ASSIGNMENT – 3

Abalone Age Prediction

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MAXIMUM MARK	2 Mark

1. Download the dataset

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

2. Load the dataset

In [8]:

```
data=pd.read_csv("abalone.csv")
data
```

Out[8]:

	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

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

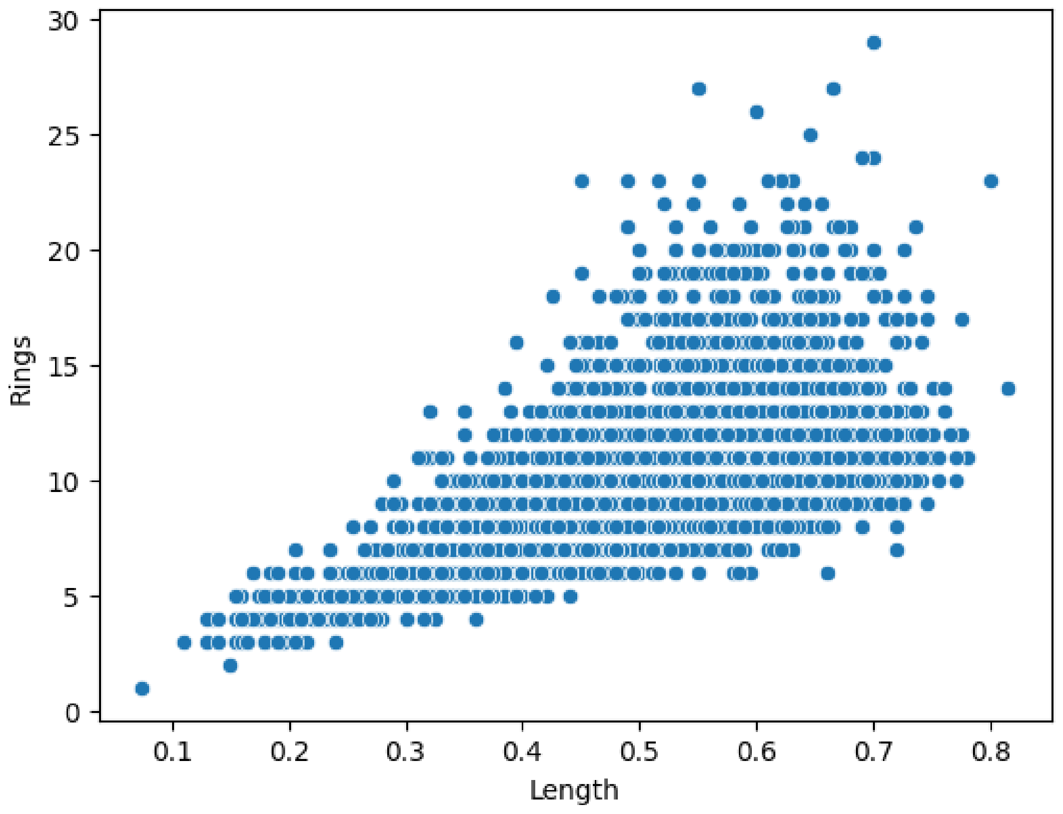
3. perform the visualizations

Bivariate analysis

In [9]:

```
sns.scatterplot(x=data.Length,y=data.Rings)
```

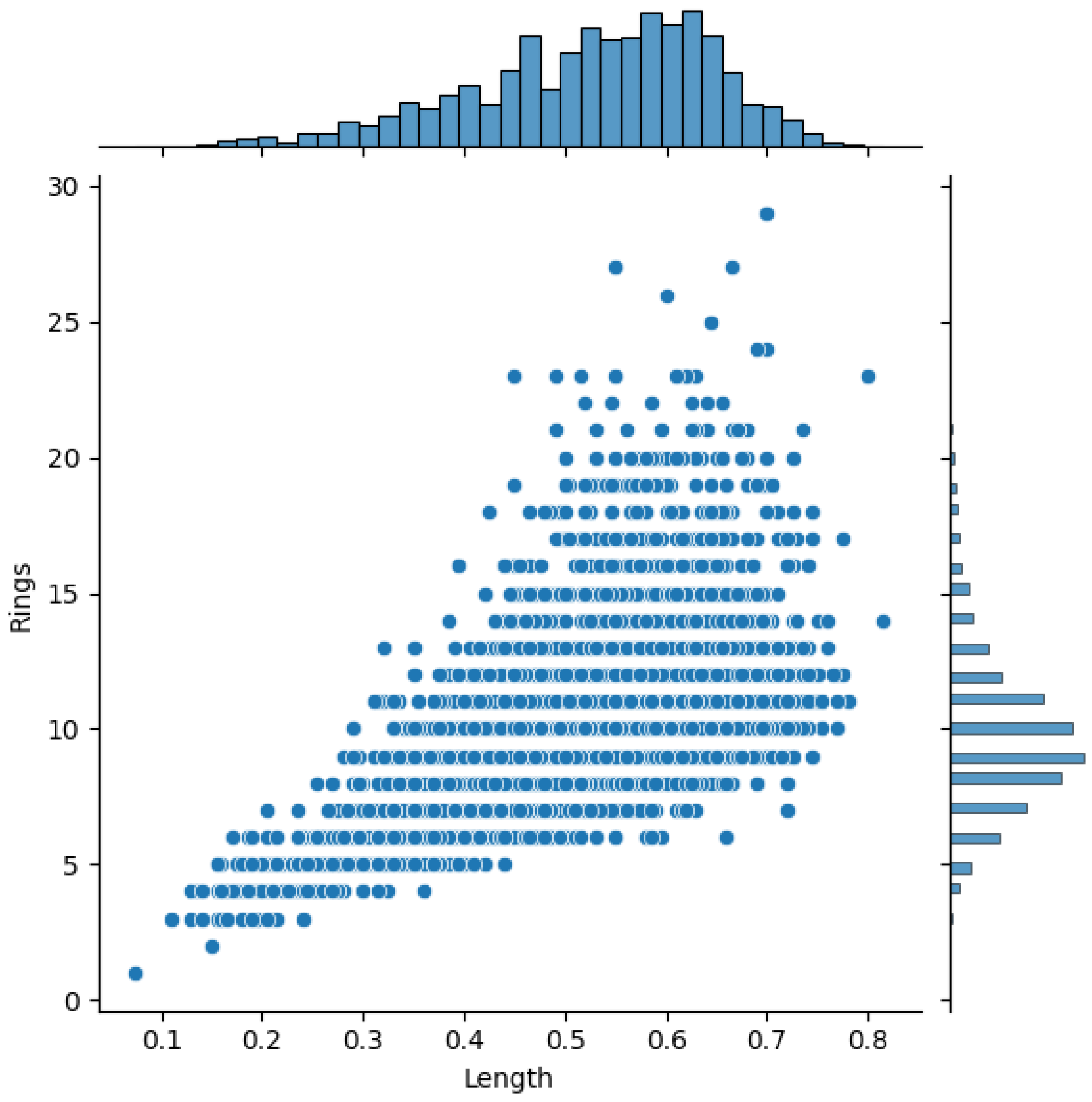
Out[9]:



In [10]:

```
sns.jointplot(x=data.Length,y=data.Rings)
```

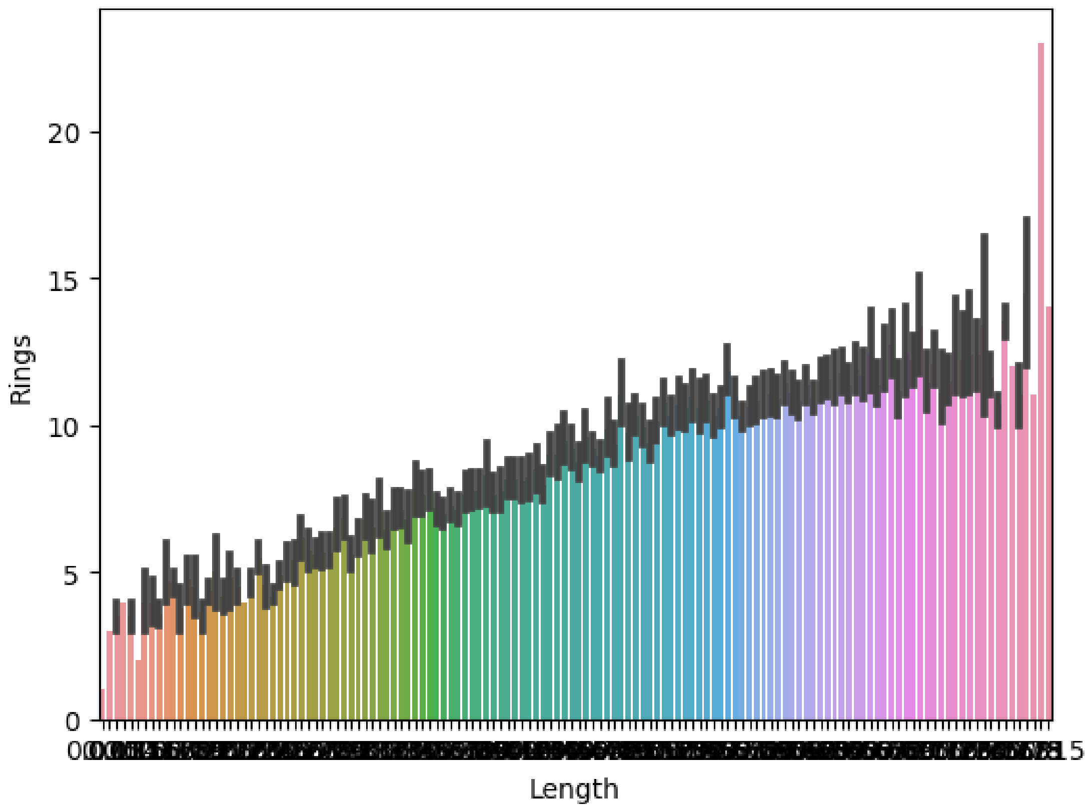
Out[10]:



In [21]:

```
sns.barplot(x=data.Length,y=data.Rings)
```

Out[21]:



Univariate analysis

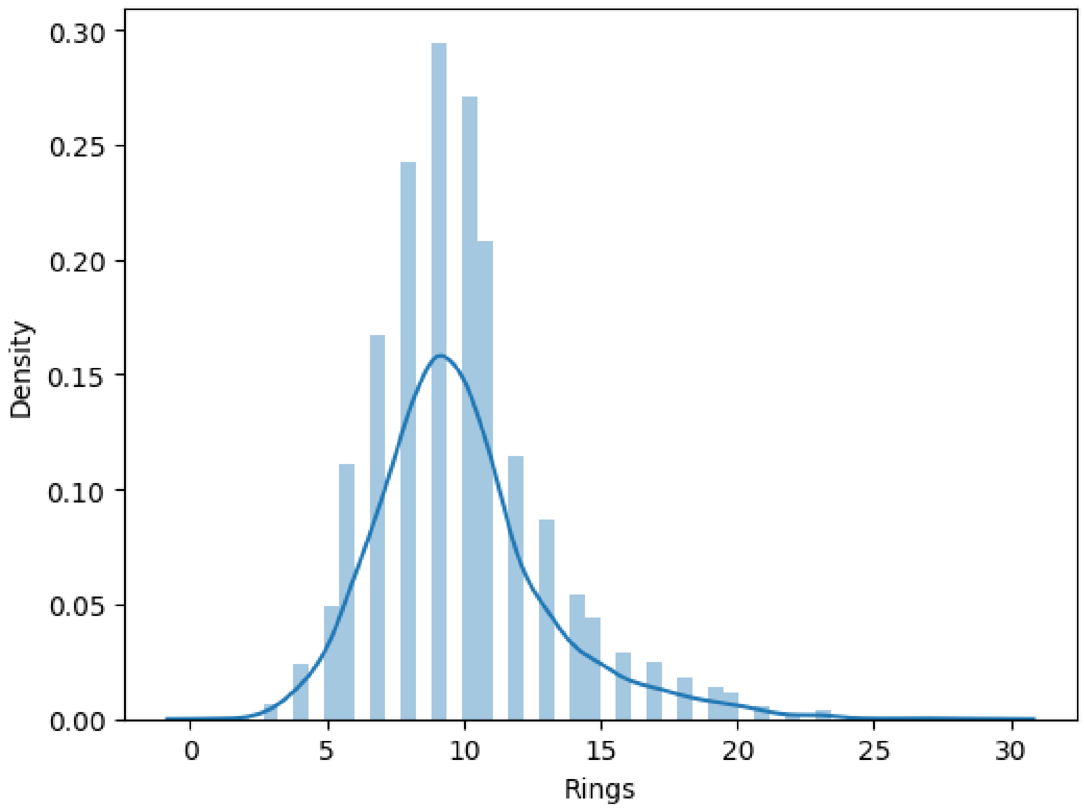
In [22]:

```
import warnings
warnings.filterwarnings('ignore')
```

In [23]:

```
sns.distplot(data.Rings)
```

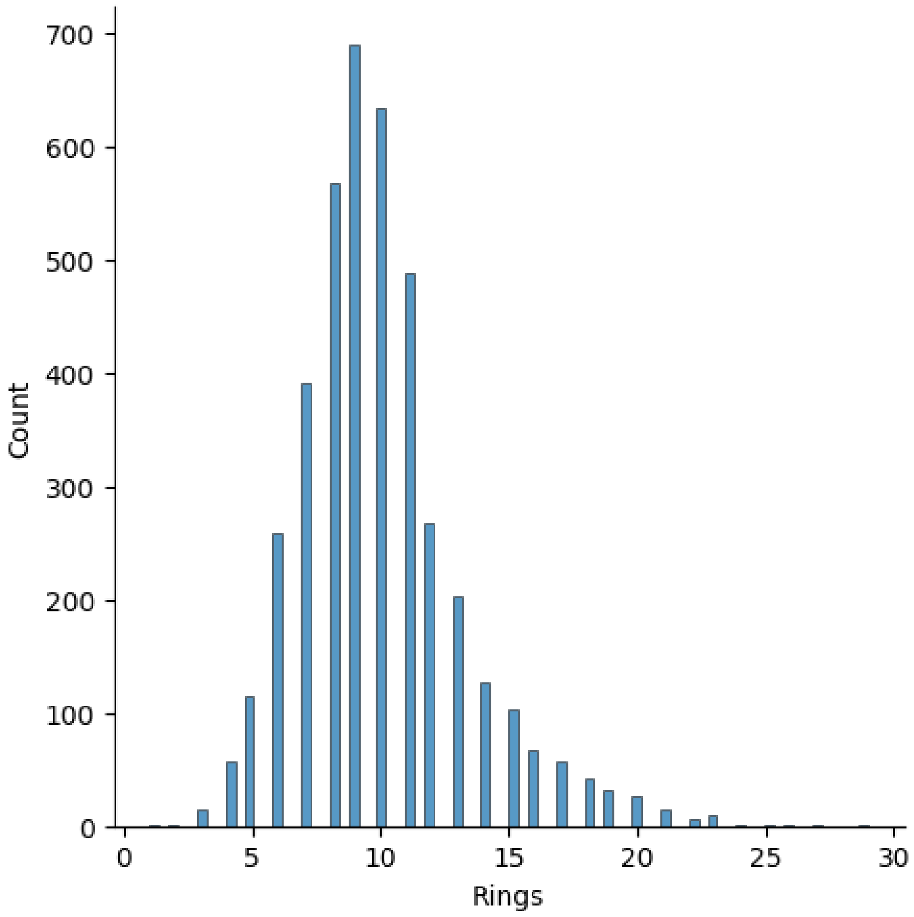
Out[23]:



In [24]:

```
sns.displot(data.Rings)
```

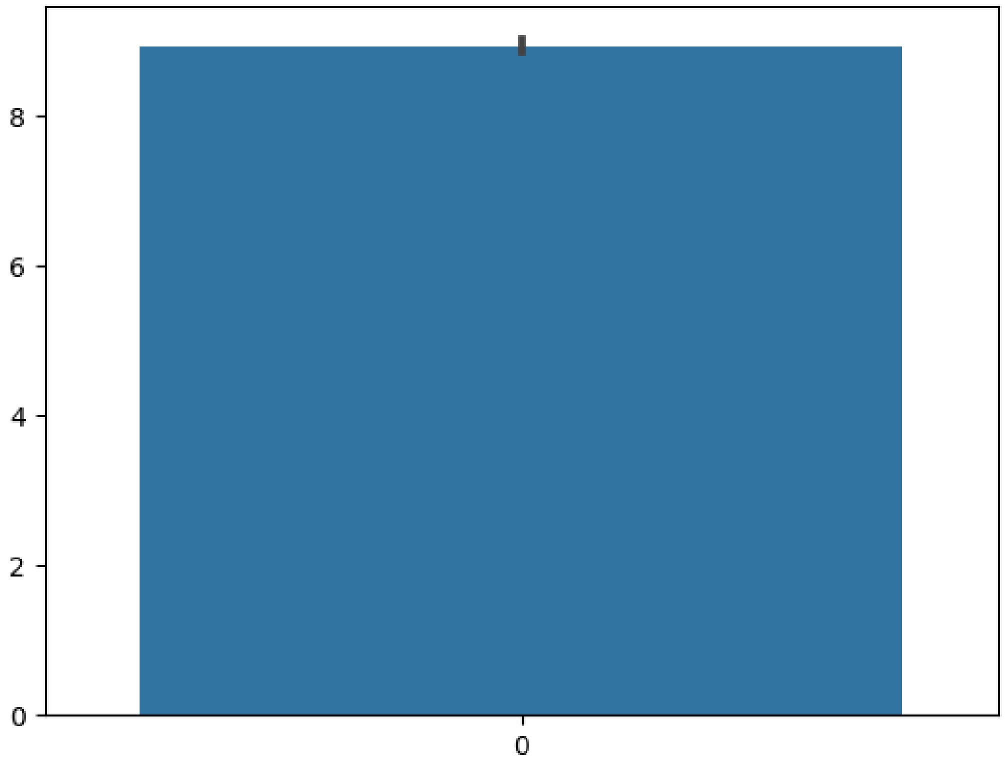
Out[24]:



In [111]:

```
sns.barplot(data.Rings)
```

Out[111]:



4. perform descriptive statistics

In [27]:

```
data.head()
```

Out[27]:

	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 [67]:

```
data.tail()
```

Out[67]:

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
4172	0	0.565	73	0.165	0.8870	0.3700	0.2390	0.2490	10
4173	2	0.590	71	0.135	0.9660	0.4390	0.2145	0.2605	9
4174	2	0.600	78	0.205	1.1760	0.5255	0.2875	0.3080	8
4175	0	0.625	80	0.150	1.0945	0.5310	0.2610	0.2960	9
4176	2	0.710	94	0.195	1.9485	0.9455	0.3765	0.4950	11

In [68]:

```
data.info()
```

```
RangeIndex: 4177 entries, 0 to 4176
Data columns (total 9 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   Sex             4177 non-null   int32
 1   Length          4177 non-null   float64
 2   Diameter        4177 non-null   int64
 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(6), int32(1), int64(2)
memory usage: 277.5 KB
```

In [69]:

```
data.shape
```

Out[69]:

```
(4177, 9)
```

measure of tendency

In [70]:

```
data.mean()
```

Out[70]:

```
Sex                1.052909
Length             0.523992
Diameter          64.576969
Height             0.139516
Whole weight       0.828742
Shucked weight     0.359367
Viscera weight     0.180594
Shell weight       0.238831
Rings              8.933445
dtype: float64
```

In [71]:

```
data.mode()
```

Out[71]:

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	2.0	0.550	73.0	0.15	0.2225	0.175	0.1715	0.275	8.0
1	NaN	0.625	NaN	NaN	NaN	NaN	NaN	NaN	NaN

In [72]:

```
data.median()
```

Out[72]:

```
Sex                1.0000
Length             0.5450
Diameter          68.0000
Height             0.1400
Whole weight       0.7995
Shucked weight     0.3360
Viscera weight     0.1710
Shell weight       0.2340
Rings              8.0000
dtype: float64
```

In [73]:

```
data.skew()
```

Out[73]:

```
Sex               -0.098155
Length            -0.639873
Diameter          -0.607999
Height             3.128817
Whole weight       0.530959
Shucked weight     0.719098
Viscera weight     0.591852
Shell weight       0.620927
Rings              1.108353
dtype: float64
```

In [74]:

```
data.kurtosis()
```

Out[74]:

```
Sex                -1.514387
Length              0.064621
Diameter           -0.054859
Height             76.025509
Whole weight       -0.023644
Shucked weight      0.595124
Viscera weight      0.084012
Shell weight        0.531926
Rings               2.283203
dtype: float64
```

In [75]:

```
data.std()
```

Out[75]:

```
Sex                 0.822240
Length              0.120093
Diameter           19.841382
Height              0.041827
Whole weight        0.490389
Shucked weight      0.221963
Viscera weight      0.109614
Shell weight        0.139203
Rings               3.222790
dtype: float64
```

In [76]:

```
data.var()
```

Out[76]:

```
Sex                  0.676079
Length               0.014422
Diameter           393.680437
Height               0.001750
Whole weight         0.240481
Shucked weight       0.049268
Viscera weight       0.012015
Shell weight         0.019377
Rings               10.386374
dtype: float64
```

5.check the missing values and deal with them

In [77]:

```
data.isnull().any()
```

Out[77]:

```
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 [78]:

```
data.isnull().sum()
```

Out[78]:

```
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 [79]:

```
data.dropna()
```

Out[79]:

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	2	0.455	56	0.095	0.5140	0.2245	0.1010	0.1500	14
1	2	0.350	36	0.090	0.2255	0.0995	0.0485	0.0700	6
2	0	0.530	67	0.135	0.6770	0.2565	0.1415	0.2100	8
3	2	0.440	56	0.125	0.5160	0.2155	0.1140	0.1550	9
4	1	0.330	34	0.080	0.2050	0.0895	0.0395	0.0550	6
...	...	...	...	...	...	...	...	...	...
4172	0	0.565	73	0.165	0.8870	0.3700	0.2390	0.2490	10

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
4173	2	0.590	71	0.135	0.9660	0.4390	0.2145	0.2605	9
4174	2	0.600	78	0.205	1.1760	0.5255	0.2875	0.3080	8
4175	0	0.625	80	0.150	1.0945	0.5310	0.2610	0.2960	9
4176	2	0.710	94	0.195	1.9485	0.9455	0.3765	0.4950	11

4177 rows × 9 columns

6. Find the outliers and replace them outliers

In [80]:

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

Out[80]:

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0.25	0.0	0.450	53.0	0.115	0.4415	0.186	0.0935	0.130	7.0
0.75	2.0	0.615	79.0	0.165	1.1530	0.502	0.2530	0.329	10.0

7.Check the categorical columns and perform the encoding

In [81]:

```
from sklearn.preprocessing import LabelEncoder
```

In [82]:

```
le=LabelEncoder()
```

In [83]:

```
data["Sex"]=le.fit_transform(data['Sex'])
data["Rings"]=le.fit_transform(data['Rings'])
data["Diameter"]=le.fit_transform(data['Diameter'])
data.head()
```

Out[83]:

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	2	0.455	56	0.095	0.5140	0.2245	0.1010	0.150	14
1	2	0.350	36	0.090	0.2255	0.0995	0.0485	0.070	6
2	0	0.530	67	0.135	0.6770	0.2565	0.1415	0.210	8
3	2	0.440	56	0.125	0.5160	0.2155	0.1140	0.155	9
4	1	0.330	34	0.080	0.2050	0.0895	0.0395	0.055	6

8. split the data into dependent and independent variables

In [84]:

```
x=data.iloc[:,:-1].values
y=data.iloc[:,-1].values
x
```

Out[84]:

```
array([[2.000e+00, 4.550e-01, 5.600e+01, ..., 2.245e-01, 1.010e-01,
        1.500e-01],
       [2.000e+00, 3.500e-01, 3.600e+01, ..., 9.950e-02, 4.850e-02,
        7.000e-02],
       [0.000e+00, 5.300e-01, 6.700e+01, ..., 2.565e-01, 1.415e-01,
        2.100e-01],
       ...,
       [2.000e+00, 6.000e-01, 7.800e+01, ..., 5.255e-01, 2.875e-01,
        3.080e-01],
       [0.000e+00, 6.250e-01, 8.000e+01, ..., 5.310e-01, 2.610e-01,
        2.960e-01],
       [2.000e+00, 7.100e-01, 9.400e+01, ..., 9.455e-01, 3.765e-01,
        4.950e-01]])
```

In [85]:

```
y
```

Out[85]:

```
array([14,  6,  8, ...,  8,  9, 11], dtype=int64)
```

In [86]:

```
print(x.shape,y.shape)
```

```
(4177, 8) (4177,)
```

9. Scale the independent variables

In [87]:

```
from sklearn.preprocessing import scale
```

In [88]:

```
x=scale(x)
x
```

Out[88]:

```
array([[ 1.15198011, -0.57455813, -0.43232856, ..., -0.60768536,
        -0.72621157, -0.63821689],
       [ 1.15198011, -1.44898585, -1.44044354, ..., -1.17090984,
        -1.20522124, -1.21298732],
       [-1.28068972,  0.05003309,  0.12213469, ..., -0.4634999 ,
        -0.35668983, -0.20713907],
       ...,
       [ 1.15198011,  0.6329849 ,  0.67659793, ...,  0.74855917,
         0.97541324,  0.49695471],
       [-1.28068972,  0.84118198,  0.77740943, ...,  0.77334105,
         0.73362741,  0.41073914],
       [ 1.15198011,  1.54905203,  1.48308992, ...,  2.64099341,
         1.78744868,  1.84048058]])
```

10. Split the data into training and testing

In [89]:

```
from sklearn.model_selection import train_test_split
```

In [90]:

```
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_sta
te=0)
```

In [91]:

```
x_train.shape
```

Out[91]:

```
(3341, 8)
```

In [92]:

```
x_test.shape
```

Out[92]:

```
(836, 8)
```

11. Build the model

In [93]:

```
from sklearn.linear_model import LinearRegression
```

In [94]:

```
regressor=LinearRegression()

regressor.fit(x_train,y_train)
```

Out[94]:

LinearRegression()
In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

In [95]:

```
from sklearn.tree import DecisionTreeClassifier
```

In [96]:

```
model=DecisionTreeClassifier()
```

In [97]:

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

Out[97]:

DecisionTreeClassifier()
In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

12. Train and the model

In [98]:

```
from sklearn.neighbors import KNeighborsClassifier
```

In [99]:

```
knn=KNeighborsClassifier(n_neighbors=5)
```

In [100]:

```
knn.fit(x_train,y_train)
knn.fit(x_test,y_test)
```

Out[100]:

KNeighborsClassifier()
In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

14. Measure the performance using metrics

In [101]:

```
from sklearn.naive_bayes import GaussianNB
```

In [102]:

```
nb=GaussianNB()
nb.fit(x_train,y_train)
```

Out[102]:

GaussianNB()
In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

In [103]:

```
from sklearn.metrics import accuracy_score, confusion_matrix
```

In [104]:

```
pred=nb.predict(x_test)
pred
```

Out[104]:

```
array([ 8,  7, 10,  3, 10, 10,  6,  7,  5, 10,  6,  4,  6,  7,  3,  9,  5,
        9, 10,  6,  5,  4,  6,  5,  8,  8,  2, 10,  8,  8,  5,  2,  9, 10,
        6,  7,  6,  9,  6, 10,  9,  7,  8,  8,  9,  6,  9, 10,  8,  5,  8,
        5,  6, 10,  7,  6,  3,  5,  5,  5,  9,  8,  8,  6,  5, 10, 10, 10,
        7, 10,  7, 26, 10,  8,  8,  7,  8,  7, 10,  7,  9,  4,  5,  9,  8,
        6,  9, 10,  2,  5,  8,  8,  6,  5,  8,  4,  7,  5,  9, 10, 10,  7,
       10,  9,  3, 10,  7,  5,  5,  9, 10, 10,  7,  8,  8, 10, 10,  9,  4,
        7,  5,  8,  5,  6,  8,  9, 10, 10,  5, 10, 10,  7,  7, 10, 10,  9,
        7,  7,  5, 10,  7,  7,  5,  8,  9,  8,  6,  7,  6,  4,  7, 23,  5,
       10,  5,  5,  9,  5,  9,  5,  8,  4,  7,  9,  3,  9,  5,  4,  8,  8,
        8,  2,  6,  9, 10, 10,  3,  6,  6,  8,  7,  9,  8,  7,  8,  8,  9,
        7,  4,  7,  8,  7,  6,  9,  8,  7,  5,  7,  2, 10,  6,  7, 10,  8,
       10,  9,  3, 10,  7,  7,  3,  8,  8,  8,  9,  8,  8, 10,  3, 10,  8,
       10,  6,  9, 10,  9, 10,  7, 11,  9,  8,  7,  4, 10,  7,  9,  7,  3,
        7,  8,  7,  9,  8, 10,  8,  8, 10,  6,  9, 10, 10,  6, 10, 10,  8,
        7,  5,  7,  8, 10, 10,  7,  9,  4,  7,  6,  6,  6,  5,  5,  8,  6,
        5,  6,  4, 10, 10,  6,  9,  7,  4, 10,  5, 10, 10,  8,  6, 10,  8,
        9,  7,  7,  4,  7,  5,  7,  4,  3,  8, 10,  6,  6, 23,  7,  6,  6,
        8,  8,  8,  8, 10, 10,  6,  8, 10,  9,  7,  4,  6,  8, 10,  8,  6,
       10,  9,  7,  7,  8, 10, 10,  7, 23,  2, 10,  8, 10,  6,  7, 10,  8,
        6,  7, 10,  9,  8,  6,  4,  8,  9,  5,  4,  8, 10, 10, 10,  7, 10,
       10,  6,  7,  7,  8,  6,  9, 10,  3,  4,  8,  8,  7,  9,  5,  9,  6,
       10,  9, 10,  6,  7,  2,  7,  8,  9, 10,  3, 10, 10,  7,  6,  4, 10,
        8,  7,  7, 19,  5, 10,  6,  8,  7,  6,  8,  5, 10,  6, 10,  3, 10,
       10,  7,  7,  6, 10,  8, 10,  8,  9,  9, 10, 10,  7,  7,  8,  9,  4,
        8,  8, 10,  9,  9,  7, 10,  7,  8,  6,  6, 10,  8,  8, 10,  6,  4,
        9,  6,  5,  5,  9,  3,  7,  9,  2,  4,  9,  4,  5,  6,  9,  8,  6,
        9,  6, 10,  7,  8,  7, 10,  4, 19,  6,  7,  8,  8,  6, 10,  7,  6,
        6,  6,  5, 10,  7, 10,  6,  8, 10, 10,  8,  7,  7, 10,  2,  8,  8,
        8,  4,  5,  6,  4,  9,  9,  6,  9,  5,  9,  9,  9,  7, 10,  5,  4,
        7,  9, 10,  9,  6,  6,  9, 10, 10,  8,  8,  8, 10,  9,  4, 10,  6,
        7,  7,  7,  6,  6,  6,  8,  3,  8, 10, 10,  9, 10,  6,  8,  6,  9,
        5,  8,  7,  6,  9,  9,  8, 10,  6, 10,  9,  6,  7,  8,  9,  8,  8,
        9, 10,  8, 10,  3,  6,  8,  8,  6,  8,  8,  7,  8,  7,  6,  8,  8,
       10,  2,  9,  4,  3,  4,  7,  8, 26,  9,  7, 10,  4,  6, 10,  5,  9,
       10,  2,  6,  4, 10,  7, 10,  8, 10, 10,  7,  9,  4,  8, 10,  6, 10,
        8,  7,  8, 10,  7,  5, 10,  8,  7, 10,  5,  8,  9,  8,  6,  9,  6,
        8,  6,  5,  6,  5,  6,  8,  3, 10,  6,  8,  7, 10, 10,  9,  8,  7,
        5,  8, 10,  7,  6,  6,  6,  8,  5, 10,  6,  6,  9,  9,  7,  6,  9,
        8,  7,  6,  6,  4,  4,  8,  8, 10, 10, 10,  3,  6,  6,  4,  8, 10,
        9,  8,  9,  7,  7,  6,  8,  9,  7, 10,  9,  9,  8, 10,  7, 10, 10,
        8,  7,  6,  5,  8,  9,  9,  7,  8,  7,  6, 10,  9,  4,  4,  4,  8,
        5,  7,  9,  7,  6,  6,  9,  3,  7,  5,  9,  4, 10,  7,  8,  9,  8,
       10,  9, 10,  7,  8,  7, 10,  6,  4,  8,  8,  4,  6,  8,  5,  9,  8,
        7,  6,  8,  8,  5, 10,  6, 10,  7,  5,  8,  9,  5,  4,  5,  4,  8,
        8, 10,  9,  8,  6,  4,  6,  8, 10,  8,  7,  5,  7,  5,  8, 10,  8,
        6,  5,  6,  8,  7,  6,  9,  8,  8, 10, 10,  8,  9,  8,  8,  8,  2,
        7,  6,  6,  6,  4,  4,  6,  7, 10,  6,  7,  6,  7,  8,  8, 23,  7,
        8,  9,  8,  7,  4,  8, 10,  4,  6,  8,  9,  7,  4,  4,  8,  9,  6,
        6,  9,  3], dtype=int64)
```

In [105]:

```
accuracy_score(y_test,pred)
```

Out[105]:

```
0.24162679425837322
```