Download the dataset

Load the dataset into the tool

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

data=pd.read_csv("C:\\Users\\Legend Phoenix\\Downloads\\abalone.csv")
data.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
```

```
Age=1.5+data.Rings
data["Age"]=Age
data=data.rename(columns = {'Whole weight':'Whole_weight','Shucked
weight':'Shucked_weight','Viscera weight':'Viscera_weight','Shell
weight':'Shell_weight'})
data=data.drop(columns=["Rings"],axis=1)
data.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
```

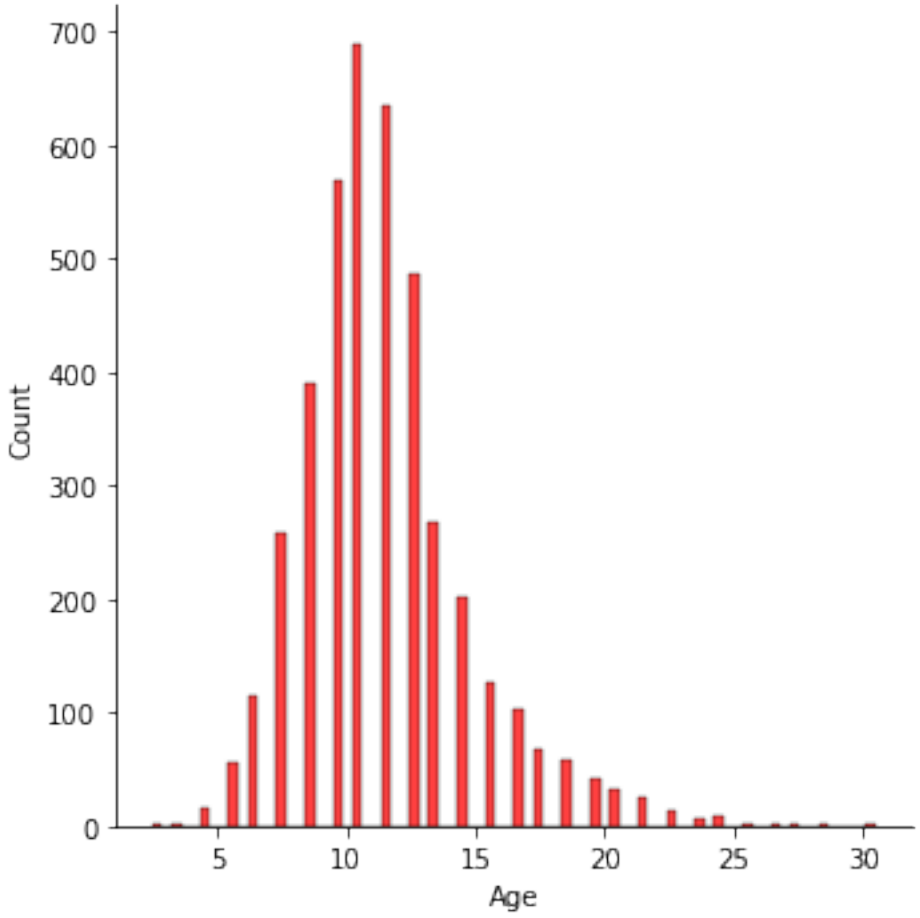
```
   Shell_weight   Age
0         0.150  16.5
1         0.070   8.5
2         0.210  10.5
3         0.155  11.5
4         0.055   8.5
```

Perform Below Visualizations

Univariate Analysis

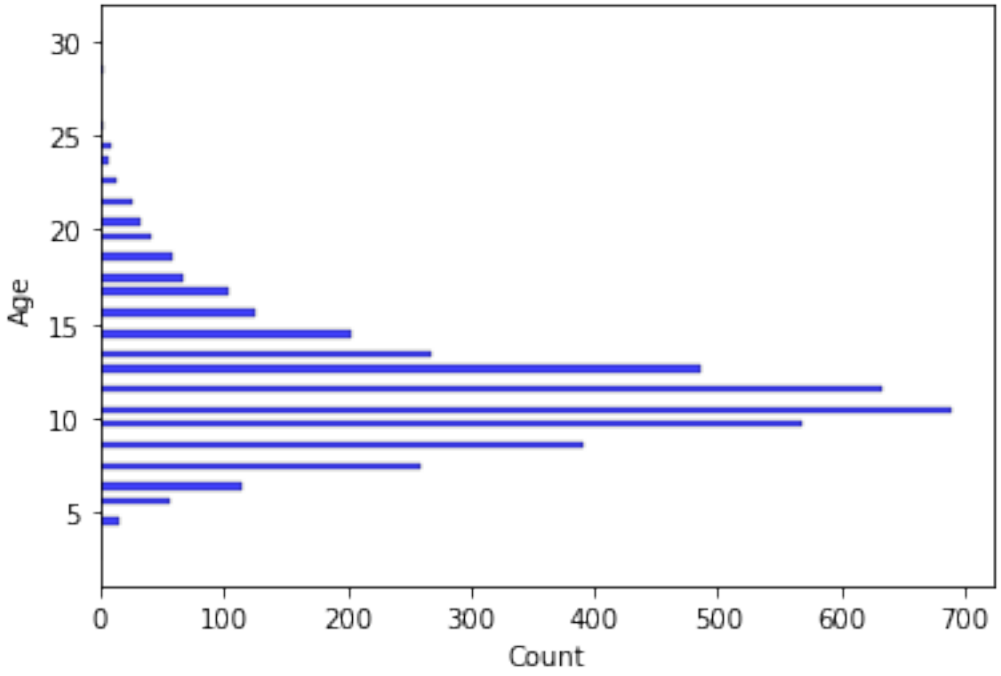
```
sns.displot(data["Age"], color='red')
```

```
<seaborn.axisgrid.FacetGrid at 0x255918d0460>
```



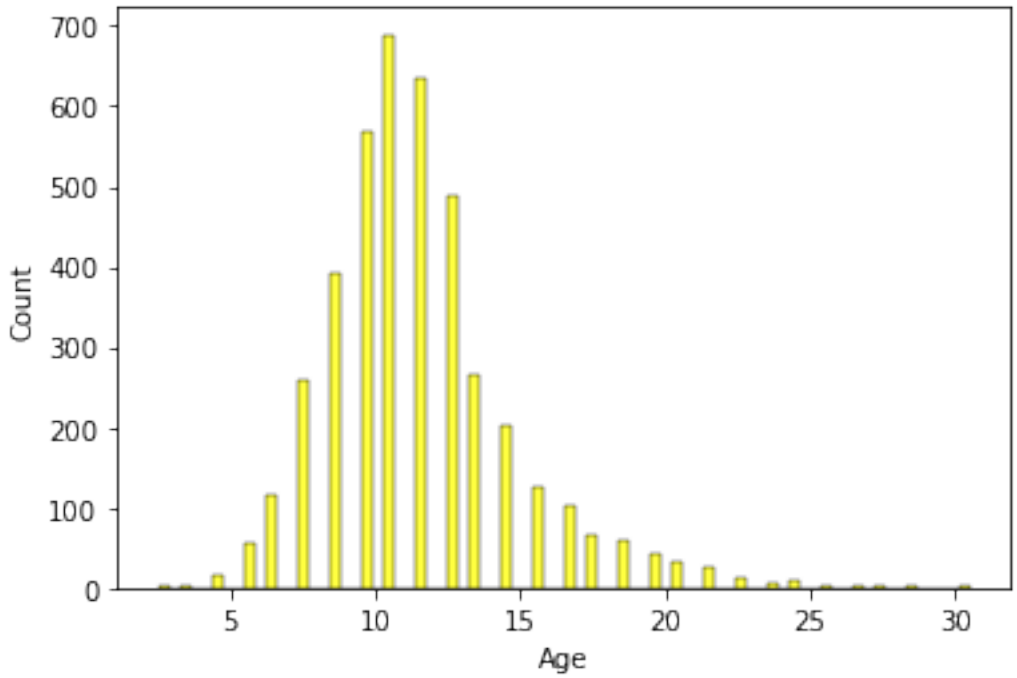

```
sns.histplot(y=data.Age,color='blue')
```

```
<AxesSubplot:xlabel='Count', ylabel='Age'>
```



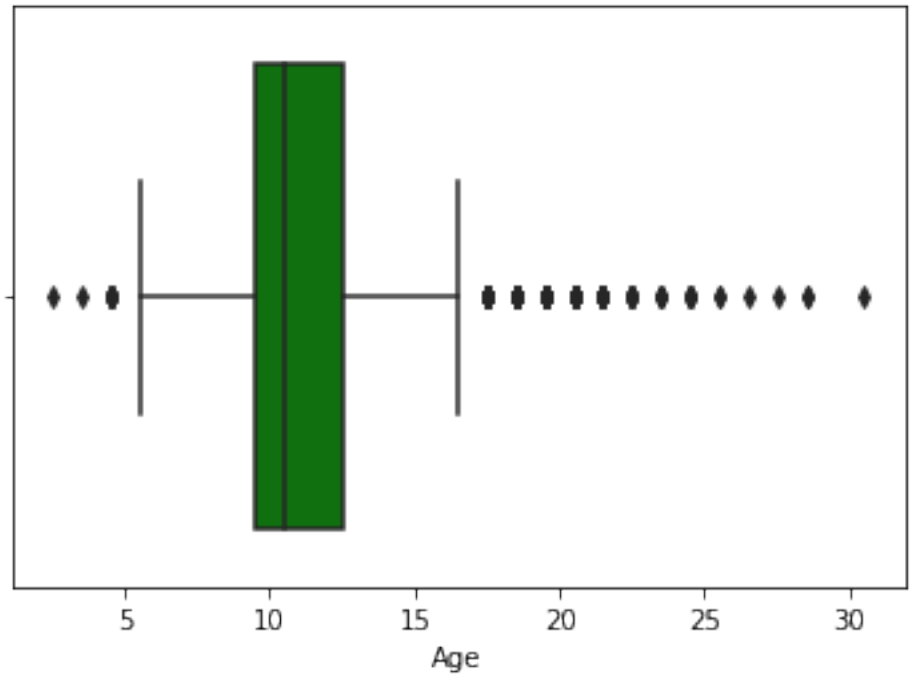

```
sns.histplot(x=data.Age,color='yellow')
```

```
<AxesSubplot:xlabel='Age', ylabel='Count'>
```



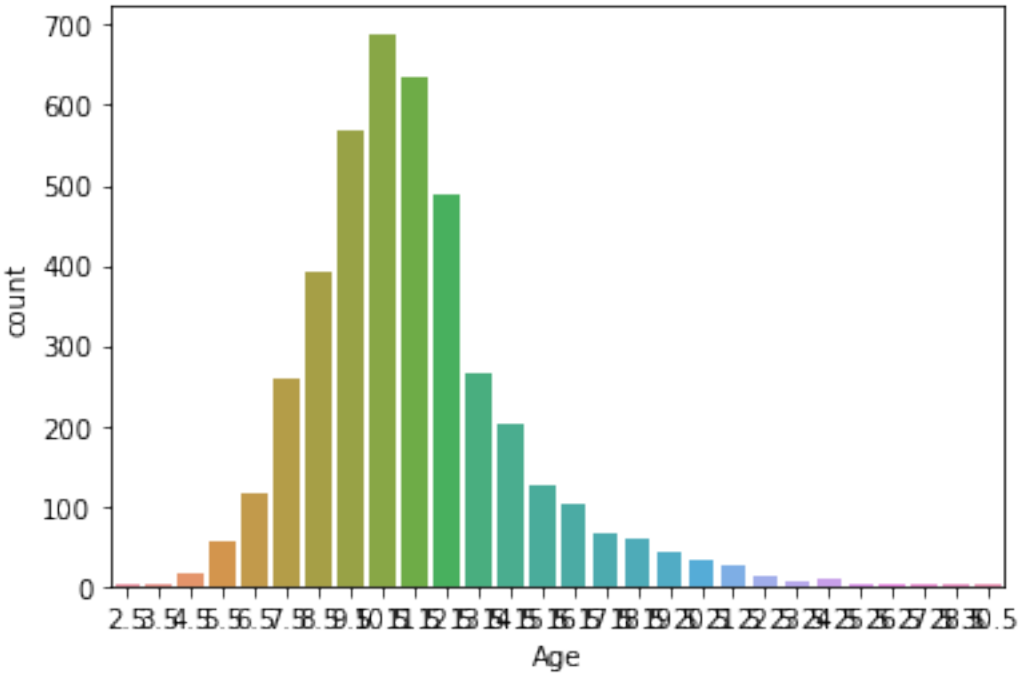

```
sns.boxplot(x=data.Age,color='green')
```

```
<AxesSubplot:xlabel='Age'>
```




```
sns.countplot(x=data.Age)
```

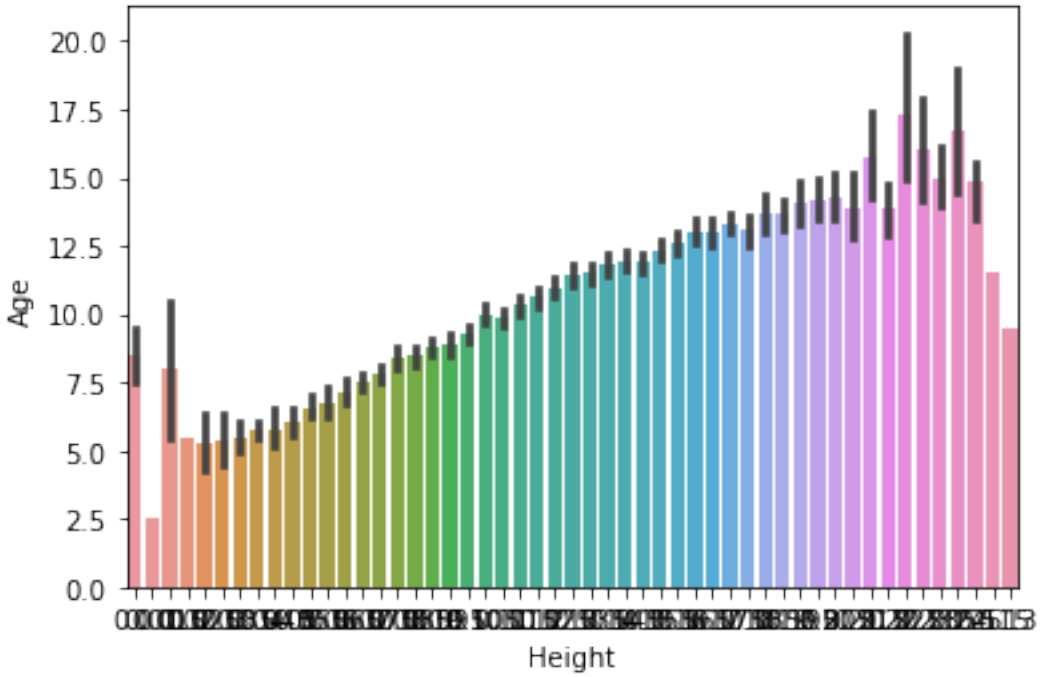
```
<AxesSubplot:xlabel='Age', ylabel='count'>
```



Bi-Variate Analysis

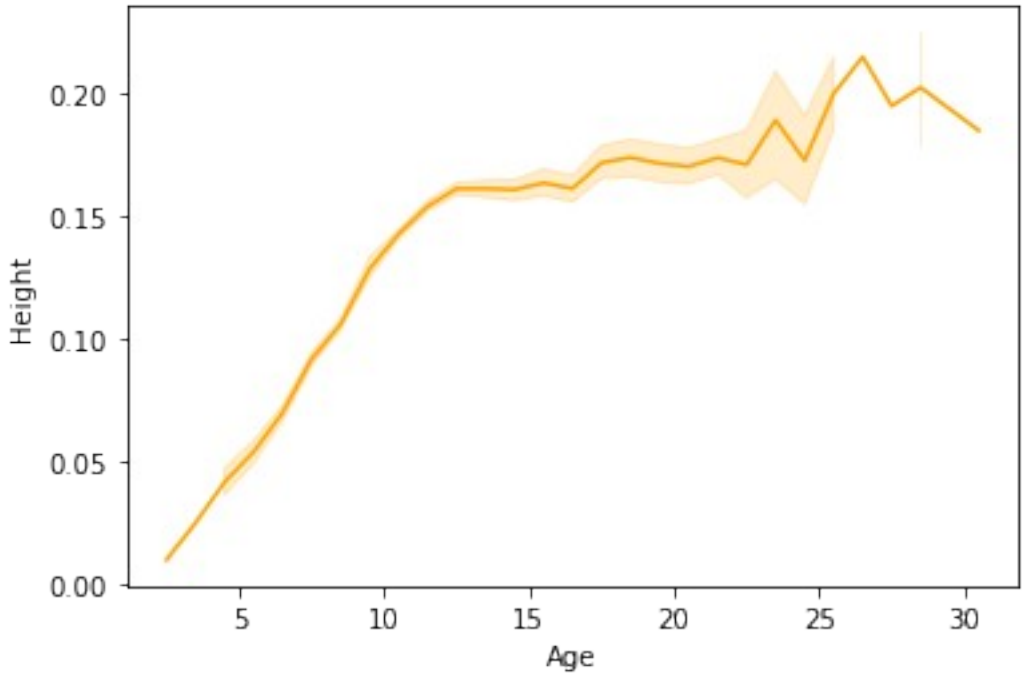
```
sns.barplot(x=data.Height,y=data.Age)
```

```
<AxesSubplot:xlabel='Height', ylabel='Age'>
```



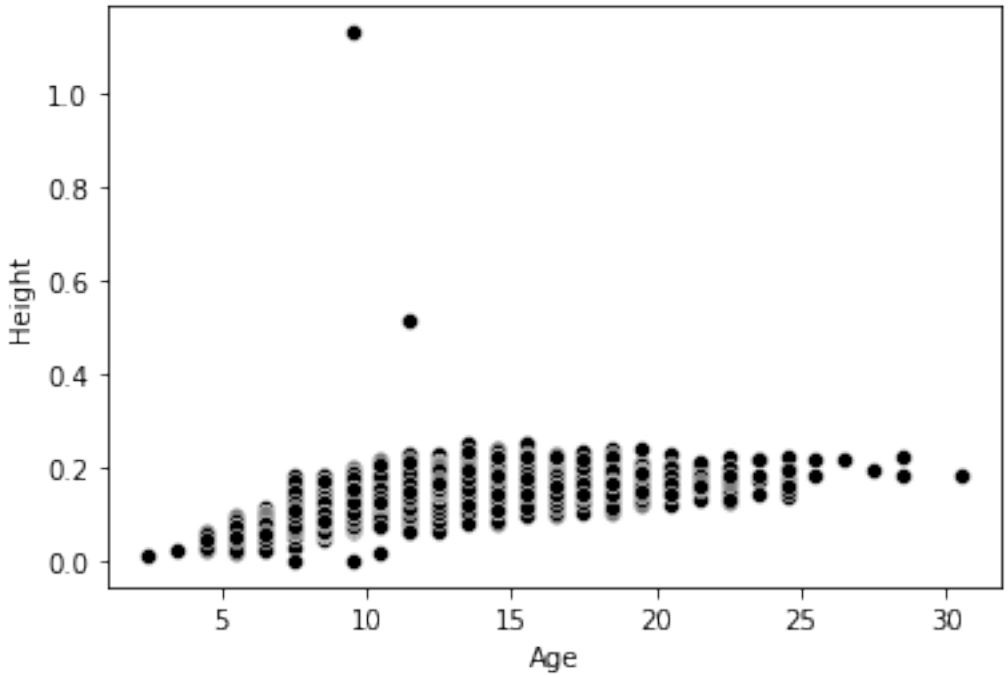

```
sns.lineplot(x=data.Age,y=data.Height, color='orange')
```

```
<AxesSubplot:xlabel='Age', ylabel='Height'>
```



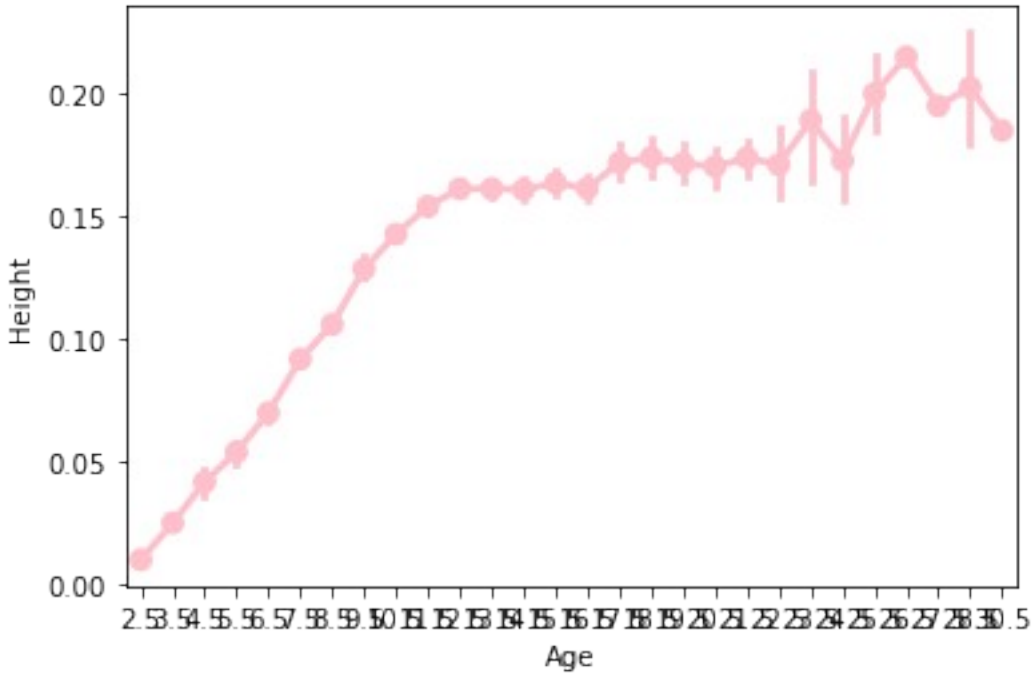

```
sns.scatterplot(x=data.Age,y=data.Height,color='black')
```

```
<AxesSubplot:xlabel='Age', ylabel='Height'>
```



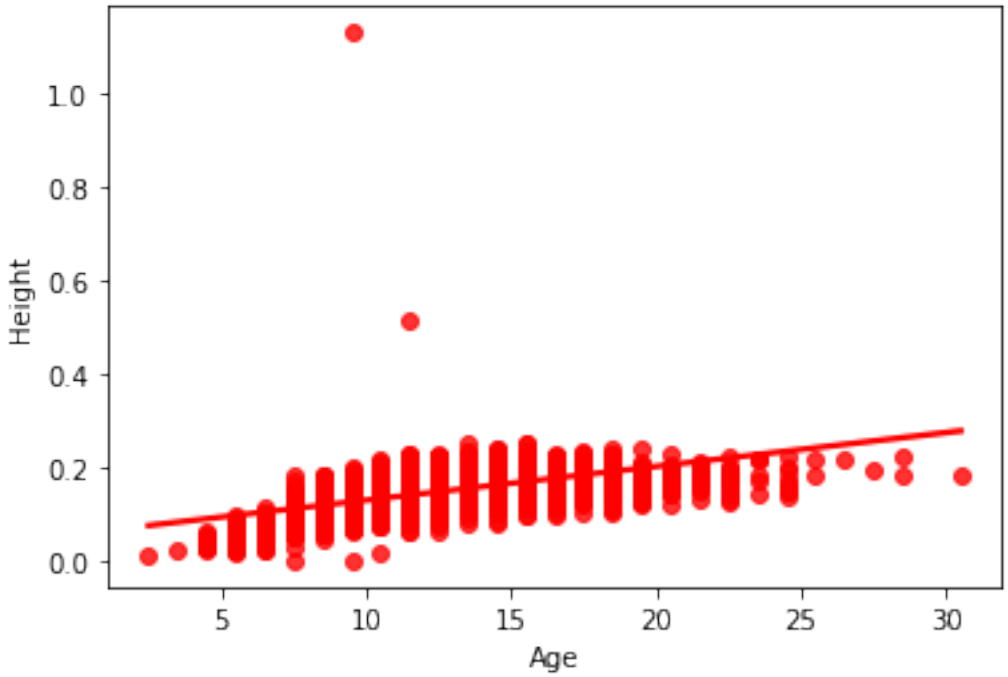

```
sns.pointplot(x=data.Age,y=data.Height,color='pink')
```

```
<AxesSubplot:xlabel='Age', ylabel='Height'>
```




```
sns.regplot(x=data.Age,y=data.Height,color='red')
```

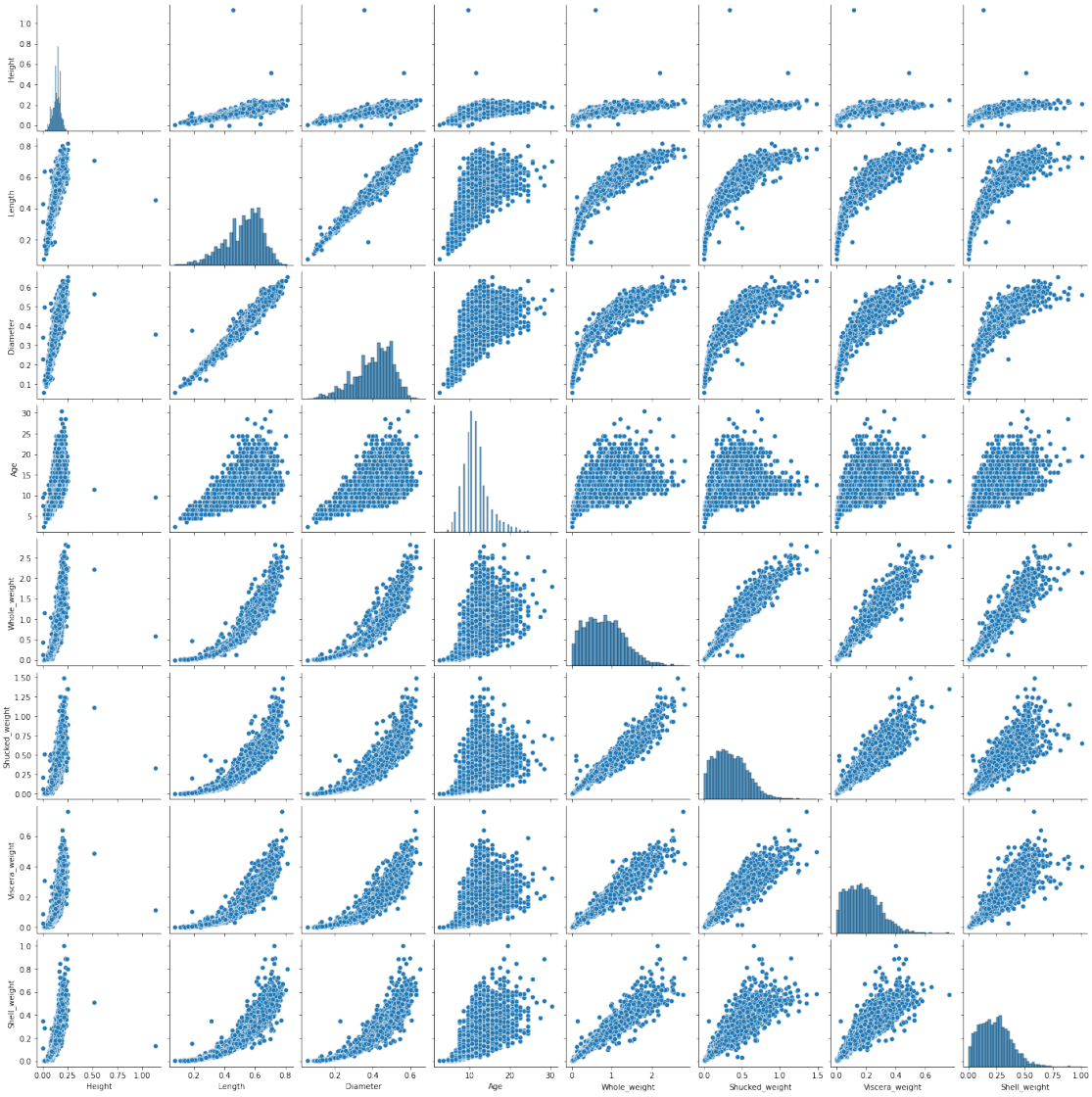
```
<AxesSubplot:xlabel='Age', ylabel='Height'>
```



Multi-Variate Analysis

```
sns.pairplot(data=data[["Height","Length","Diameter","Age","Whole_weig
ht","Shucked_weight","Viscera_weight","Shell_weight"]])
```

```
<seaborn.axisgrid.PairGrid at 0x25593a89730>
```



Perform descriptive statistics on the dataset

```
data.describe(include='all')
```

	Sex	Length	Diameter	Height	Whole_weight	\
count	4177	4177.000000	4177.000000	4177.000000	4177.000000	
unique	3	NaN	NaN	NaN	NaN	
top	M	NaN	NaN	NaN	NaN	
freq	1528	NaN	NaN	NaN	NaN	
mean	NaN	0.523992	0.407881	0.139516	0.828742	
std	NaN	0.120093	0.099240	0.041827	0.490389	
min	NaN	0.075000	0.055000	0.000000	0.002000	
25%	NaN	0.450000	0.350000	0.115000	0.441500	
50%	NaN	0.545000	0.425000	0.140000	0.799500	
75%	NaN	0.615000	0.480000	0.165000	1.153000	
max	NaN	0.815000	0.650000	1.130000	2.825500	

	Shucked_weight	Viscera_weight	Shell_weight	Age
count	4177.000000	4177.000000	4177.000000	4177.000000
unique	NaN	NaN	NaN	NaN
top	NaN	NaN	NaN	NaN
freq	NaN	NaN	NaN	NaN
mean	0.359367	0.180594	0.238831	11.433684
std	0.221963	0.109614	0.139203	3.224169
min	0.001000	0.000500	0.001500	2.500000
25%	0.186000	0.093500	0.130000	9.500000
50%	0.336000	0.171000	0.234000	10.500000
75%	0.502000	0.253000	0.329000	12.500000
max	1.488000	0.760000	1.005000	30.500000

Check for Missing values and deal with them

```
data.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
```

Find the outliers and replace them outliers

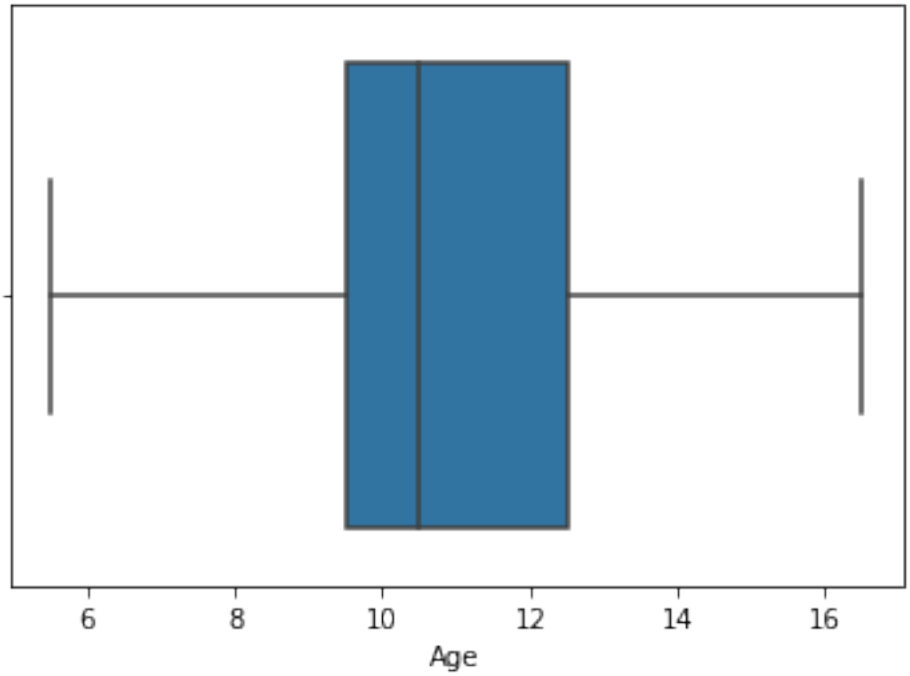
```
outliers=data.quantile(q=(0.25,0.75))
outliers
```

```
a = data.Age.quantile(0.25)
b = data.Age.quantile(0.75)
c = b - a
lower_limit = a - 1.5 * c
data.median(numeric_only=True)
```

```
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
Age               10.5000
dtype: float64
```

```
data['Age'] = np.where(data['Age'] < lower_limit, 7, data['Age'])
sns.boxplot(x=data.Age,showfliers = False)
```

```
<AxesSubplot:xlabel='Age'>
```



Check the categorical columns and perform encoding

```
data.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
```

```
from sklearn.preprocessing import LabelEncoder

lab = LabelEncoder()
data.Sex = lab.fit_transform(data.Sex)

data.head()
```

```
   Sex  Length  Diameter  Height  Whole_weight  Shucked_weight  \
0    2   0.455     0.365   0.095        0.5140          0.2245
1    2   0.350     0.265   0.090        0.2255          0.0995
2    0   0.530     0.420   0.135        0.6770          0.2565
3    2   0.440     0.365   0.125        0.5160          0.2155
4    1   0.330     0.255   0.080        0.2050          0.0895

   Viscera_weight  Shell_weight   Age
0          0.1010         0.150  16.5
1          0.0485         0.070   8.5
2          0.1415         0.210  10.5
3          0.1140         0.155  11.5
4          0.0395         0.055   8.5
```

Split the data into dependent and independent variables

```
y = data["Sex"]
y.head()
```

```
0    2
1    2
2    0
3    2
4    1
Name: Sex, dtype: int32
```

```
x=data.drop(columns=["Sex"],axis=1)
x.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
```

```
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
```

Scale the independent variables

```
from sklearn.preprocessing import scale
X_Scaled = pd.DataFrame(scale(x), columns=x.columns)
X_Scaled.head()
```

```
     Length  Diameter    Height  Whole_weight  Shucked_weight
Viscera_weight  \
0 -0.574558 -0.432149 -1.064424     -0.641898       -0.607685       -
0.726212
1 -1.448986 -1.439929 -1.183978     -1.230277       -1.170910       -
1.205221
2  0.050033  0.122130 -0.107991     -0.309469       -0.463500       -
0.356690
3 -0.699476 -0.432149 -0.347099     -0.637819       -0.648238       -
0.607600
4 -1.615544 -1.540707 -1.423087     -1.272086       -1.215968       -
1.287337

   Shell_weight       Age
0     -0.638217  1.577830
1     -1.212987 -0.919022
2     -0.207139 -0.294809
3     -0.602294  0.017298
4     -1.320757 -0.919022
```

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_Scaled, y,
test_size=0.2, random_state=0)

X_Train.shape,X_Test.shape

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

Y_Train.shape,Y_Test.shape

((3341,), (836,))

X_Train.head()
```

```
        Length  Diameter    Height  Whole_weight  Shucked_weight  \
3141 -2.864726 -2.750043 -1.423087     -1.622870       -1.553902
3521 -2.573250 -2.598876 -2.020857     -1.606554       -1.551650
```

```
883   1.132658  1.230689  0.728888      1.145672        1.041436
3627  1.590691  1.180300  1.446213      2.164373        2.661269
2106  0.591345  0.474853  0.370226      0.432887        0.255175

      Viscera_weight  Shell_weight       Age
3141       -1.583867     -1.644065 -1.543234
3521       -1.565619     -1.626104 -1.387181
883         0.286552      1.538726  1.577830
3627        2.330326      1.377072  0.017298
2106        0.272866      0.906479  1.265723
```

```
X_Test.head()
```

```
        Length  Diameter    Height  Whole_weight  Shucked_weight  \
668   0.216591  0.172519  0.370226      0.181016       -0.368878
1580 -0.199803 -0.079426 -0.466653     -0.433875       -0.443224
3784  0.799543  0.726798  0.370226      0.870348        0.755318
463  -2.531611 -2.447709 -2.020857     -1.579022       -1.522362
2615  1.007740  0.928354  0.848442      1.390405        1.415417

      Viscera_weight  Shell_weight       Age
668         0.569396      0.690940  0.953617
1580       -0.343004     -0.325685 -0.606915
3784        1.764639      0.565209  0.329404
463        -1.538247     -1.572219 -1.543234
2615        1.778325      0.996287  0.641511
```

```
Y_Train.head()
```

```
3141    1
3521    1
883     2
3627    2
2106    2
Name: Sex, dtype: int32
```

```
Y_Test.head()
```

```
668     2
1580    1
3784    2
463     1
2615    2
Name: Sex, dtype: int32
```

Build the model

```
from sklearn.ensemble import RandomForestClassifier
model = RandomForestClassifier(n_estimators=10,criterion='entropy')

model.fit(X_Train,Y_Train)
```

```
RandomForestClassifier(criterion='entropy', n_estimators=10)

y_predict = model.predict(X_Test)

y_predict_train = model.predict(X_Train)
```

Train the Model

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

print('Training accuracy: ',accuracy_score(Y_Train,y_predict_train))

Training accuracy:  0.9808440586650703
```

Test the model

```
print('Testing accuracy: ',accuracy_score(Y_Test,y_predict))

Testing accuracy:  0.5334928229665071
```

Measure the performance using metrics

```
pd.crosstab(Y_Test,y_predict)

col_0    0    1    2
Sex
0      108   29  112
1       46  209   36
2      119   48  129

print(classification_report(Y_Test,y_predict))

              precision    recall  f1-score   support

           0       0.40      0.43      0.41       249
           1       0.73      0.72      0.72       291
           2       0.47      0.44      0.45       296

    accuracy                           0.53       836
   macro avg       0.53      0.53      0.53       836
weighted avg       0.54      0.53      0.53       836
```