ASSIGNMENT 3

Problem Statement: Abalone Age Prediction

1. Download the dataset: Dataset
2. Load the dataset into the tool.

```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import numpy as np
from sklearn.preprocessing import LabelEncoder
from sklearn.preprocessing import scale
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error
from sklearn.ensemble import RandomForestClassifier #11
from sklearn.metrics import
accuracy_score,confusion_matrix,classification_report #12
import math
```

```
df=pd.read_csv("/abalone.csv")
df.head()
```

```
  Sex  Length  Diameter  Height  Whole weight  Shucked weight  Viscera weight
\
0   M   0.455     0.365   0.095        0.5140          0.2245          0.1010
1   M   0.350     0.265   0.090        0.2255          0.0995          0.0485
2   F   0.530     0.420   0.135        0.6770          0.2565          0.1415
3   M   0.440     0.365   0.125        0.5160          0.2155          0.1140
4   I   0.330     0.255   0.080        0.2050          0.0895          0.0395

   Shell weight  Rings
0         0.150     15
1         0.070      7
2         0.210      9
3         0.155     10
4         0.055      7
```

To calculate the age add '1.5' with Rings

```
age = []
for x in df["Rings"]:
  age.append(x+1.5)

df['Age'] = age
df['Age'].head()
```

```
0    16.5
1     8.5
2    10.5
```

```
3    11.5
4     8.5
Name: Age, dtype: float64
```

```
df.drop(columns=['Rings'],axis=1,inplace=True)
```

```
df.head()
```

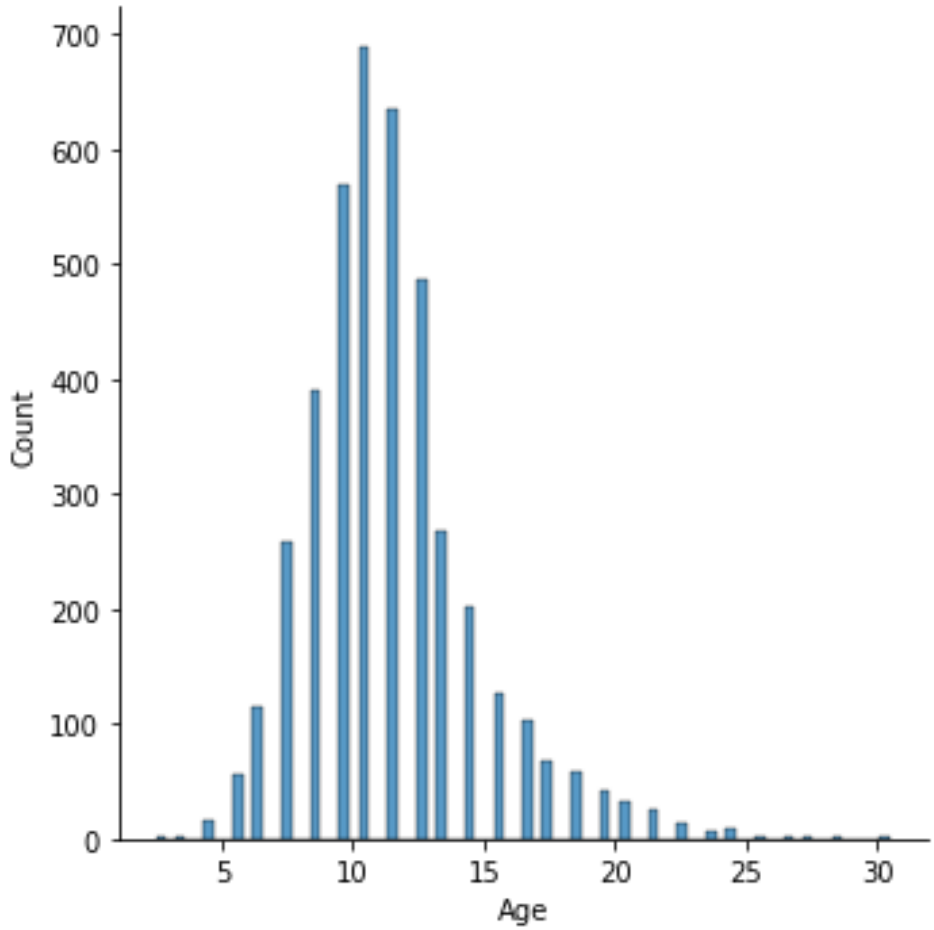
```
  Sex  Length  Diameter  Height  Whole weight  Shucked weight  Viscera weight
\
0   M   0.455     0.365   0.095        0.5140          0.2245          0.1010
1   M   0.350     0.265   0.090        0.2255          0.0995          0.0485
2   F   0.530     0.420   0.135        0.6770          0.2565          0.1415
3   M   0.440     0.365   0.125        0.5160          0.2155          0.1140
4   I   0.330     0.255   0.080        0.2050          0.0895          0.0395

   Shell weight   Age
0         0.150  16.5
1         0.070   8.5
2         0.210  10.5
3         0.155  11.5
4         0.055   8.5
```

1. Perform Below Visualizations.

· Univariate Analysis

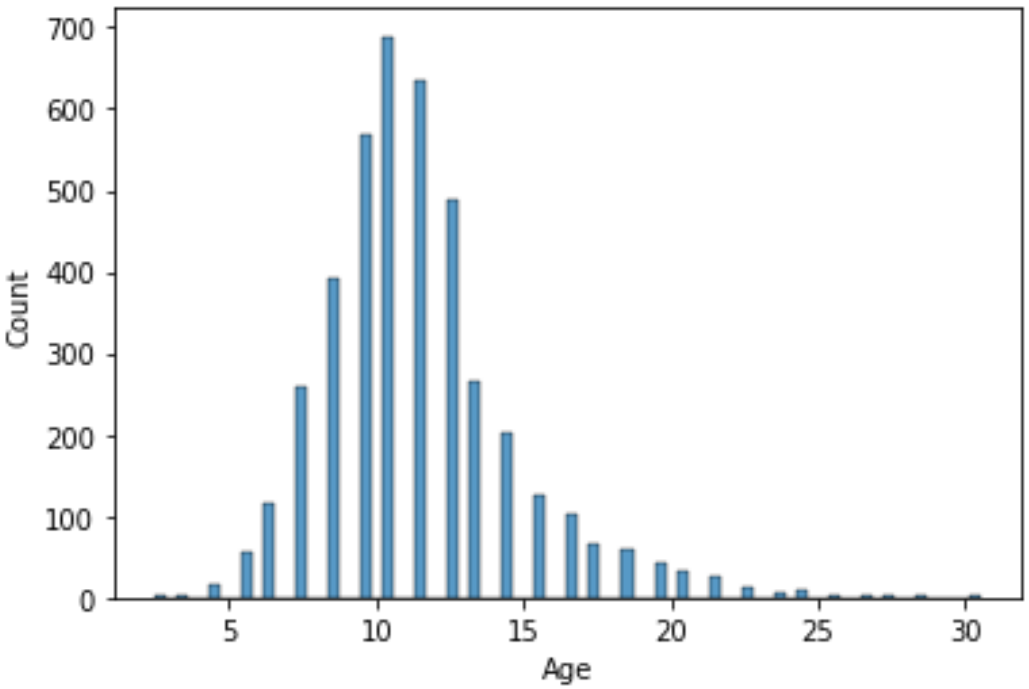
```
sns.displot(df["Age"])
```

```
<seaborn.axisgrid.FacetGrid at 0x7f90b7e29cd0>
```



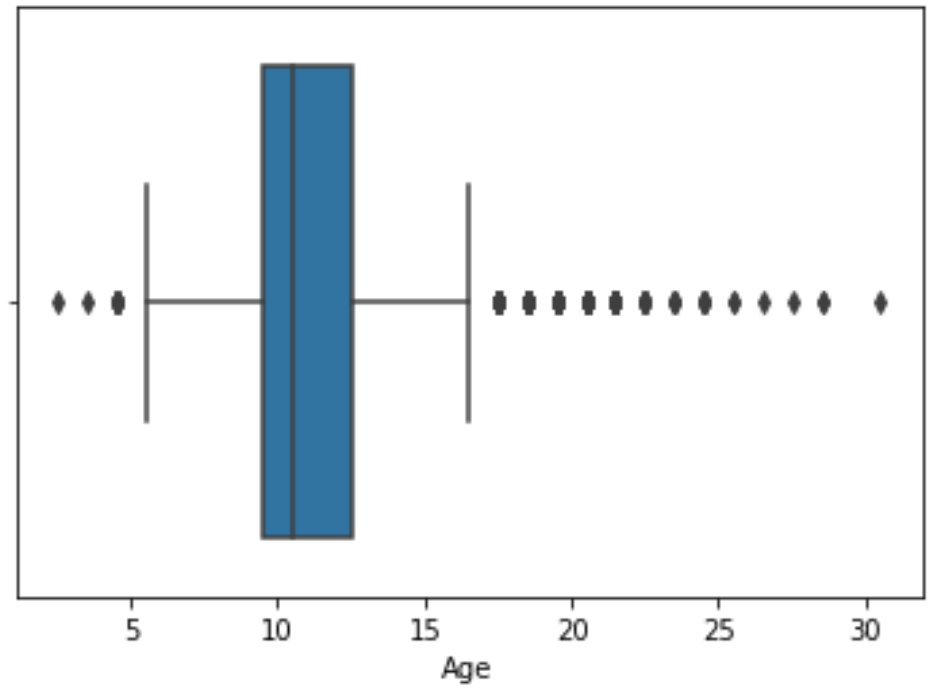

```
sns.histplot(x=df['Age'])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f90b4752f50>
```



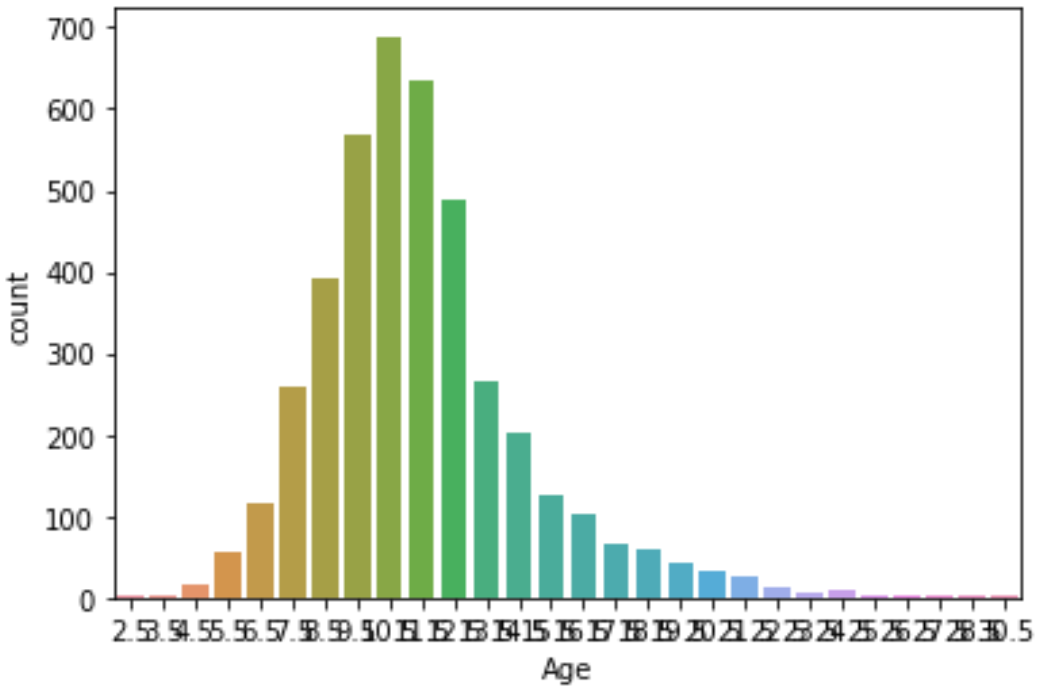

```
sns.boxplot(x=df['Age'])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f90b446c2d0>
```




```
sns.countplot(x=df['Age'])
```

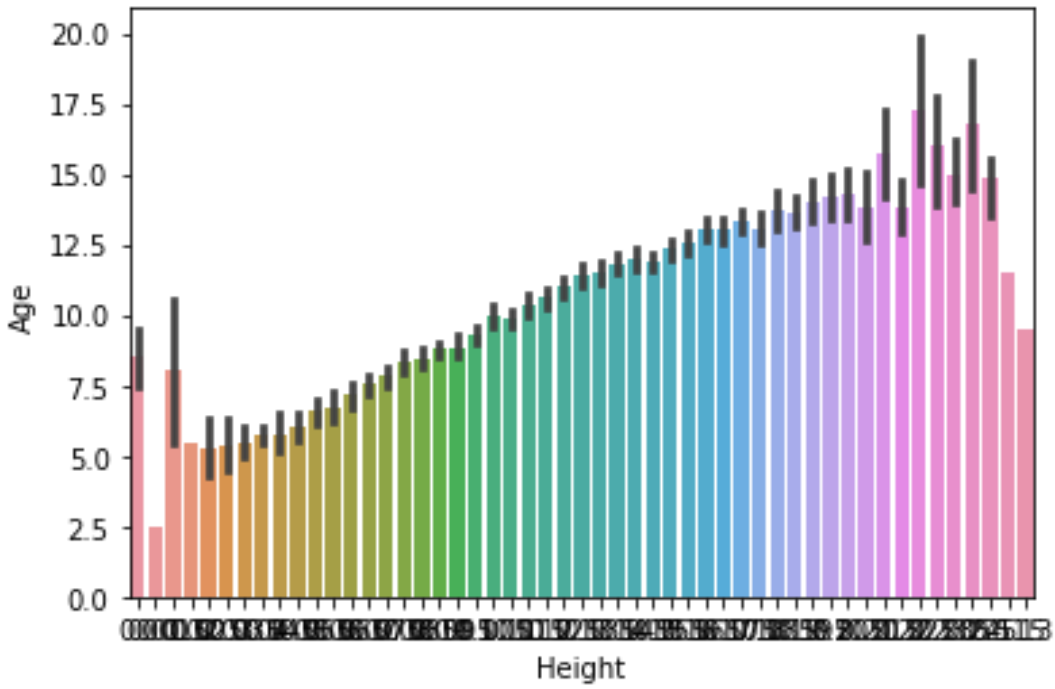
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f90b461b310>
```



· Bi-Variate Analysis

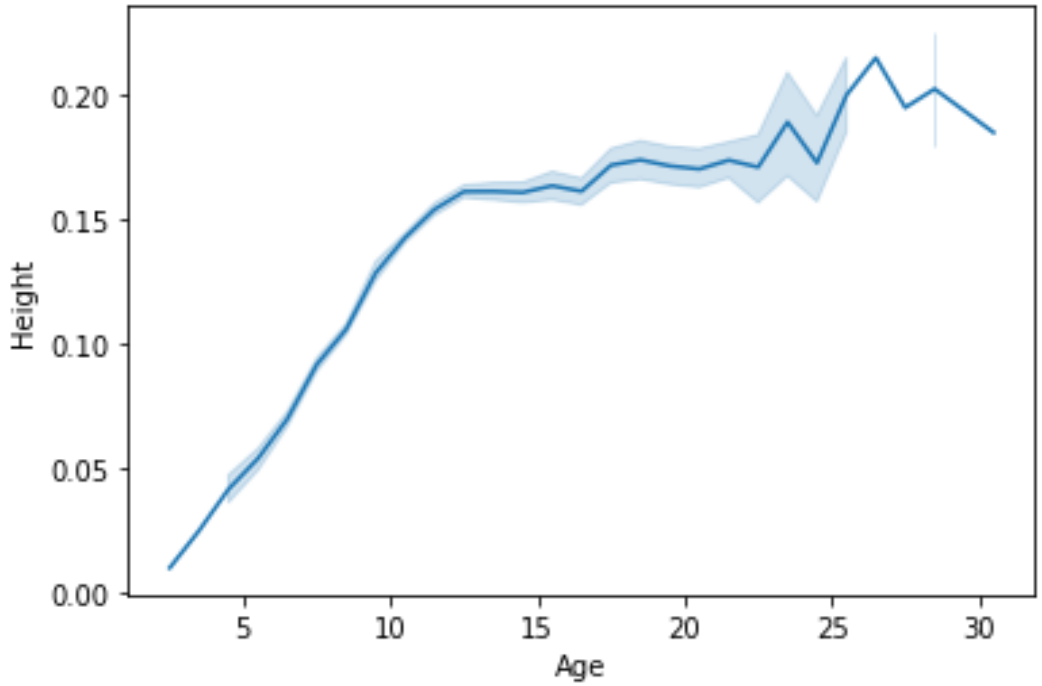
```
sns.barplot(x=df['Height'],y=df['Age'])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f90b6fe32d0>
```



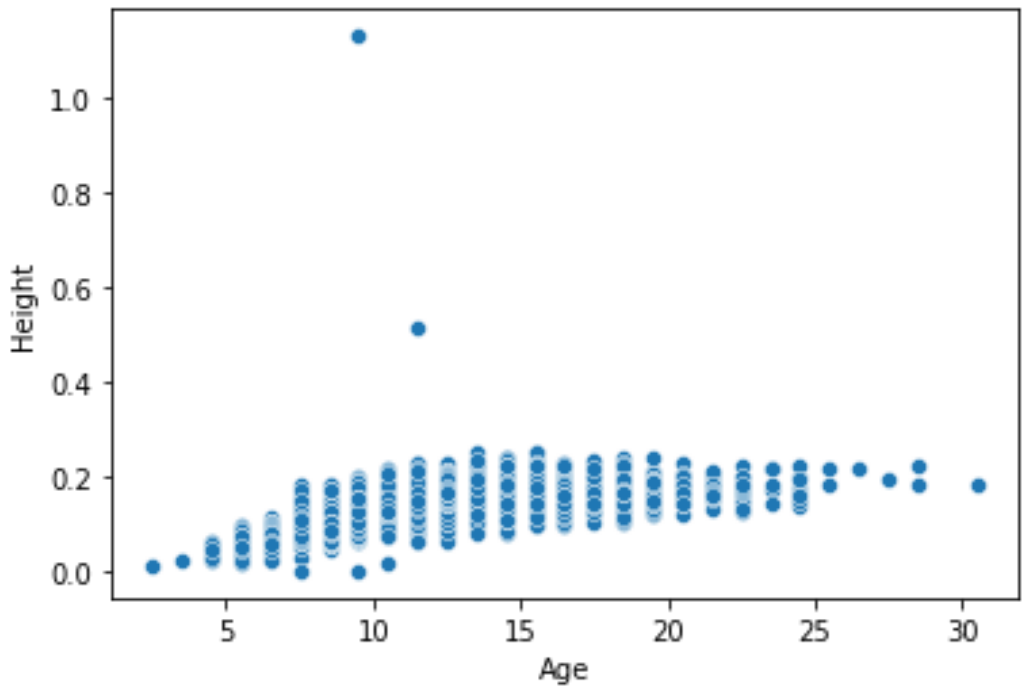

```
sns.lineplot(x=df['Age'],y=df['Height'])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f90b7457290>
```



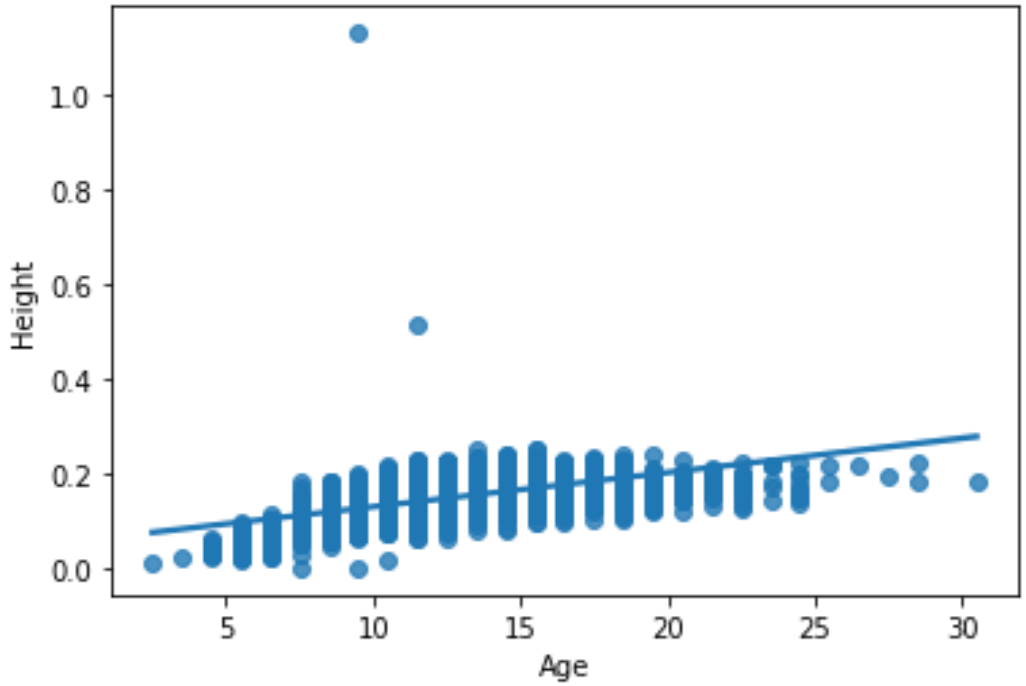

```
sns.scatterplot(x=df['Age'],y=df['Height'])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f90b79337d0>
```




```
sns.regplot(x=df['Age'],y=df['Height'])
```

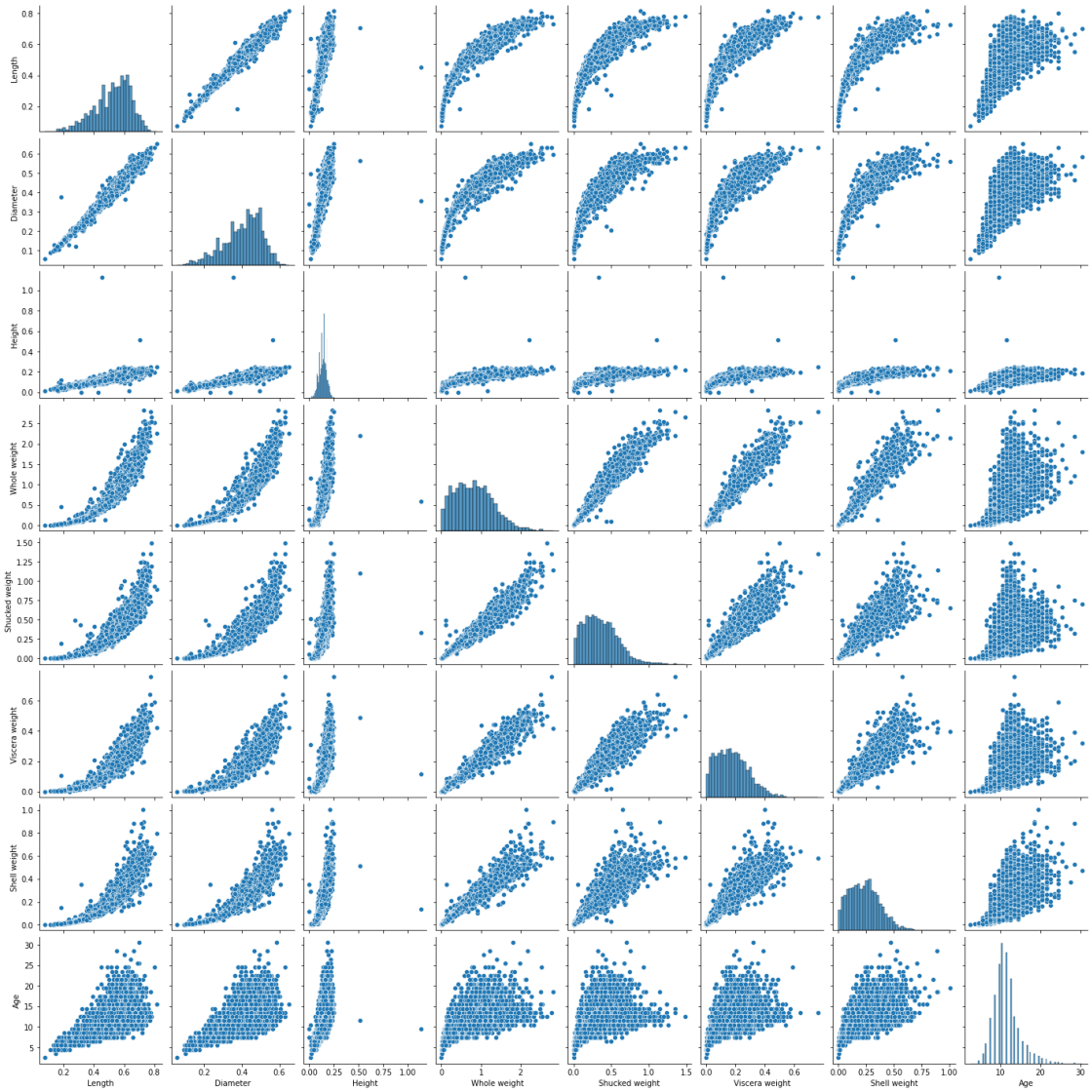
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f90b78fd9d0>
```



Multi-Variate Analysis

```
sns.pairplot(data=df)
```

```
<seaborn.axisgrid.PairGrid at 0x7f90b749cb10>
```



1. Perform descriptive statistics on the dataset.

```
df.describe()
```

```
              Length     Diameter       Height  Whole weight  Shucked weight  \
count  4177.000000  4177.000000  4177.000000   4177.000000     4177.000000
mean      0.523992     0.407881     0.139516      0.828742        0.359367
std       0.120093     0.099240     0.041827      0.490389        0.221963
min       0.075000     0.055000     0.000000      0.002000        0.001000
25%       0.450000     0.350000     0.115000      0.441500        0.186000
50%       0.545000     0.425000     0.140000      0.799500        0.336000
75%       0.615000     0.480000     0.165000      1.153000        0.502000
max       0.815000     0.650000     1.130000      2.825500        1.488000

       Viscera weight  Shell weight          Age
count     4177.000000   4177.000000  4177.000000
mean         0.180594      0.238831    11.433684
```

```
std          0.109614      0.139203     3.224169
min          0.000500      0.001500     2.500000
25%          0.093500      0.130000     9.500000
50%          0.171000      0.234000    10.500000
75%          0.253000      0.329000    12.500000
max          0.760000      1.005000    30.500000
```

1. Check for Missing values and deal with them.

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

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

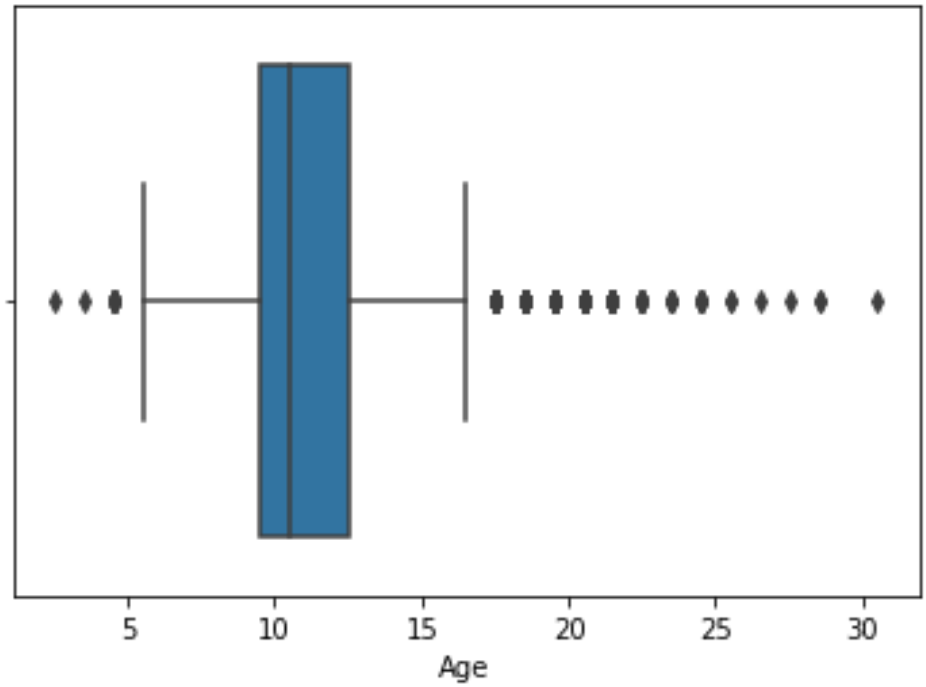
```
df.isna().any()
```

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

1. Find the outliers and replace them outliers

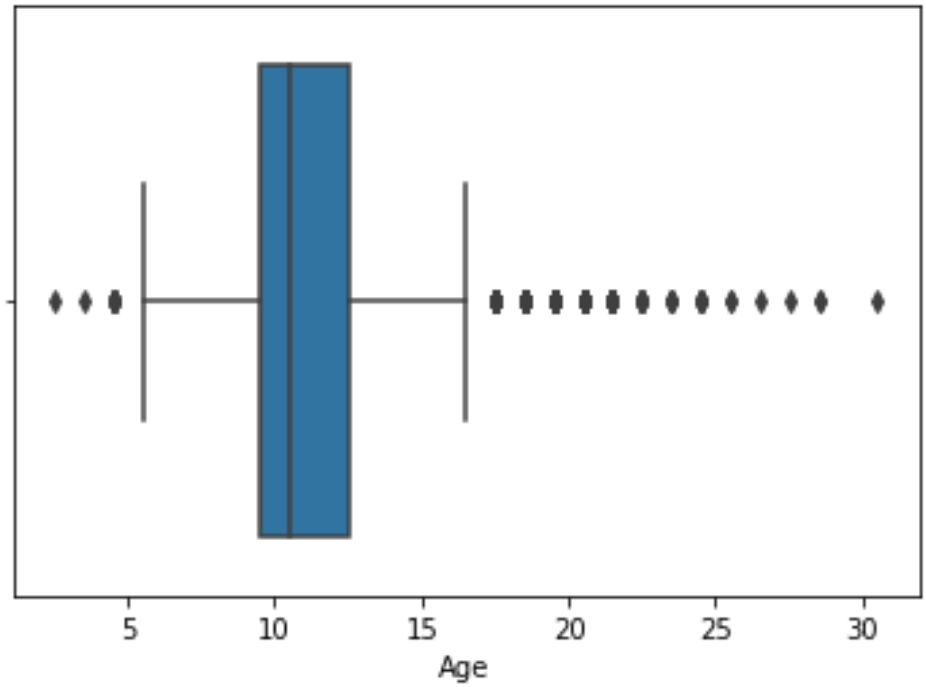
```
x = sns.boxplot(x=df["Age"])
x
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f90b28eea90>
```




```
x = df.Age
sns.boxplot(x=x)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f90b2950610>
```



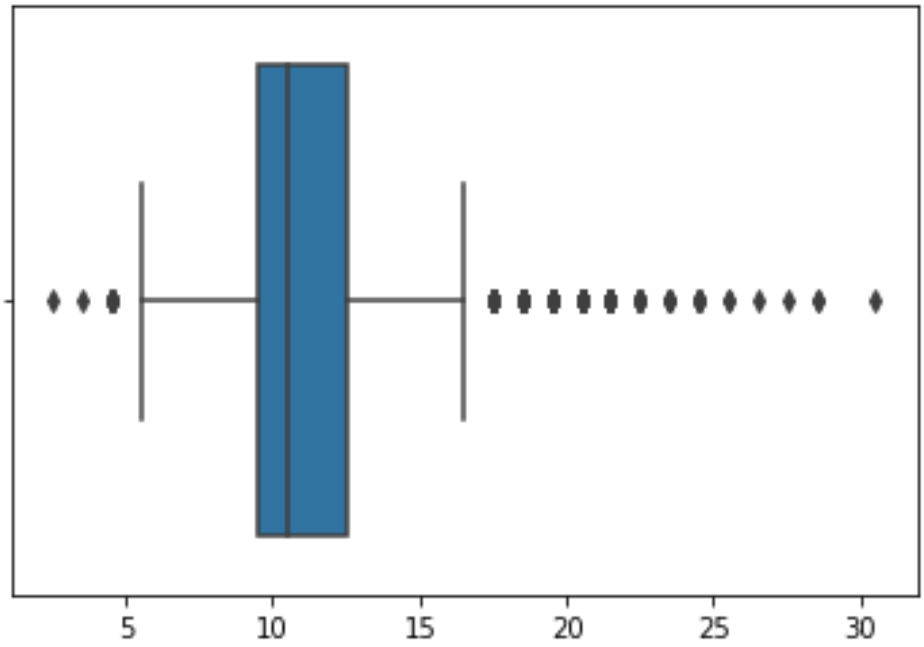

```
x = np.where(df['Age']>57,39, df['Age'])
```

```
x
```

```
array([16.5,  8.5, 10.5, ..., 10.5, 11.5, 13.5])
```

```
sns.boxplot(x=x)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f90b0fefc50>
```



1. Check for Categorical columns and perform encoding.

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

```
pd.Categorical(df["Whole weight"])
```

```
[0.5140, 0.2255, 0.6770, 0.5160, 0.2050, ..., 0.8870, 0.9660, 1.1760, 1.0945,
1.9485]
Length: 4177
Categories (2429, float64): [0.0020, 0.0080, 0.0105, 0.0130, ..., 2.5550,
2.6570, 2.7795, 2.8255]
```

```
pd.get_dummies(df["Height"]).head()
```

```
   0.000  0.010  0.015  0.020  0.025  0.030  0.035  0.040  0.045  0.050  ...
\
0      0      0      0      0      0      0      0      0      0      0  ...
1      0      0      0      0      0      0      0      0      0      0  ...
2      0      0      0      0      0      0      0      0      0      0  ...
3      0      0      0      0      0      0      0      0      0      0  ...
4      0      0      0      0      0      0      0      0      0      0  ...

   0.210  0.215  0.220  0.225  0.230  0.235  0.240  0.250  0.515  1.130
0      0      0      0      0      0      0      0      0      0      0
1      0      0      0      0      0      0      0      0      0      0
```

```
2      0      0      0      0      0      0      0      0      0      0
3      0      0      0      0      0      0      0      0      0      0
4      0      0      0      0      0      0      0      0      0      0

[5 rows x 51 columns]
```

```
pd.get_dummies(df).head()
```

```
   Length  Diameter  Height  Whole weight  Shucked weight  Viscera weight  \
0   0.455     0.365   0.095        0.5140          0.2245          0.1010
1   0.350     0.265   0.090        0.2255          0.0995          0.0485
2   0.530     0.420   0.135        0.6770          0.2565          0.1415
3   0.440     0.365   0.125        0.5160          0.2155          0.1140
4   0.330     0.255   0.080        0.2050          0.0895          0.0395

   Shell weight   Age  Sex_F  Sex_I  Sex_M
0         0.150  16.5      0      0      1
1         0.070   8.5      0      0      1
2         0.210  10.5      1      0      0
3         0.155  11.5      0      0      1
4         0.055   8.5      0      1      0
```

1. Split the data into dependent and independent variables.

```
X = df.iloc[:, :-1].values
```

```
X
```

```
array([['M', 0.455, 0.365, ..., 0.2245, 0.101, 0.15],
       ['M', 0.35, 0.265, ..., 0.0995, 0.0485, 0.07],
       ['F', 0.53, 0.42, ..., 0.2565, 0.1415, 0.21],
       ...,
       ['M', 0.6, 0.475, ..., 0.5255, 0.2875, 0.308],
       ['F', 0.625, 0.485, ..., 0.531, 0.261, 0.296],
       ['M', 0.71, 0.555, ..., 0.9455, 0.3765, 0.495]], dtype=object)
```

```
Y = df.iloc[:, -1].values
```

```
Y
```

```
array([16.5,  8.5, 10.5, ..., 10.5, 11.5, 13.5])
```

1. Scale the independent variables

```
x = scale(df["Viscera weight"])
x
```

```
array([-0.72621157, -1.20522124, -0.35668983, ...,  0.97541324,
        0.73362741,  1.78744868])
```

1. Split the data into training and testing

```
x = df.iloc[:, 1:7]
x
```

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

[4177 rows x 6 columns]
```

```
y = df.iloc[:, -1]
y
```

```
0       16.5
1        8.5
2       10.5
3       11.5
4        8.5
        ...
4172    12.5
4173    11.5
4174    10.5
4175    11.5
4176    13.5
Name: Age, Length: 4177, dtype: float64
```

```
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.25,random_stat
e =42)
```

```
x_train.shape
```

```
(3132, 6)
```

```
y_test.shape
```

```
(1045,)
```

```
x_train.head()
```

```
      Length  Diameter  Height  Whole weight  Shucked weight  Viscera weight
3823   0.615     0.455   0.135        1.0590          0.4735          0.2630
3956   0.515     0.395   0.140        0.6860          0.2810          0.1255
3623   0.660     0.530   0.175        1.5830          0.7395          0.3505
0      0.455     0.365   0.095        0.5140          0.2245          0.1010
2183   0.495     0.400   0.155        0.8085          0.2345          0.1155
```

```
x_test.head()
```

```
      Length  Diameter  Height  Whole weight  Shucked weight  Viscera weight
866    0.605     0.455   0.160        1.1035          0.4210          0.3015
1483   0.590     0.440   0.150        0.8725          0.3870          0.2150
599    0.560     0.445   0.195        0.9810          0.3050          0.2245
1702   0.635     0.490   0.170        1.2615          0.5385          0.2665
670    0.475     0.385   0.145        0.6175          0.2350          0.1080
```

```
y_train.head()
```

```
3823    10.5
3956    13.5
3623    11.5
0       16.5
2183     7.5
Name: Age, dtype: float64
```

1. Build the Model

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

```
LinearRegression()
```

1. Train the Model

```
Y_predict_train = model.predict(x_train)
Y_predict_train
```

```
array([11.25888828, 11.95379472, 12.33692259, ..., 11.12903068,
       10.71152746, 11.59516371])
```

13.Test the Model

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

```
array([13.0478407 , 11.43166184, 15.59825921, ..., 13.69440346,
       11.79279231, 10.83037939])
```

Measuring the performance using Metrics

```
print(mean_squared_error(y_test, y_predict))
print(math.sqrt(mean_squared_error(y_test, y_predict)))
```

```
4.862459933051861
2.2050986220692854
```