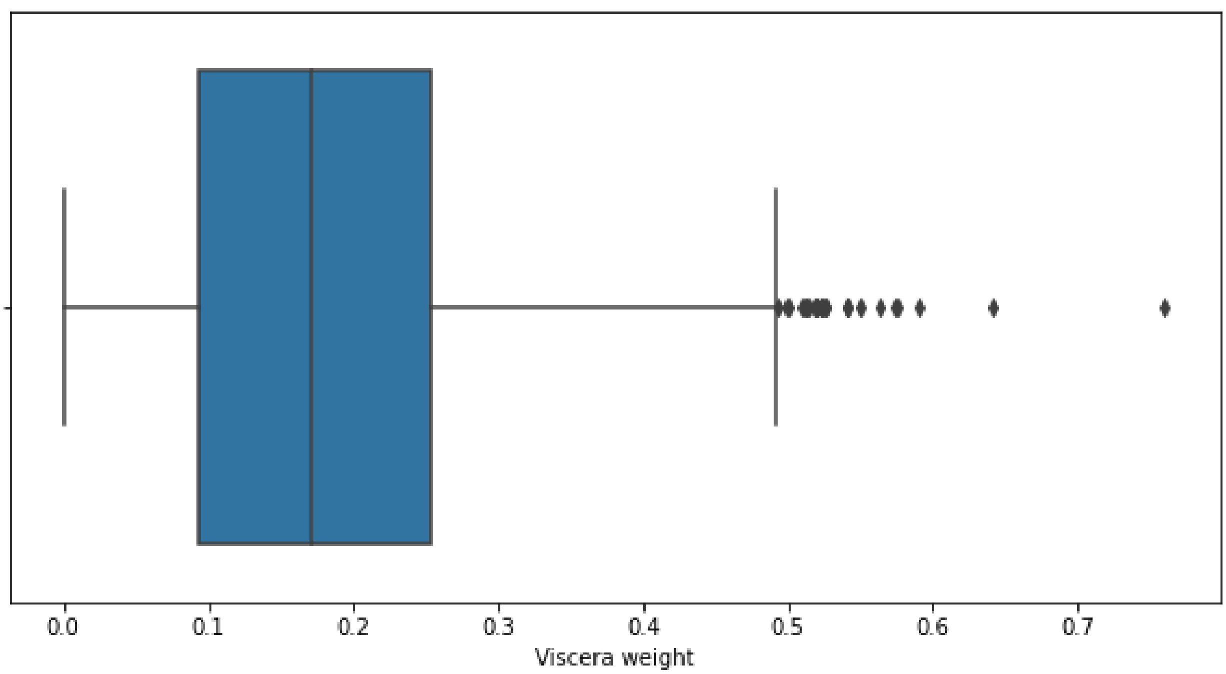

```
#Shucked weight
sns.boxplot(x=df['Shucked weight'])
```




```
q1 = df['Shucked weight'].quantile(0.25)
q2 = df['Shucked weight'].quantile(0.75)
iqr = q2-q1
q1, q2, iqr
(0.186, 0.502, 0.316)
upper_limit = q2 + (1.5 * iqr)
lower_limit = q1 - (1.5 * iqr)
lower_limit, upper_limit
(-0.288, 0.976)
new_df = df.loc[(df['Shucked weight'] <= upper_limit) & (df['Shucked weight']
>= lower_limit)]
print('before removing outliers:', len(df))
print('after removing outliers:',len(new_df))
print('outliers:', len(df)-len(new_df))
before removing outliers: 4177
after removing outliers: 4129
outliers: 48
new_df = df.copy()
new_df.loc[(new_df['Shucked weight']>upper_limit), 'Shucked weight'] =
upper_limit
new_df.loc[(new_df['Shucked weight']<lower_limit), 'Shucked weight'] =
lower_limit
sns.boxplot(x=new_df['Shucked weight'])
```

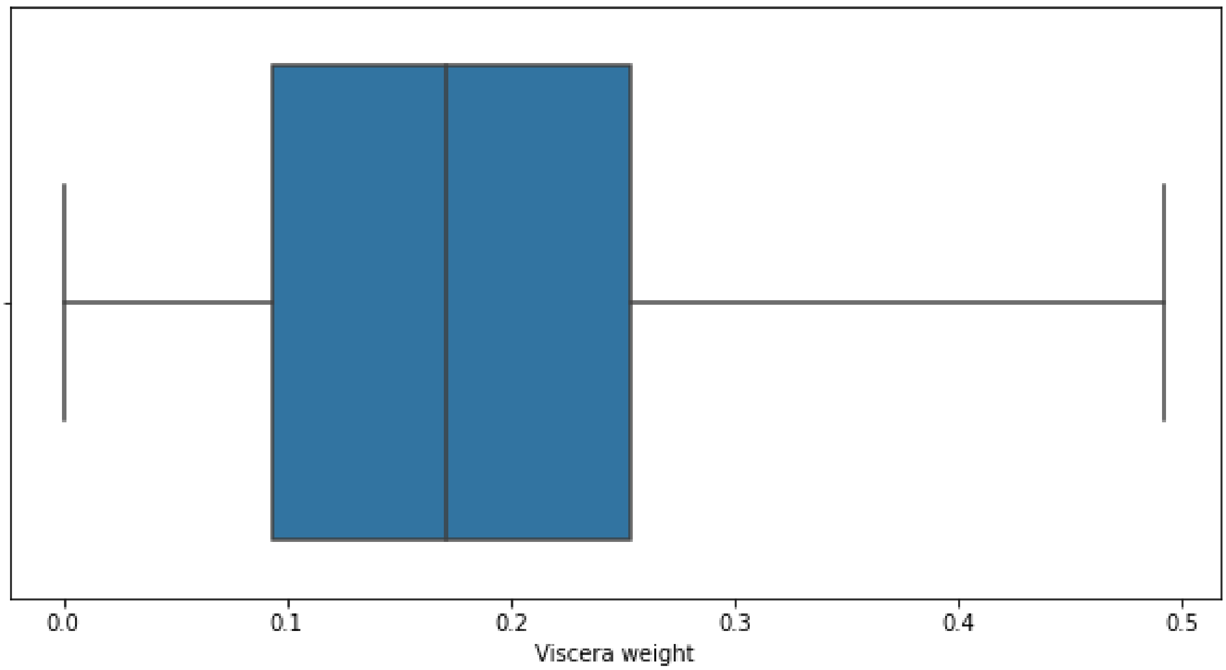



```
#Viscera weight
sns.boxplot(x=df['Viscera weight'])
```

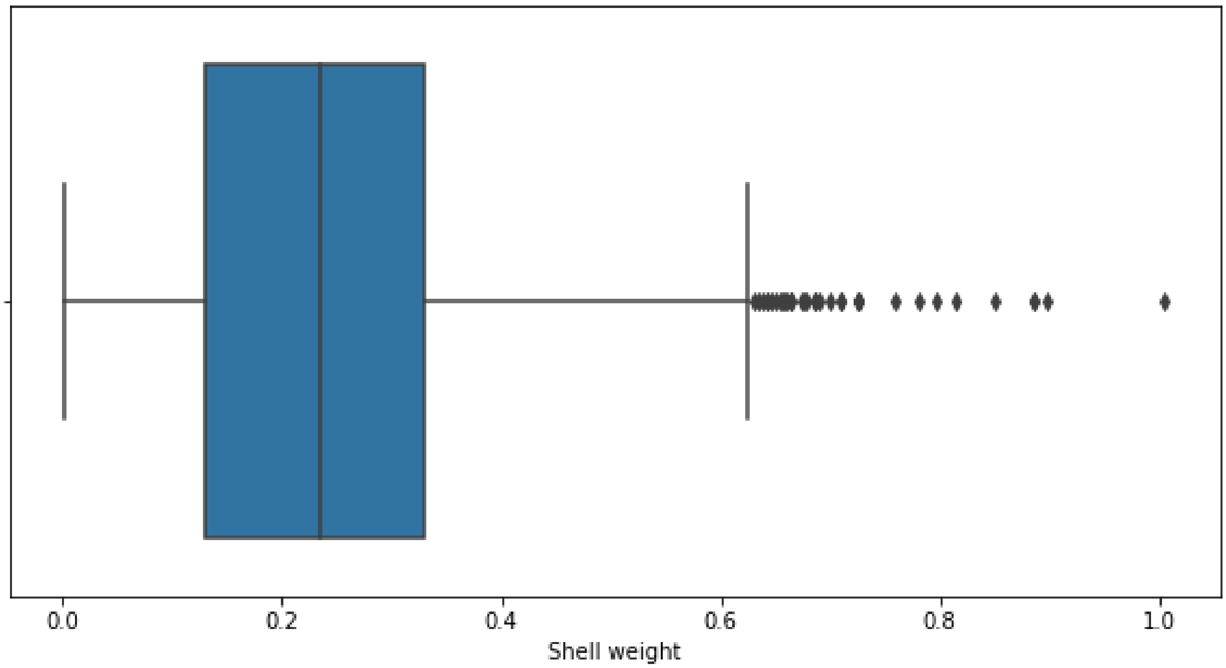



```
q1 = df['Viscera weight'].quantile(0.25)
q2 = df['Viscera weight'].quantile(0.75)
iqr = q2-q1
q1, q2, iqr
(0.0935, 0.253, 0.1595)
upper_limit = q2 + (1.5 * iqr)
lower_limit = q1 - (1.5 * iqr)
lower_limit, upper_limit
(-0.14575000000000002, 0.49225)
```

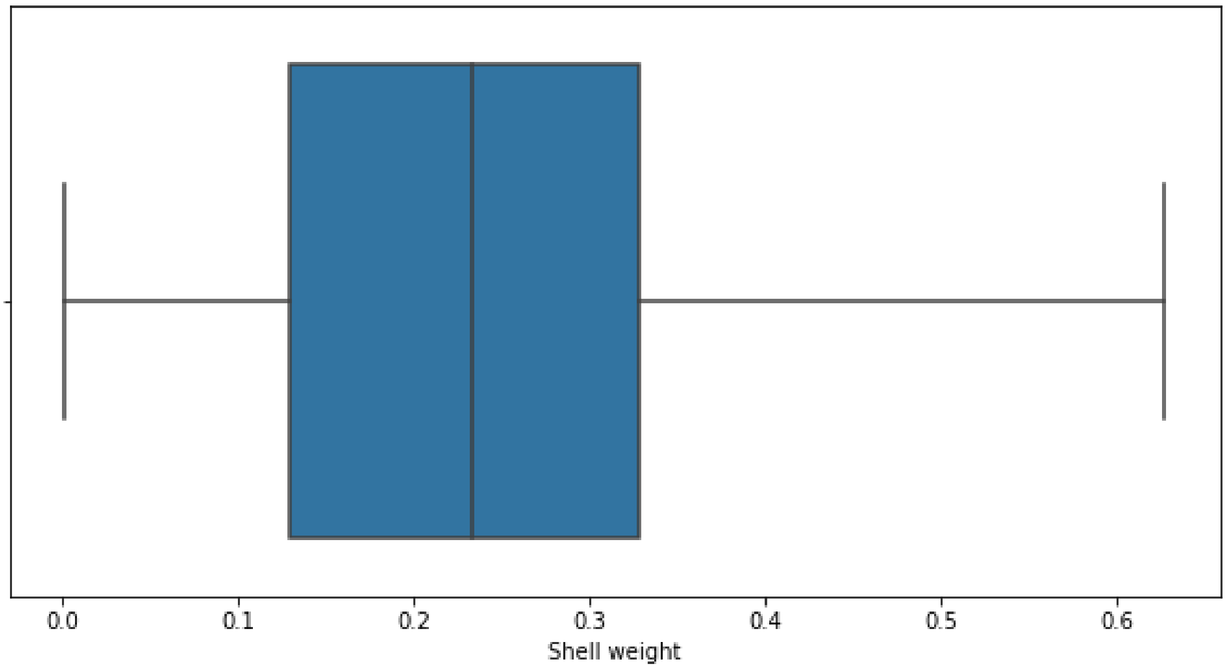
```
new_df = df.loc[(df['Viscera weight'] <= upper_limit) & (df['Viscera weight']
>= lower_limit)]
print('before removing outliers:', len(df))
print('after removing outliers:',len(new_df))
print('outliers:', len(df)-len(new_df))
before removing outliers: 4177
after removing outliers: 4151
outliers: 26
new_df = df.copy()
new_df.loc[(new_df['Viscera weight']>upper_limit), 'Viscera weight'] =
upper_limit
new_df.loc[(new_df['Viscera weight']<lower_limit), 'Viscera weight'] =
lower_limit
sns.boxplot(x=new_df['Viscera weight'])
```



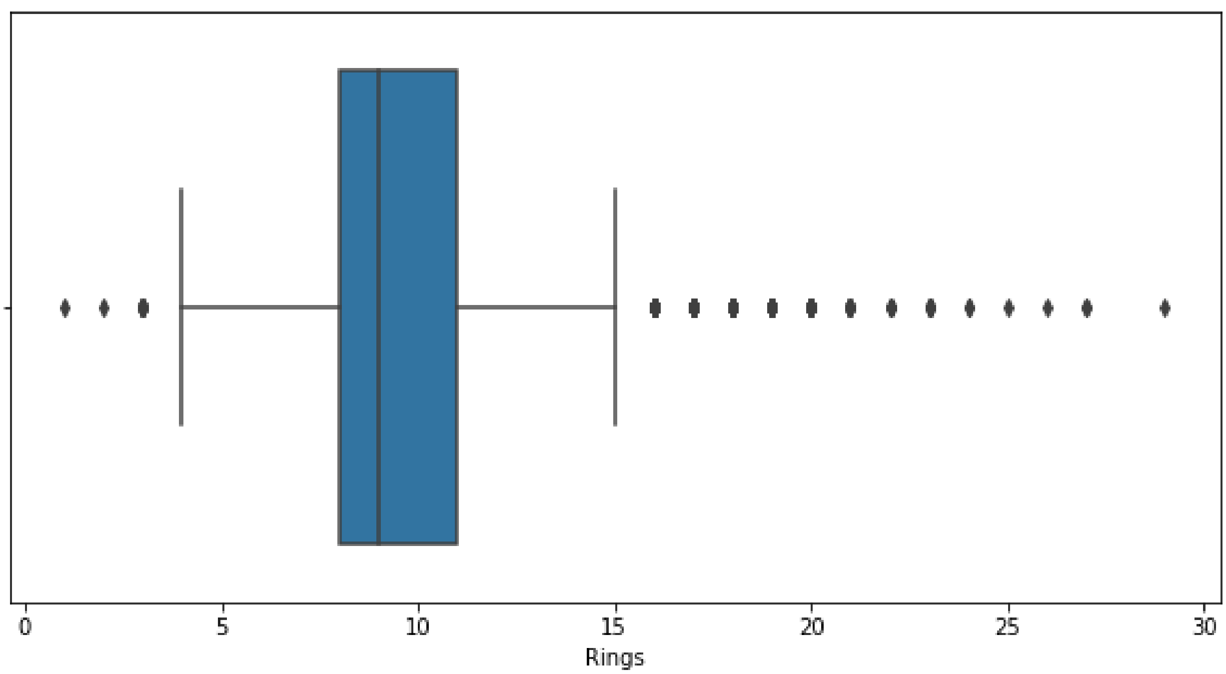

```
#shell weight
sns.boxplot(x=df['Shell weight'])
```




```
q1 = df['Shell weight'].quantile(0.25)
q2 = df['Shell weight'].quantile(0.75)
iqr = q2-q1
q1, q2, iqr
(0.13, 0.329, 0.199)
upper_limit = q2 + (1.5 * iqr)
lower_limit = q1 - (1.5 * iqr)
lower_limit, upper_limit
(-0.16849999999999998, 0.6275)
new_df = df.loc[(df['Shell weight'] <= upper_limit) & (df['Shell weight'] >=
lower_limit)]
print('before removing outliers:', len(df))
print('after removing outliers:',len(new_df))
print('outliers:', len(df)-len(new_df))
before removing outliers: 4177
after removing outliers: 4142
outliers: 35
new_df = df.copy()
new_df.loc[(new_df['Shell weight']>upper_limit), 'Shell weight'] =
upper_limit
new_df.loc[(new_df['Shell weight']<lower_limit), 'Shell weight'] =
lower_limit
sns.boxplot(x=new_df['Shell weight'])
```

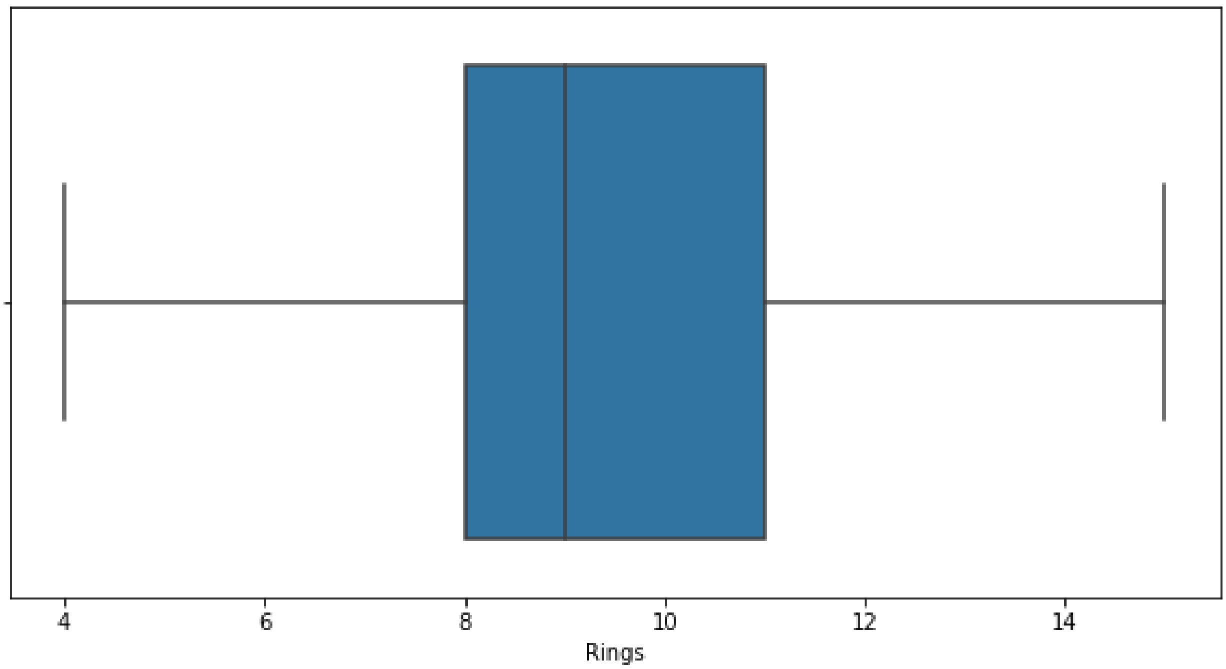



```
#Rings
sns.boxplot(x=df['Rings'])
```




```
q1 = df['Rings'].quantile(0.25)
q2 = df['Rings'].quantile(0.75)
iqr = q2-q1
q1, q2, iqr
(8.0, 11.0, 3.0)
upper_limit = q2 + (1.5 * iqr)
lower_limit = q1 - (1.5 * iqr)
lower_limit, upper_limit
(3.5, 15.5)
```

```
new_df = df.loc[(df['Rings'] <= upper_limit) & (df['Rings'] >= lower_limit)]
print('before removing outliers:', len(df))
print('after removing outliers:',len(new_df))
print('outliers:', len(df)-len(new_df))
before removing outliers: 4177
after removing outliers: 3899
outliers: 278
new_df = df.loc[(df['Rings'] <= upper_limit) & (df['Rings'] >= lower_limit)]
print('before removing outliers:', len(df))
print('after removing outliers:',len(new_df))
print('outliers:', len(df)-len(new_df))
before removing outliers: 4177
after removing outliers: 3899
outliers: 278
sns.boxplot(x=new_df['Rings'])
```



7. Check for Categorical columns and perform encoding

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

	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

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
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	0.9660	0.4390	0.2145	0.2605	10
4174	1	0.600	0.475	0.205	1.1760	0.5255	0.2875	0.3080	9
4175	0	0.625	0.485	0.150	1.0945	0.5310	0.2610	0.2960	10
4176	1	0.710	0.555	0.195	1.9485	0.9455	0.3765	0.4950	12

4177 rows × 9 columns

```
from sklearn.preprocessing import LabelEncoder,OneHotEncoder,StandardScaler
label_encoder =LabelEncoder()
df['Sex']= label_encoder.fit_transform(df['Sex'])
df
```

	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	0.9660	0.4390	0.2145	0.2605	10
4174	1	0.600	0.475	0.205	1.1760	0.5255	0.2875	0.3080	9
4175	0	0.625	0.485	0.150	1.0945	0.5310	0.2610	0.2960	10
4176	1	0.710	0.555	0.195	1.9485	0.9455	0.3765	0.4950	12

4177 rows × 9 columns

```
enc = OneHotEncoder(drop='first')

enc_df = pd.DataFrame(enc.fit_transform(df[['Sex']]).toarray())

df =df.join(enc_df)
df.head()
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings	0	1
0	1	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15	1.0	0.0
1	1	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7	1.0	0.0
2	0	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9	0.0	0.0
3	1	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10	1.0	0.0
4	2	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7	0.0	1.0

8. Split the data into dependent and independent variables

```
x= df.iloc[:,1:8]
x
```

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

4177 rows × 7 columns

```
y=df.iloc[:,8]
y
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
```

9. Scale the independent variables

```
scale = StandardScaler()
scaledX = scale.fit_transform(x)

print(scaledX)
[[-0.57455813 -0.43214879 -1.06442415 ... -0.60768536 -0.72621157
  -0.63821689]
 [-1.44898585 -1.439929   -1.18397831 ... -1.17090984 -1.20522124
  -1.21298732]
 [ 0.05003309  0.12213032 -0.10799087 ... -0.4634999  -0.35668983
  -0.20713907]
 ...
 [ 0.6329849   0.67640943  1.56576738 ...  0.74855917  0.97541324
   0.49695471]
 [ 0.84118198  0.77718745  0.25067161 ...  0.77334105  0.73362741
   0.41073914]
 [ 1.54905203  1.48263359  1.32665906 ...  2.64099341  1.78744868
   1.84048058]]
```

10. Split the data into training and testing

```
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.shape, x_train.shape, x_test.shape,y_train.shape, y_test.shape)
(4177, 7) (3341, 7) (836, 7) (3341,) (836,)
```

11. Build the Model

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

12. Train the Model

```
linearmodel.fit(x_train, y_train)
LinearRegression()
```

13. Test the Model

```
y_train_pred = linearmodel.predict(x_train)
y_test_pred = linearmodel.predict(x_test)
y_test_pred
array([10.17397542, 10.07068143,  8.67134702, 12.71828702,  8.86787867,
       10.75020563, 13.81975514,  9.3096892 ,  5.87779411,  7.63321116,
```

```
10.3846552 , 10.97183695,  9.08525726,  9.41456742,  7.03254741,
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12.31827093,  6.32982348,  6.93276273,  9.82100727,  6.89363451,
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```

14. Measure the performance using Metrics

```
from sklearn.metrics import mean_absolute_error, mean_squared_error
s = mean_squared_error(y_train, y_train_pred)
print('Mean Squared error of training set :%2f'%s)

p = mean_squared_error(y_test, y_test_pred)
print('Mean Squared error of testing set :%2f'%p)
Mean Squared error of training set :4.949028
Mean Squared error of testing set :4.785948
# Build the Model
from sklearn.ensemble import RandomForestRegressor
rfr = RandomForestRegressor(max_depth=2, random_state=0,
                              n_estimators=100)
#Train the model
rfr.fit(x_train, y_train)
rfr.fit(x_test, y_test)
RandomForestRegressor(max_depth=2, random_state=0)
#Test the model
y_train_pred = rfr.predict(x_train)
y_test_pred = rfr.predict(x_test)
#measure the performance using metrics
rfr.score(x_test, y_test)
0.41877128928053997
```

K Neighbors Regression

```
#Build the model
from sklearn.neighbors import KNeighborsRegressor
knr = KNeighborsRegressor(n_neighbors =4 )
#Train the model
knr.fit(x_train, y_train)
knr.fit(x_test, y_test)
KNeighborsRegressor(n_neighbors=4)
#Test the model
y_train_pred = knr.predict(x_train)
y_test_pred = knr.predict(x_test)
#Measure the performance using Metrics
knr.score(x_train, y_train)
0.48693687494342397
```

Decision Tree Regression

```
#Build the model
from sklearn.tree import DecisionTreeRegressor
dtr = DecisionTreeRegressor(random_state=0)
#Train the model
dtr.fit(x_test,y_test)
DecisionTreeRegressor(random_state=0)
#Test the model
y_train_pred = dtr.predict(x_train)
y_test_pred = dtr.predict(x_test)
#Mesure the performance using Metrics
dtr.score(x_train, y_train)
0.07943400002124779
```

Lasso Regression

```
#Build the model
from sklearn.linear_model import Lasso
lr=Lasso(alpha=0.01)
#Train the model
lr.fit(x_train,y_train)
Lasso(alpha=0.01)
y_train_pred = lr.predict(x_train)
y_test_pred = lr.predict(x_test)
#Measure the performance using Metrics
lr.score(x_train, y_train)
0.512187188782296
```