#importing module

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

Load the dataset into the tool

```
data=pd.read_csv("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
```

#Let's know the shape of the data

```
data.shape
```

```
(4177, 9)
```

#One additional task is that, we have to add the "Age" column using "Rings" data. We just have to add '1.5' to the ring data

```
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()
```

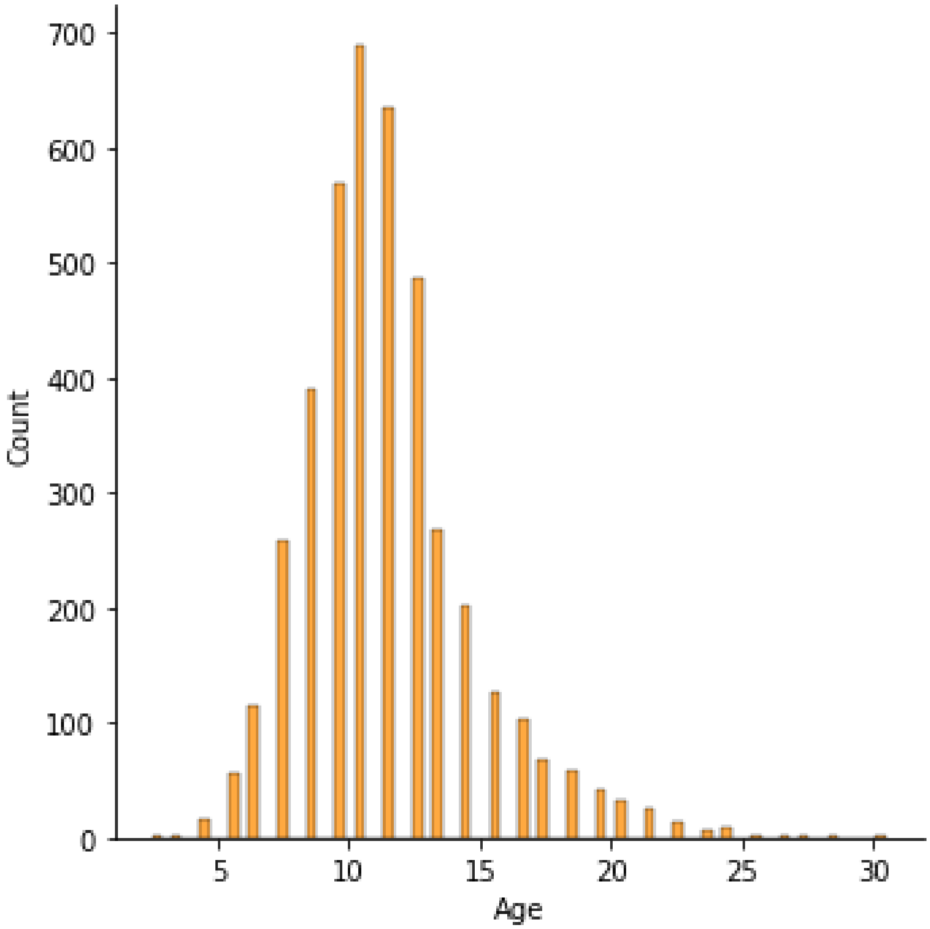
```
  Sex  Length  Diameter  Height  Whole_weight  Shucked_weight
Viscera_weight  \
```

```
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
```

#Histogram

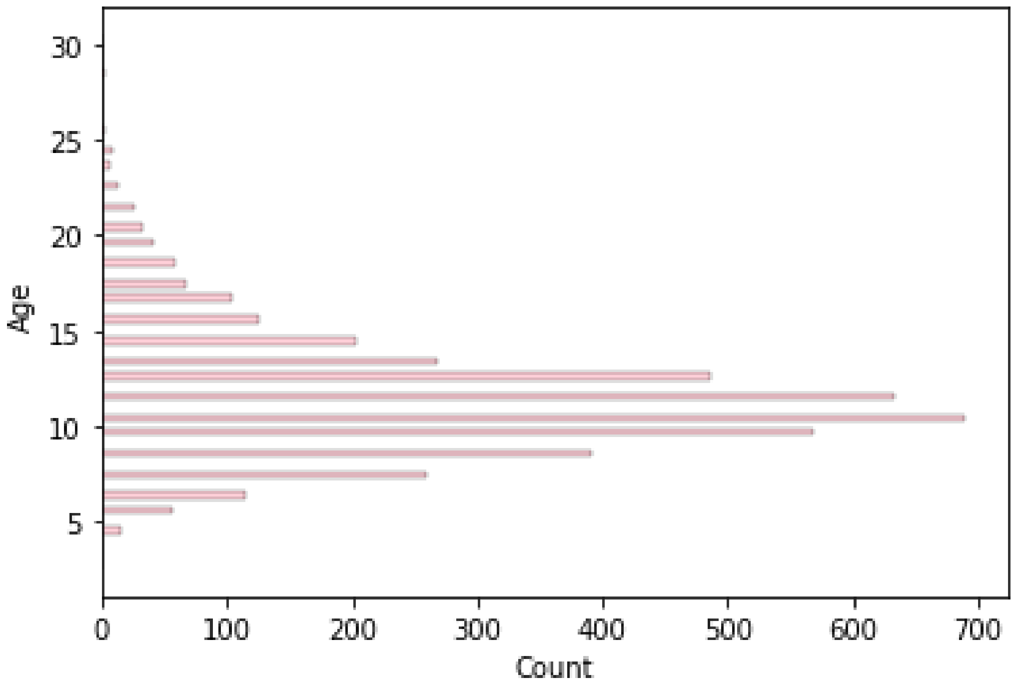
```
sns.displot(data["Age"], color='darkorange')
```

```
<seaborn.axisgrid.FacetGrid at 0x7f8a1174dd90>
```



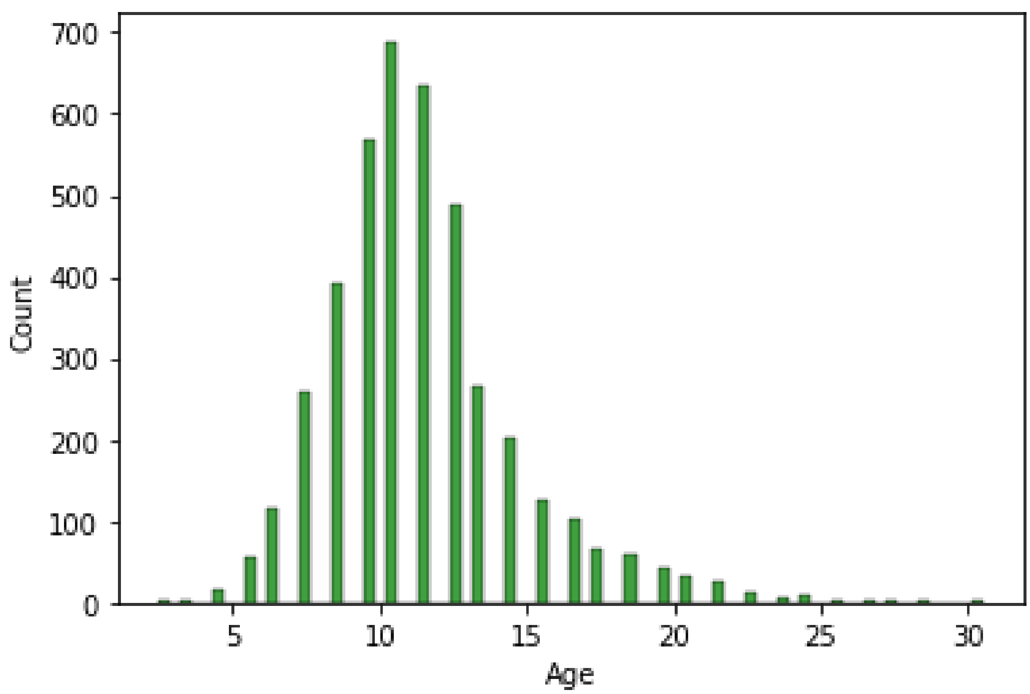

```
sns.histplot(y=data.Age,color='pink')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8a1174d450>
```




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

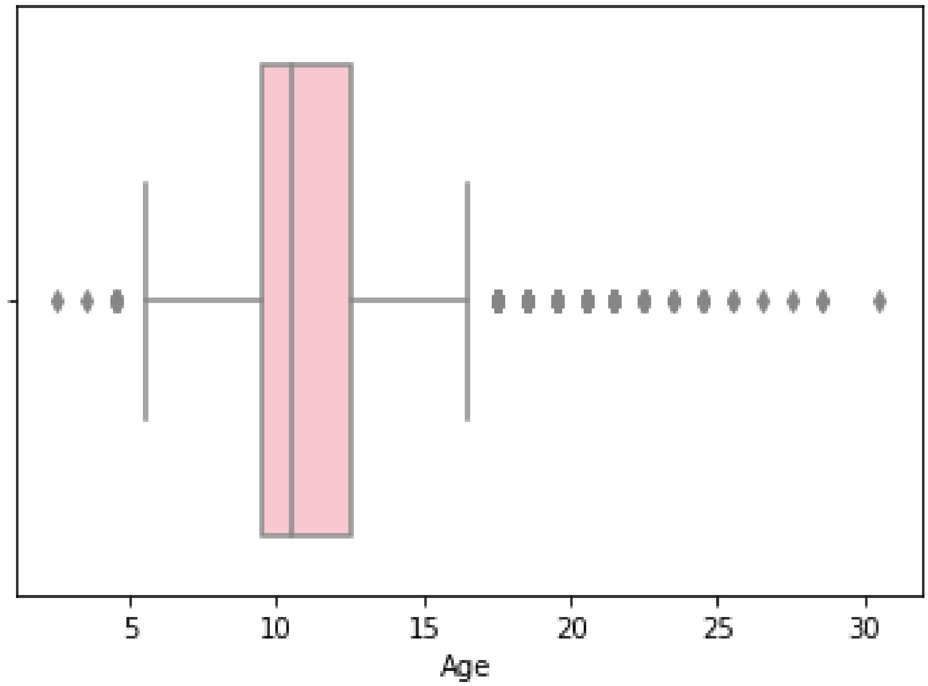
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8a0e7e6310>
```



#Boxplot

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

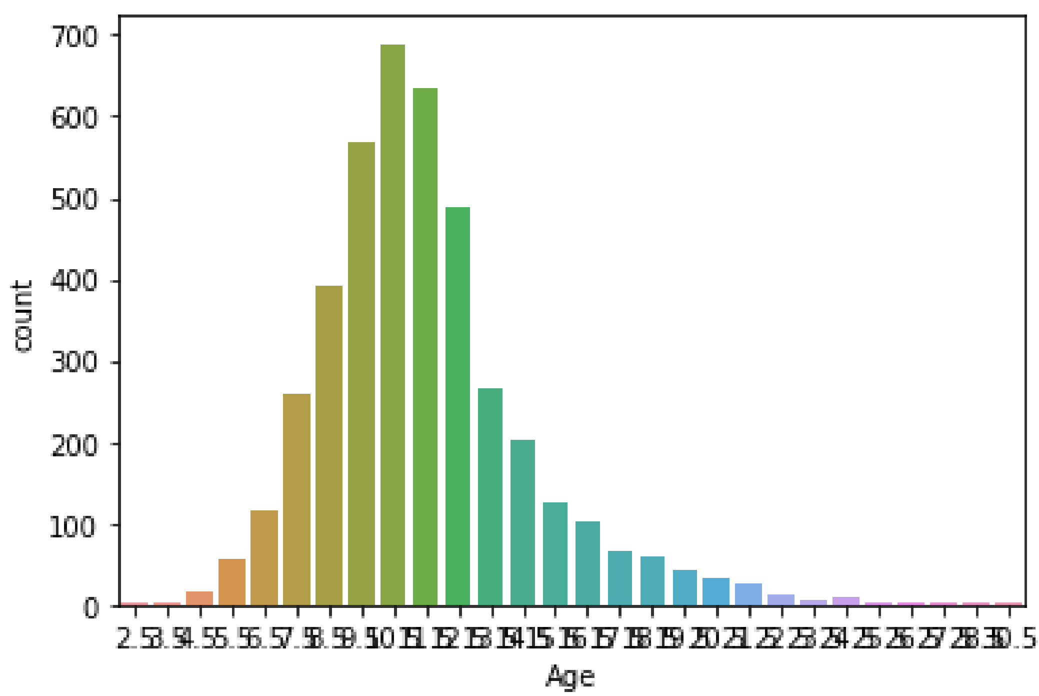
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8a0e648bd0>
```



#Countplot

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

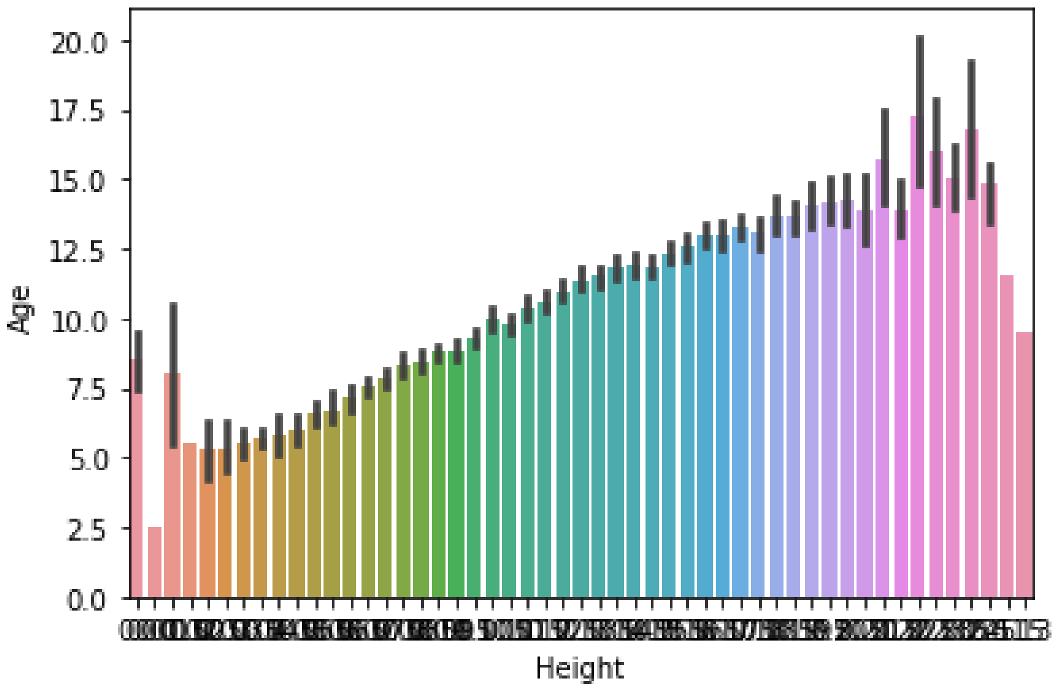
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8a0e7a42d0>
```



#Barplot

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

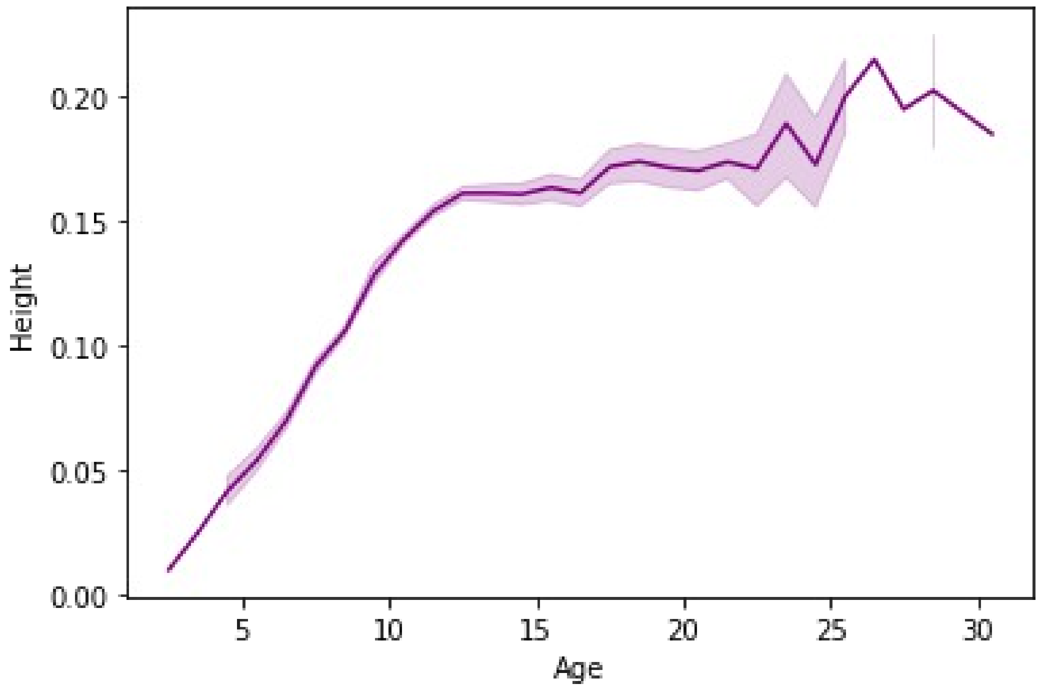
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8a0e4bd690>
```



#Linearplot

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

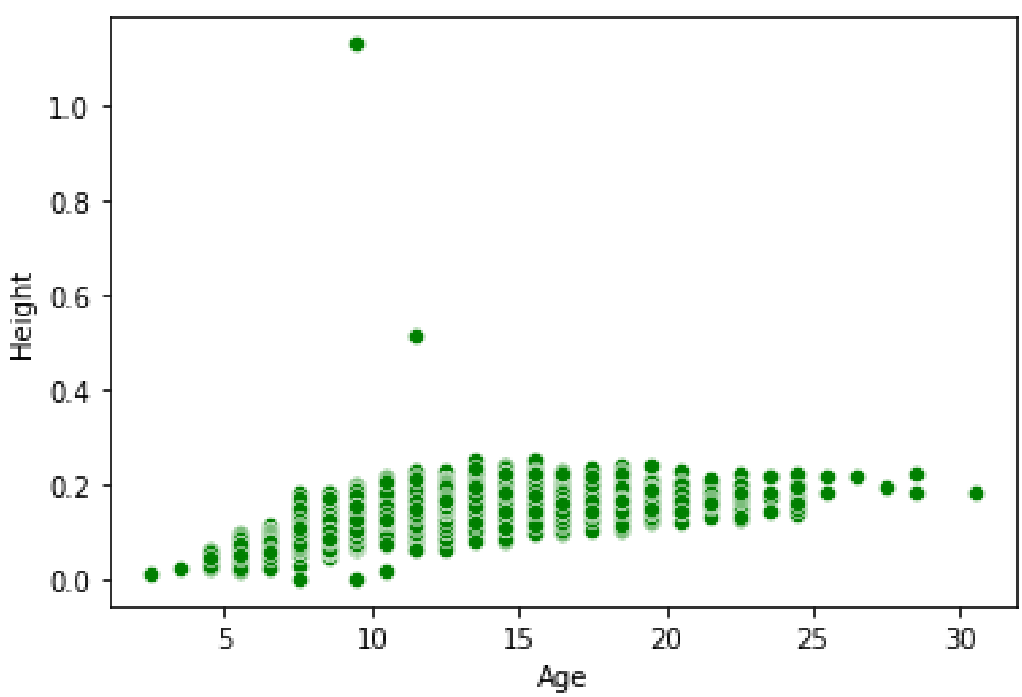
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8a0e71bcd0>
```



#Scatterplot

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

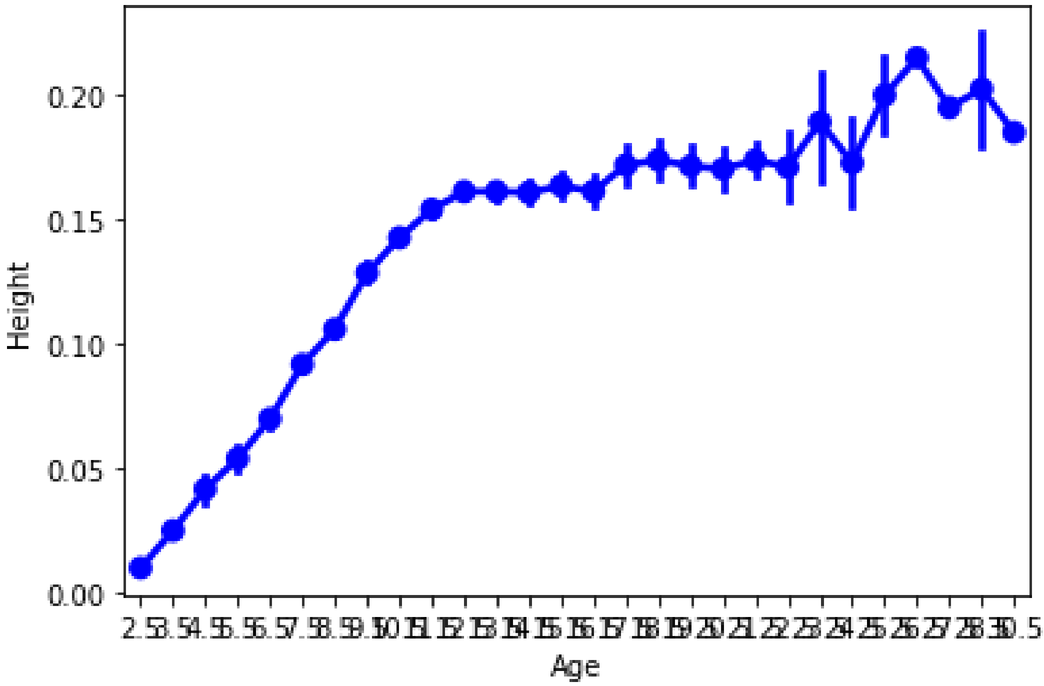
<matplotlib.axes._subplots.AxesSubplot at 0x7f8a0e70e610>



#Pointplot

```
sns.pointplot(x=data.Age, y=data.Height, color="blue")
```

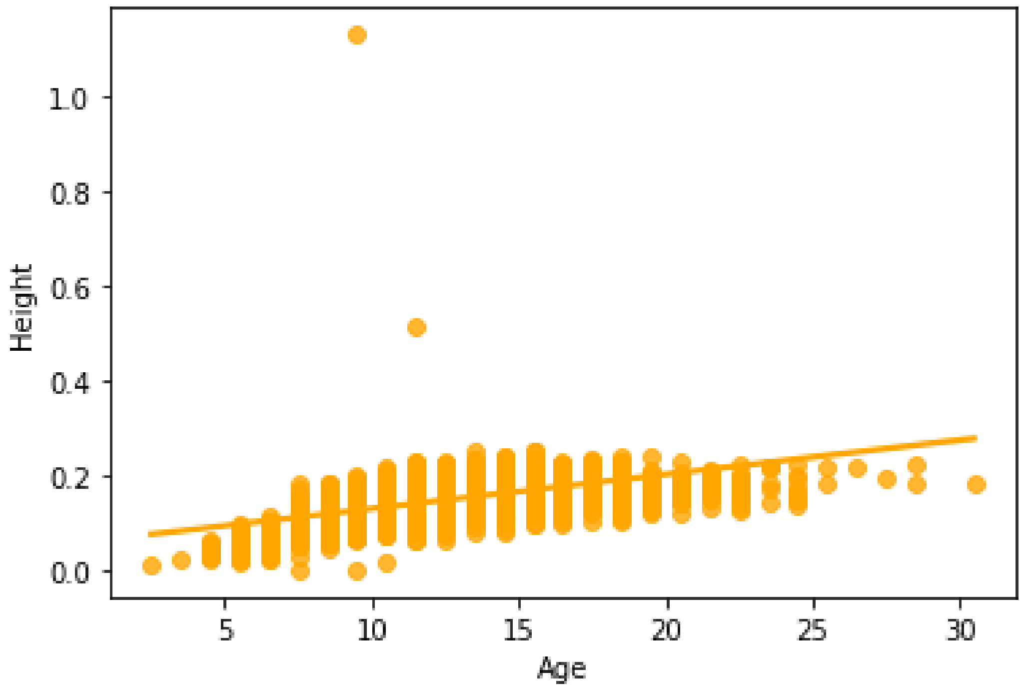
<matplotlib.axes._subplots.AxesSubplot at 0x7f8a0ed61ed0>



#Regplot

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

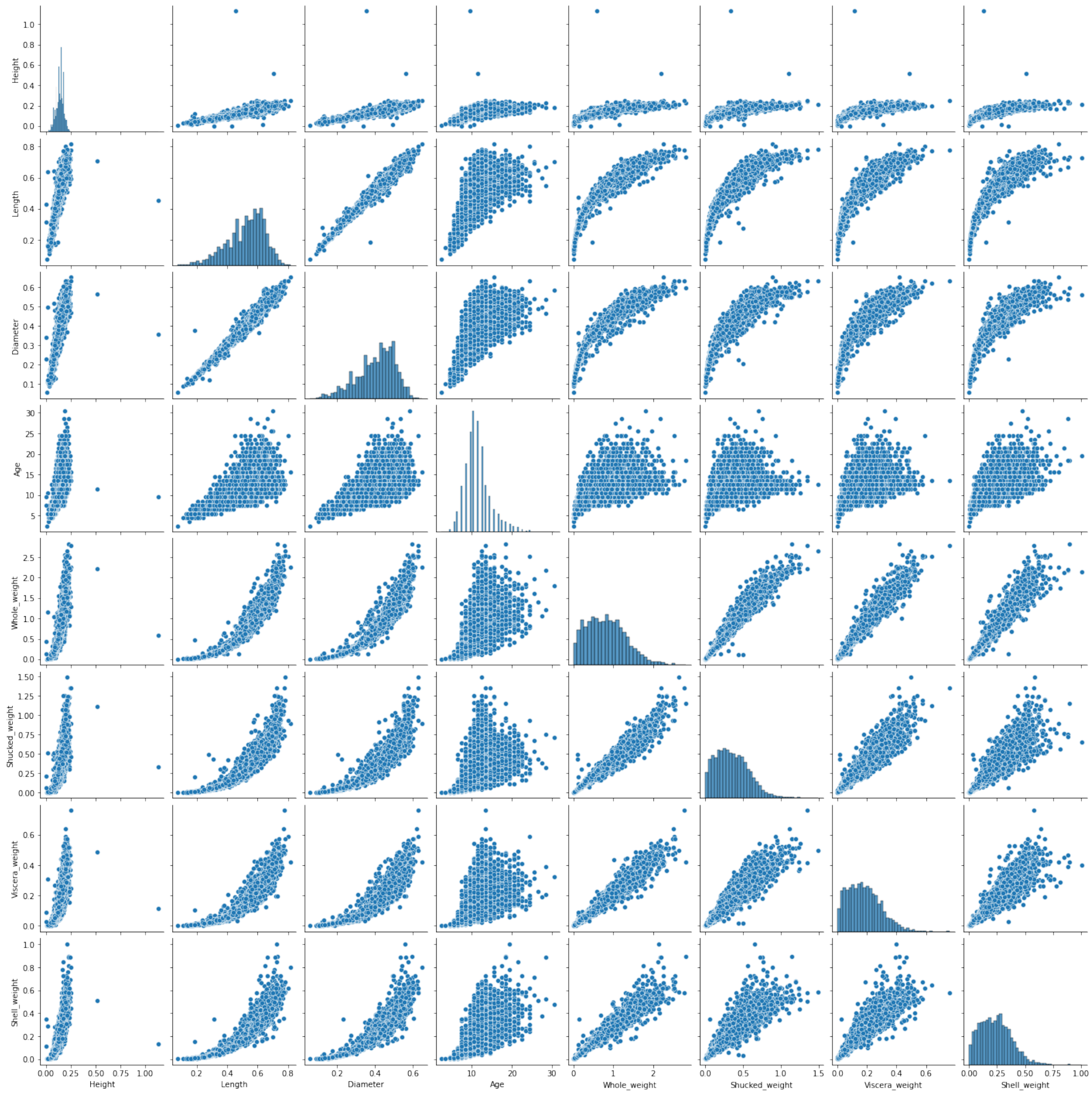
<matplotlib.axes._subplots.AxesSubplot at 0x7f8a0e1cbe90>



#Pairplot

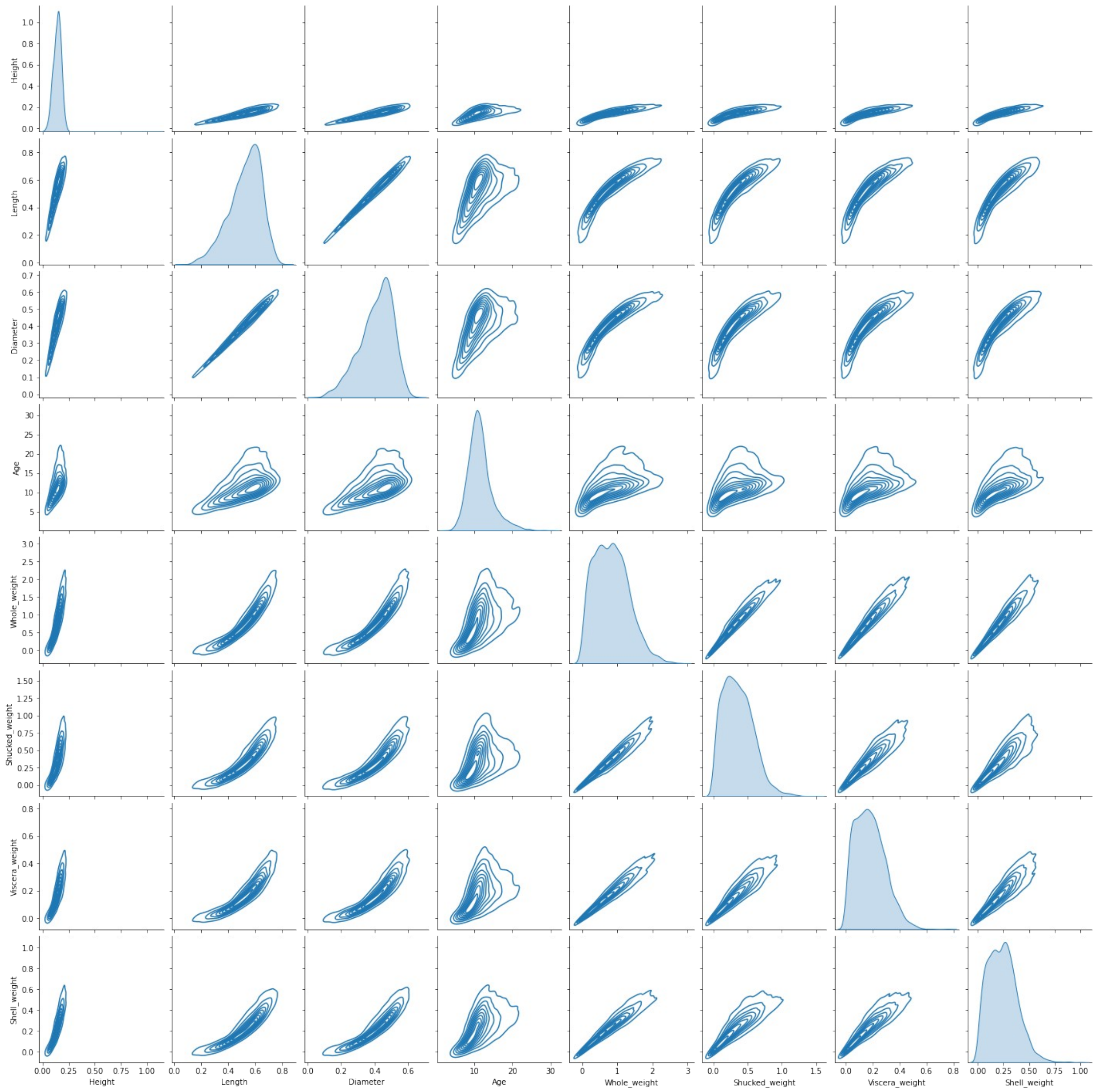
```
sns.pairplot(data=data[["Height","Length","Diameter","Age","Whole_weig
ht","Shucked_weight","Viscera_weight","Shell_weight"]])
```

```
<seaborn.axisgrid.PairGrid at 0x7f8a0e1d0c90>
```




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

```
<seaborn.axisgrid.PairGrid at 0x7f8a0c133d90>
```



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
```

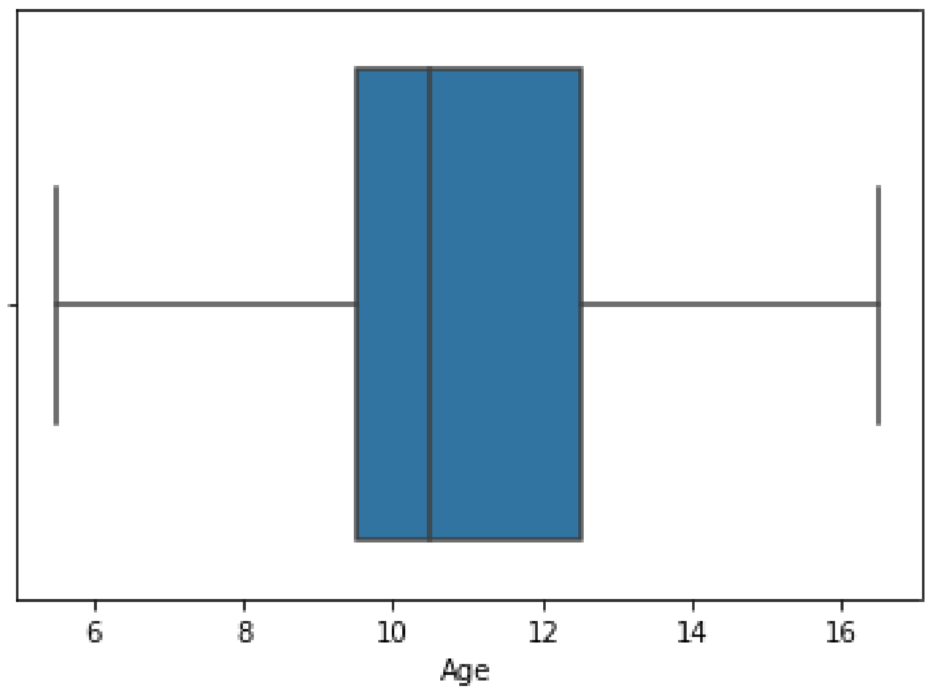
```
      Length  Diameter  Height  Whole_weight  Shucked_weight
Viscera_weight  \
0.25   0.450      0.35   0.115        0.4415           0.186
0.0935
0.75   0.615      0.48   0.165        1.1530           0.502
0.2530

      Shell_weight   Age
0.25         0.130   9.5
0.75         0.329  12.5
```

```
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)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8a08878110>
```



#Check for 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: int64
```

```
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: int64
```

Y_Test.head()

```
668     2
1580    1
3784    2
463     1
2615    2
Name: Sex, dtype: int64
```

#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:  0.9832385513319365
```

#Test the Model

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

```
Testing accuracy:  0.5358851674641149
```

#Measure the performance using Metrics

```
pd.crosstab(Y_Test,y_predict)
```

```
col_0    0    1    2
Sex
0      121   30   98
1       41  214   36
2      126   57  113
```

```
print(classification_report(Y_Test,y_predict))
```

```
              precision    recall  f1-score   support

           0       0.42      0.49      0.45       249
           1       0.71      0.74      0.72       291
           2       0.46      0.38      0.42       296

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