10 september 2022 ASSIGNMENT – 4 ID- PNT2022TMD07696 Reg no: 201912020

### 1. Dataset has been downloaded

```
In [3]: import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import numpy as np
```

### 2. Load the dataset into the tool

```
In [4]: data=pd.read_csv("abalone.csv")
data.head()
```

Out[4]:

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	М	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15
1	М	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	М	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10
4	1	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7

### Let's know the shape of the data

```
In [5]: data.shape
Out[5]: (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

#### Out[6]:

	Sex	Length	Diameter	Height	Whole_weight	Shucked_weight	Viscera_weight	Shell_weight	Age
0	М	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	16.5
1	М	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	8.5
2	F	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	10.5
3	М	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	11.5
4	1	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	8.5

#### 3. Perform Below Visualizations.

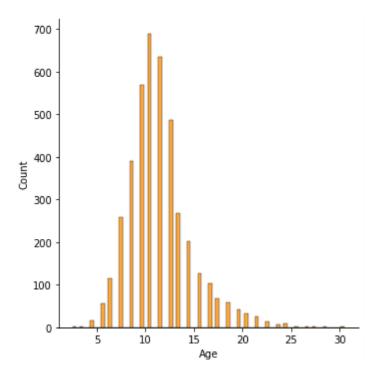
### (i) Univariate Analysis

The term univariate analysis refers to the analysis of one variable. You can remember this because the prefix "uni" means "one." There are three common ways to perform univariate analysis on one variable: 1. Summary statistics – Measures the center and spread of values.

### Histogram

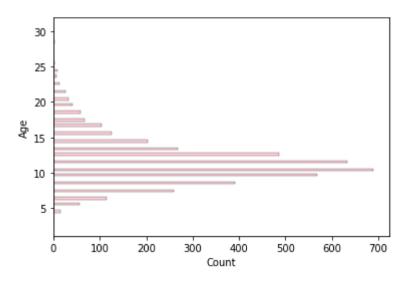
In [7]: sns.displot(data["Age"], color='darkorange')

Out[7]: <seaborn.axisgrid.FacetGrid at 0x7f5d2388cc90>



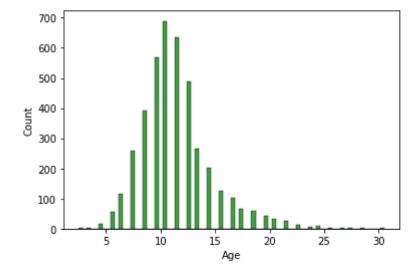
In [8]: sns.histplot(y=data.Age,color='pink')

Out[8]: <matplotlib.axes.\_subplots.AxesSubplot at 0x7f5d20e8f950>



In [9]: sns.histplot(x=data.Age,color='green')

Out[9]: <matplotlib.axes.\_subplots.AxesSubplot at 0x7f5d2382ef90>



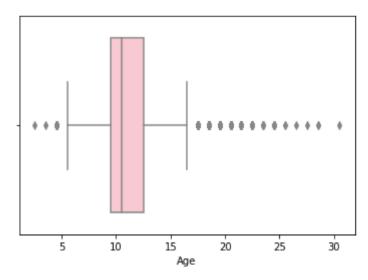
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## **Boxplot**

```
In [10]: sns.boxplot(x=data.Age,color='pink')
```

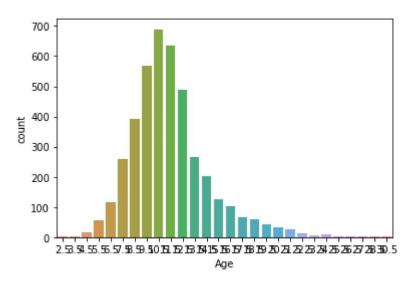
Out[10]: <matplotlib.axes.\_subplots.AxesSubplot at 0x7f5d23938510>



### Countplot

```
In [11]: sns.countplot(x=data.Age)
```

Out[11]: <matplotlib.axes.\_subplots.AxesSubplot at 0x7f5d2095ab10>



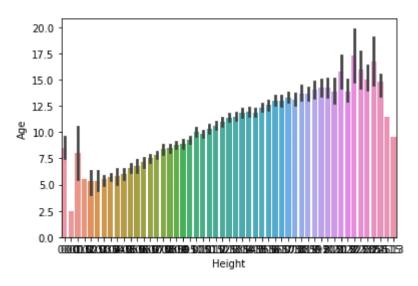
## (ii) Bi-Variate Analysis

Image result for bivariate analysis in python It is a methodical statistical technique applied to a pair of variables (features/ attributes) of data to determine the empirical relationship between them. In order words, it is meant to determine any concurrent relations (usually over and above a simple correlation analysis).

#### **Barplot**

In [12]: sns.barplot(x=data.Height,y=data.Age)

Out[12]: <matplotlib.axes.\_subplots.AxesSubplot at 0x7f5d20633a50>

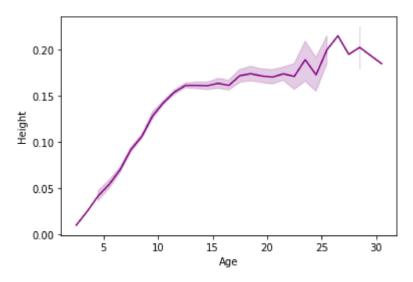


#### Linearplot

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In [13]: sns.lineplot(x=data.Age,y=data.Height, color='purple')

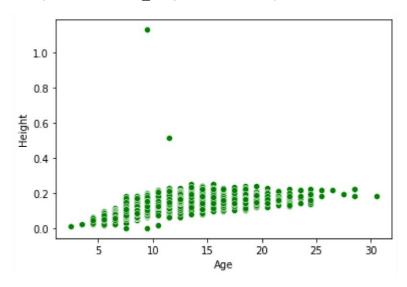
Out[13]: <matplotlib.axes.\_subplots.AxesSubplot at 0x7f5d207844d0>



#### Scatterplot

In [14]: sns.scatterplot(x=data.Age,y=data.Height,color='green')

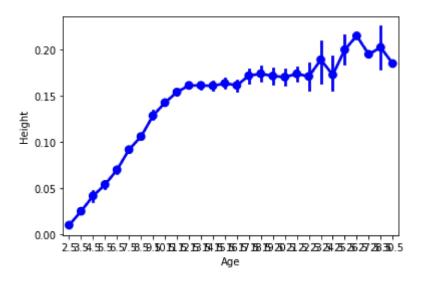
Out[14]: <matplotlib.axes.\_subplots.AxesSubplot at 0x7f5d20541650>



#### **Pointplot**

```
In [15]: sns.pointplot(x=data.Age, y=data.Height, color="blue")
```

Out[15]: <matplotlib.axes.\_subplots.AxesSubplot at 0x7f5d202b7f10>



#### Regplot

30

Out[17]: <seaborn.axisgrid.PairGrid at 0x7f5d201a0450>

10

15

Age

20

25

## (iii) Multi-Variate Analysis

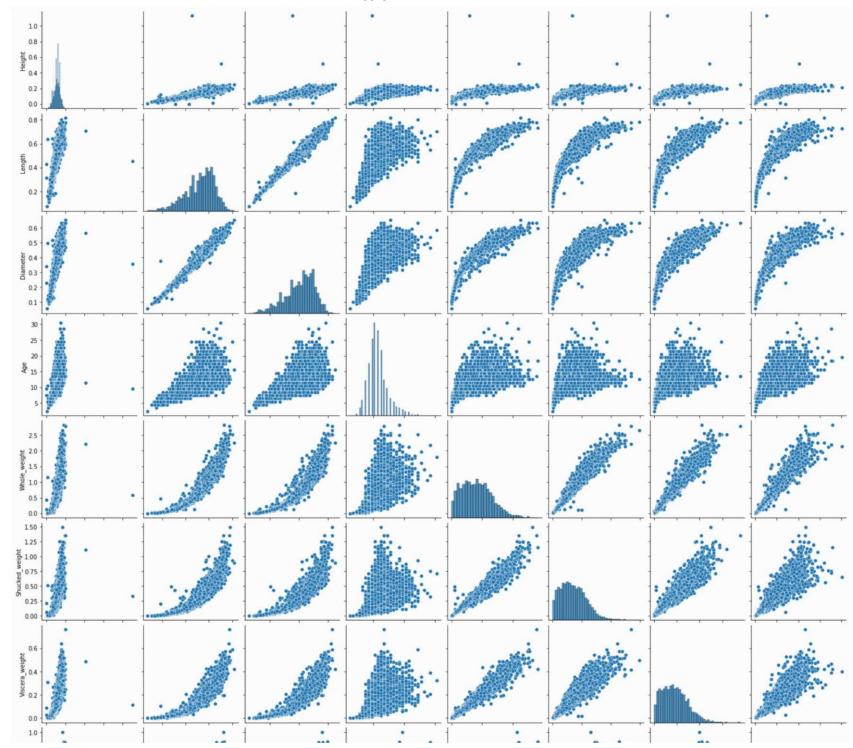
0.4

0.2

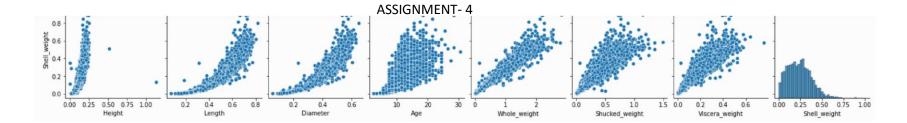
0.0

Multivariate analysis is based in observation and analysis of more than one statistical outcome variable at a time. In design and analysis, the technique is used to perform trade studies across multiple dimensions while taking into account the effects of all variables on the responses of interest.

#### **Pairplot**



10/28/22, 3:08 PM



## 4. Perform descriptive statistics on the dataset

In [20]: data.describe(include='all')

Out[20]:

	Sex	Length	Diameter	Height	Whole_weight	Shucked_weight	Viscera_weight	Shell_weight	Age
count	4177	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000
unique	3	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
top	М	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
freq	1528	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
mean	NaN	0.523992	0.407881	0.139516	0.828742	0.359367	0.180594	0.238831	11.433684
std	NaN	0.120093	0.099240	0.041827	0.490389	0.221963	0.109614	0.139203	3.224169
min	NaN	0.075000	0.055000	0.000000	0.002000	0.001000	0.000500	0.001500	2.500000
25%	NaN	0.450000	0.350000	0.115000	0.441500	0.186000	0.093500	0.130000	9.500000
50%	NaN	0.545000	0.425000	0.140000	0.799500	0.336000	0.171000	0.234000	10.500000
75%	NaN	0.615000	0.480000	0.165000	1.153000	0.502000	0.253000	0.329000	12.500000
max	NaN	0.815000	0.650000	1.130000	2.825500	1.488000	0.760000	1.005000	30.500000

## 5. Check for Missing values and deal with them

## 6. Find the outliers and replace them outliers

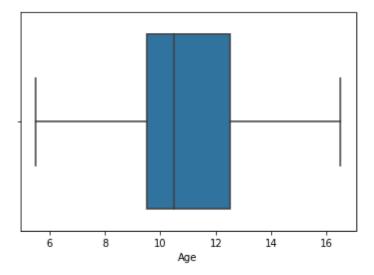
```
In [22]: outliers=data.quantile(q=(0.25,0.75))
outliers
```

Out[22]:

	Length	Diameter	Height	Whole_weight	Shucked_weight	Viscera_weight	Shell_weight	Age
0.25	0.450	0.35	0.115	0.4415	0.186	0.0935	0.130	9.5
0.75	0.615	0.48	0.165	1.1530	0.502	0.2530	0.329	12.5

```
In [23]: | 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)
Out[23]: 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
In [24]: | data['Age'] = np.where(data['Age'] < lower_limit, 7, data['Age'])</pre>
          sns.boxplot(x=data.Age,showfliers = False)
```

Out[24]: <matplotlib.axes.\_subplots.AxesSubplot at 0x7f5d1b0a0050>



## 7. Check for Categorical columns and perform encoding

```
In [27]:
           data.head()
Out[27]:
               Sex Length Diameter Height Whole_weight Shucked_weight Viscera_weight Shell_weight Age
                      0.455
                                0.365
                                       0.095
            0
                 М
                                                     0.5140
                                                                      0.2245
                                                                                     0.1010
                                                                                                   0.150
                                                                                                         16.5
                                                     0.2255
                                                                      0.0995
                      0.350
                                0.265
                                        0.090
                                                                                     0.0485
                                                                                                   0.070
                                                                                                           8.5
            2
                      0.530
                                0.420
                                        0.135
                                                     0.6770
                                                                      0.2565
                                                                                     0.1415
                                                                                                   0.210
                                                                                                          10.5
                      0.440
                                0.365
                                       0.125
                                                     0.5160
                                                                      0.2155
                                                                                     0.1140
                                                                                                   0.155 11.5
                                                     0.2050
                                                                                     0.0395
                      0.330
                                0.255
                                       0.080
                                                                      0.0895
                                                                                                   0.055
                                                                                                           8.5
           from sklearn.preprocessing import LabelEncoder
In [28]:
           lab = LabelEncoder()
           data.Sex = lab.fit_transform(data.Sex)
           data.head()
Out[28]:
                            Diameter Height Whole_weight Shucked_weight Viscera_weight Shell_weight Age
                 2
                      0.455
                                0.365
                                       0.095
                                                     0.5140
            0
                                                                      0.2245
                                                                                     0.1010
                                                                                                   0.150 16.5
            1
                 2
                      0.350
                                0.265
                                        0.090
                                                     0.2255
                                                                      0.0995
                                                                                     0.0485
                                                                                                   0.070
                                                                                                           8.5
            2
                 0
                      0.530
                                0.420
                                       0.135
                                                     0.6770
                                                                      0.2565
                                                                                     0.1415
                                                                                                   0.210
                                                                                                          10.5
                      0.440
                                0.365
                                        0.125
                                                     0.5160
                                                                      0.2155
                                                                                     0.1140
                                                                                                   0.155
                                                                                                         11.5
```

0.0895

0.0395

0.055

8.5

## 8. Split the data into dependent and independent variables

0.2050

0.330

0.255

0.080

```
y = data["Sex"]
In [29]:
          y.head()
Out[29]: 0
                2
                2
                0
           2
           4
          Name: Sex, dtype: int64
          x=data.drop(columns=["Sex"],axis=1)
In [30]:
          x.head()
Out[30]:
              Length Diameter Height Whole_weight Shucked_weight Viscera_weight Shell_weight Age
           0
               0.455
                         0.365
                                0.095
                                             0.5140
                                                             0.2245
                                                                           0.1010
                                                                                         0.150 16.5
           1
               0.350
                         0.265
                                0.090
                                             0.2255
                                                             0.0995
                                                                           0.0485
                                                                                         0.070
                                                                                                8.5
               0.530
                                0.135
                                                             0.2565
           2
                         0.420
                                             0.6770
                                                                           0.1415
                                                                                         0.210 10.5
```

0.2155

0.0895

0.1140

0.0395

0.155 11.5

8.5

0.055

## 9. Scale the independent variables

0.365

0.255

0.125

0.080

0.440

0.330

0.5160

0.2050

```
In [31]: from sklearn.preprocessing import scale
    X_Scaled = pd.DataFrame(scale(x), columns=x.columns)
    X_Scaled.head()
```

#### Out[31]:

	Length	Diameter	Height	Whole_weight	Shucked_weight	Viscera_weight	Shell_weight	Age
0	-0.574558	-0.432149	-1.064424	-0.641898	-0.607685	-0.726212	-0.638217	1.577830
1	-1.448986	-1.439929	-1.183978	-1.230277	-1.170910	-1.205221	-1.212987	-0.919022
2	0.050033	0.122130	-0.107991	-0.309469	-0.463500	-0.356690	-0.207139	-0.294809
3	-0.699476	<b>-</b> 0.432149	-0.347099	-0.637819	-0.648238	-0.607600	-0.602294	0.017298
4	-1.615544	-1.540707	-1.423087	-1.272086	-1.215968	-1.287337	-1.320757	-0.919022

## 10. Split the data into training and testing

```
In [32]: 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)

In [33]: X_Train.shape,X_Test.shape

Out[33]: ((3341, 8), (836, 8))

In [34]: Y_Train.shape,Y_Test.shape

Out[34]: ((3341,), (836,))
```

In [35]: X\_Train.head()

Out[35]:

	Length	Diameter	Height	Whole_weight	Shucked_weight	Viscera_weight	Shell_weight	Age
3141	-2.864726	-2.750043	-1.423087	-1.622870	-1.553902	-1.583867	-1.644065	-1.543234
3521	-2.573250	<b>-</b> 2.598876	-2.020857	-1.606554	-1.551650	-1.565619	-1.626104	-1.387181
883	1.132658	1.230689	0.728888	1.145672	1.041436	0.286552	1.538726	1.577830
3627	1.590691	1.180300	1.446213	2.164373	2.661269	2.330326	1.377072	0.017298
2106	0.591345	0.474853	0.370226	0.432887	0.255175	0.272866	0.906479	1.265723

In [38]: X\_Test.head()

Out[38]:

	Length	Diameter	Height	Whole_weight	Shucked_weight	Viscera_weight	Shell_weight	Age
668	0.216591	0.172519	0.370226	0.181016	-0.368878	0.569396	0.690940	0.953617
1580	-0.199803	-0.079426	-0.466653	-0.433875	-0.443224	-0.343004	-0.325685	-0.606915
3784	0.799543	0.726798	0.370226	0.870348	0.755318	1.764639	0.565209	0.329404
463	-2.531611	-2.447709	-2.020857	-1.579022	-1.522362	-1.538247	-1.572219	-1.543234
2615	1.007740	0.928354	0.848442	1.390405	1.415417	1.778325	0.996287	0.641511

In [36]: Y\_Train.head()

Out[36]: 3141

3141 1

3521 1

883 2

3627 2

2106 2

Name: Sex, dtype: int64

### 11. Build the Model

```
In [39]: from sklearn.ensemble import RandomForestClassifier
    model = RandomForestClassifier(n_estimators=10,criterion='entropy')

In [40]: model.fit(X_Train,Y_Train)

Out[40]: RandomForestClassifier(criterion='entropy', n_estimators=10)

In [41]: y_predict = model.predict(X_Test)

In [42]: y_predict_train = model.predict(X_Train)
```

## 12. Train the Model

### 13.Test the Model

```
In [45]: print('Testing accuracy: ',accuracy_score(Y_Test,y_predict))
```

Testing accuracy: 0.5478468899521531

## 14. Measure the performance using Metrics

```
In [46]: | pd.crosstab(Y_Test,y_predict)
Out[46]:
          col 0
                         2
            Sex
             0 132 24
                 45 211 35
                     56 115
             2 125
In [47]: print(classification_report(Y_Test,y_predict))
                        precision
                                     recall f1-score
                                                         support
                     0
                             0.44
                                       0.53
                                                  0.48
                                                             249
                     1
                             0.73
                                       0.73
                                                  0.73
                                                             291
                     2
                                       0.39
                                                  0.43
                             0.47
                                                             296
                                                  0.55
                                                             836
             accuracy
                                                 0.54
                                                             836
            macro avg
                             0.55
                                       0.55
         weighted avg
                             0.55
                                       0.55
                                                  0.55
                                                             836
```