PROJECT TITLE: Airlines Data Analytics for Avaition Industry

Team ID : **PNT2022TMID11538**

In [ ]:

```
IN[]:import pandas as pd
     import numpy as np
     from matplotlib import pyplot as plt
     import seaborn as sns
     from sklearn.linear_model import LinearRegression
```

2. LOAD THE DATASET INTO **COLLAB**

In [ ]:

```
IN[]: df=pd.read_csv("/content/abalone.csv")
```

In [ ]:

```
      df['age'] = df['Rings']+1.5
      df = df.drop('Rings', axis = 1)
```

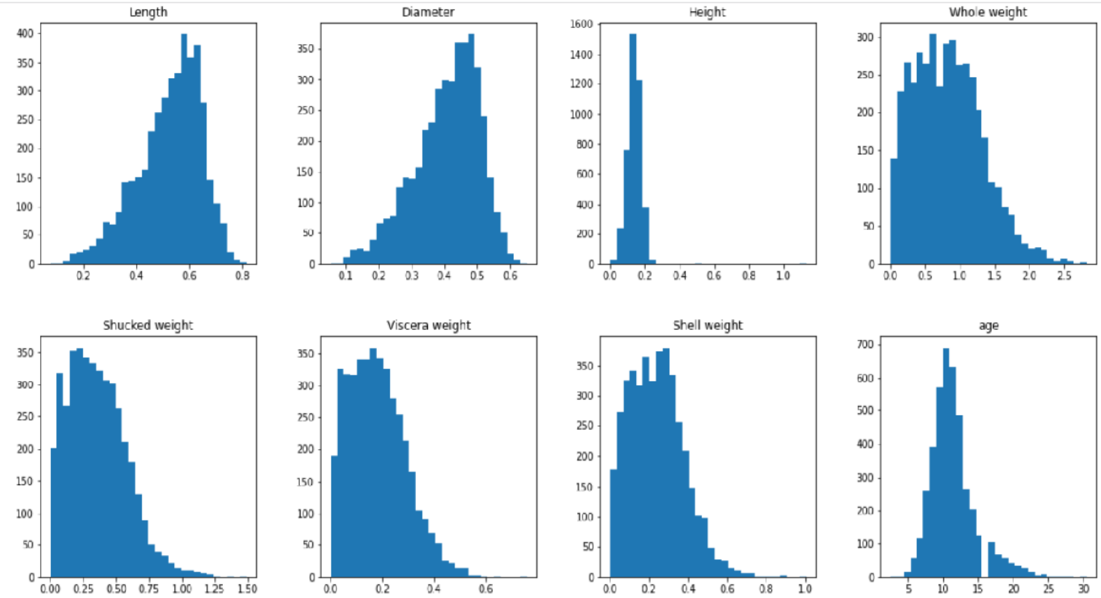
3. UNIVARIATE ANALYSIS

In [ ]:

```
IN[]:df.hist(figsize=(20,10), grid=False, layout=(2, 4), bins = 30)
```

Out[ ]:

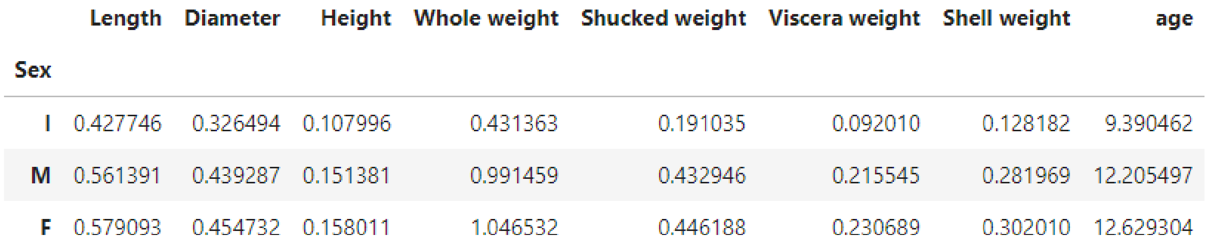
```
OUT[]:array([[,
        ,
        ,
        ],
       [,
        ,
        ,
        ]],
      dtype=object)
```



```
IN[]:df.groupby('Sex')[['Length', 'Diameter', 'Height', 'Whole weight', 'Shucked weight',
```

'Viscera weight', 'Shell weight', 'age']].mean().sort_values('age')

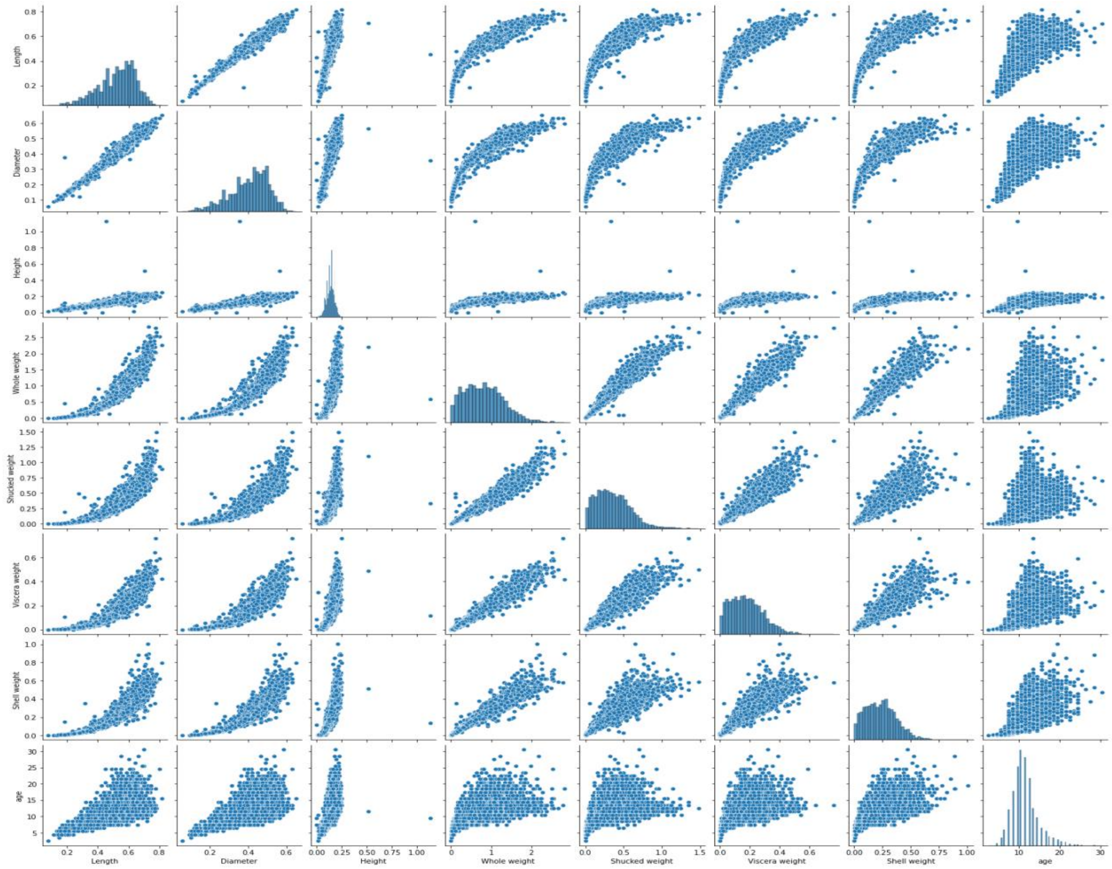
OUT[]:



	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	age
Sex								
I	0.427746	0.326494	0.107996	0.431363	0.191035	0.092010	0.128182	9.390462
M	0.561391	0.439287	0.151381	0.991459	0.432946	0.215545	0.281969	12.205497
F	0.579093	0.454732	0.158011	1.046532	0.446188	0.230689	0.302010	12.629304

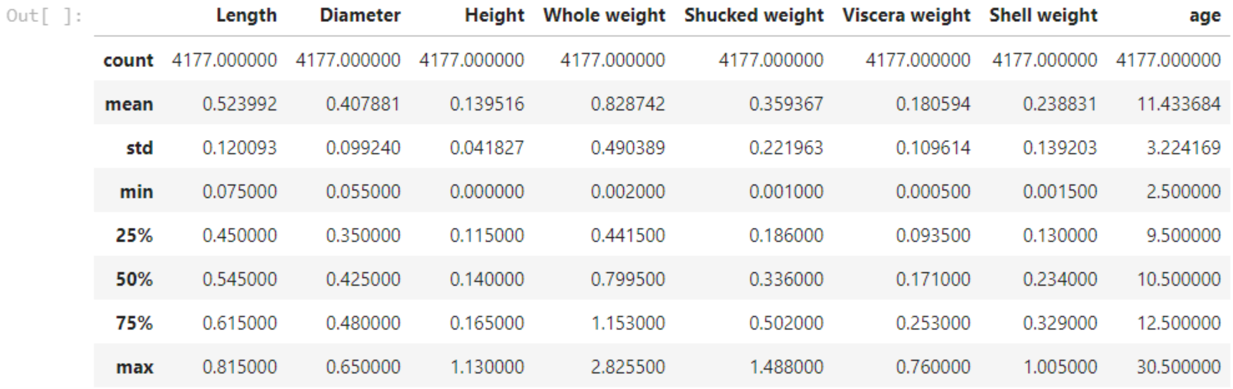
3. BIVARIATE ANALYSIS & MULTIVARIATE ANALYSIS

```
IN[]:numerical_features = df.select_dtypes(include = [np.number]).columns
     sns.pairplot(df[numerical_features])
```



4. Descriptive statistics

```
IN[]:df.describe()
```



Out[ ]:

	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	age
count	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000
mean	0.523992	0.407881	0.139516	0.828742	0.359367	0.180594	0.238831	11.433684
std	0.120093	0.099240	0.041827	0.490389	0.221963	0.109614	0.139203	3.224169
min	0.075000	0.055000	0.000000	0.002000	0.001000	0.000500	0.001500	2.500000
25%	0.450000	0.350000	0.115000	0.441500	0.186000	0.093500	0.130000	9.500000
50%	0.545000	0.425000	0.140000	0.799500	0.336000	0.171000	0.234000	10.500000
75%	0.615000	0.480000	0.165000	1.153000	0.502000	0.253000	0.329000	12.500000
max	0.815000	0.650000	1.130000	2.825500	1.488000	0.760000	1.005000	30.500000

5. Check for Missing Values

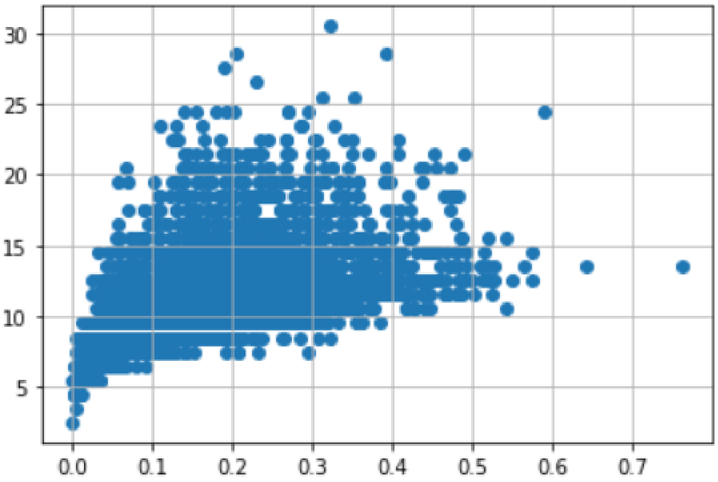
```
IN[]:df.isnull().sum()
```

```
OUT[]:Sex               0
      Length            0
      Diameter          0
      Height            0
      Whole weight      0
      Shucked weight    0
      Viscera weight    0
      Shell weight      0
      age               0
      dtype: int64
```

6. OUTLIER HANDLING

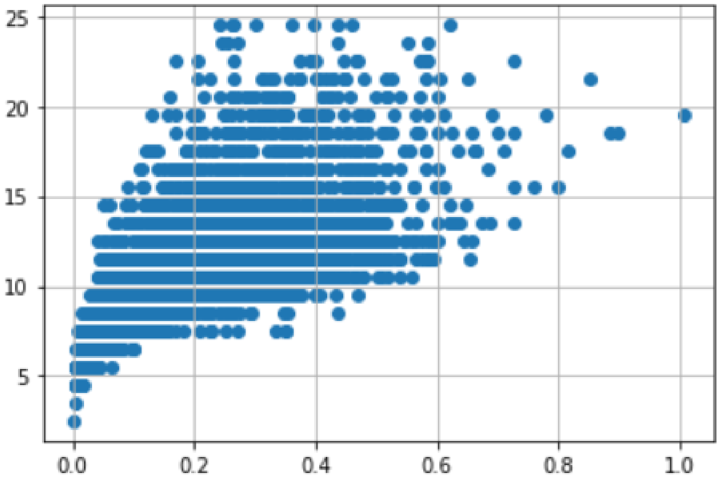
```
IN[]:df = pd.get_dummies(df)
     dummy_data = df.copy()
```

```
IN[]:var = 'Viscera weight'
     plt.scatter(x = df[var], y = df['age'],)
     plt.grid(True)
```



```
IN[]:# outliers removal
     df.drop(df[(df['Viscera weight']> 0.5) & (df['age'] < 20)].index,
inplace=True)
df.drop(df[(df['Viscera weight']<0.5) & (df['age'] > 25)].index,
inplace=True)
```

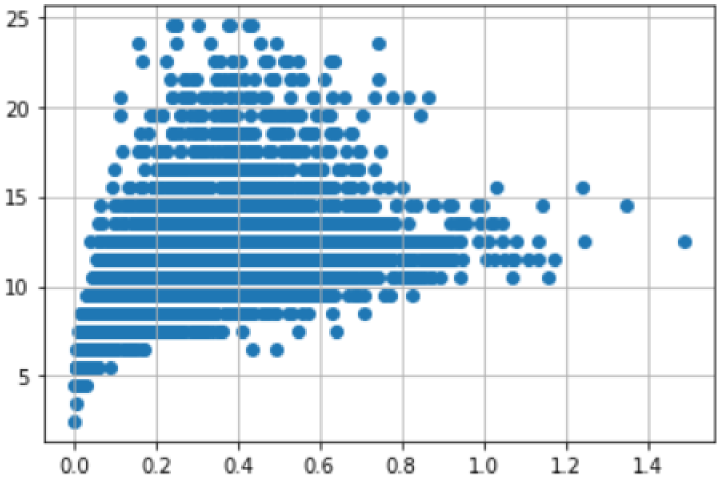
```
IN[]:var = 'Shell weight'
plt.scatter(x = df[var], y = df['age'],)
plt.grid(True)
#Outliers removal
df.drop(df[(df['Shell weight']> 0.6) & (df['age'] < 25)].index, inplace=True)
df.drop(df[(df['Shell weight']<0.8) & (df['age'] > 25)].index, inplace=True)
```



```
IN[]:var = 'Shucked weight'
```

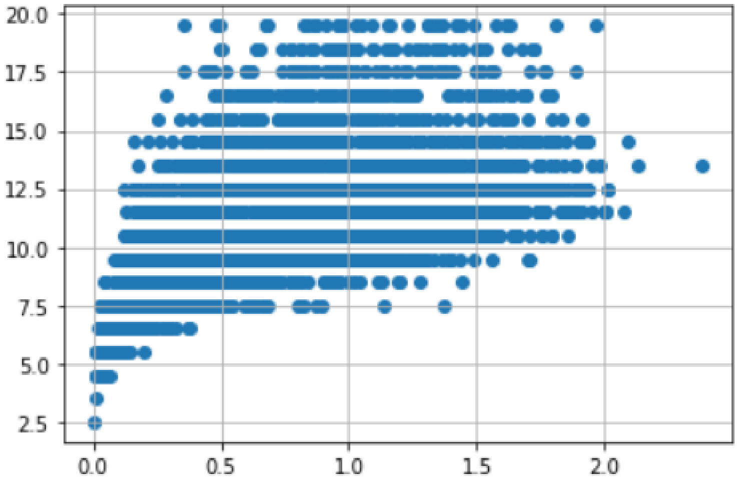
```
plt.scatter(x = df[var], y = df['age'],)
plt.grid(True)

#Outlier removal
df.drop(df[(df['Shucked weight']>= 1) & (df['age'] < 20)].index, inplace=True)
df.drop(df[(df['Shucked weight']<1) & (df['age'] > 20)].index, inplace=True)
```



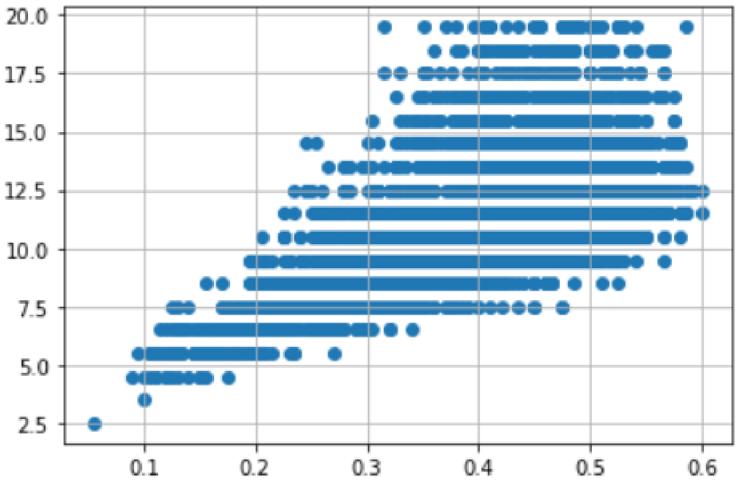
```
IN[]:var = 'Whole weight'
plt.scatter(x = df[var], y = df['age'])
plt.grid(True)

df.drop(df[(df['Whole weight'] >= 2.5) &
          (df['age'] < 25)].index, inplace = True)
df.drop(df[(df['Whole weight']<2.5) & (
df['age'] > 25)].index, inplace = True)
```

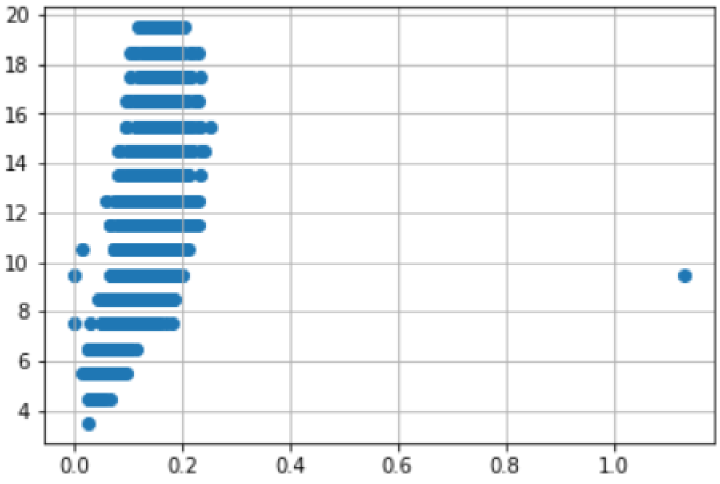


```
IN[]:var = 'Diameter'
plt.scatter(x = df[var], y = df['age'])
plt.grid(True)

df.drop(df[(df['Diameter'] <0.1) &
          (df['age'] < 5)].index, inplace = True)
df.drop(df[(df['Diameter']<0.6) & (
df['age'] > 25)].index, inplace = True)
df.drop(df[(df['Diameter']>=0.6) & (
df['age'] < 25)].index, inplace = True)
```

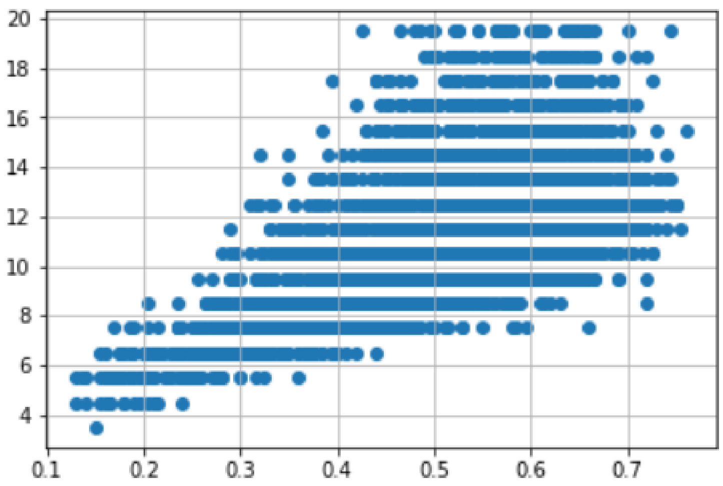


```
IN[]:var = 'Height'
     plt.scatter(x = df[var], y = df['age'])
     plt.grid(True)
     df.drop(df[(df['Height'] > 0.4) &
                (df['age'] < 15)].index, inplace = True)
     df.drop(df[(df['Height']<0.4) & (
     df['age'] > 25)].index, inplace = True)
```



```
IN[]:var = 'Length'
       plt.scatter(x = df[var], y = df['age'])
       plt.grid(True)

       df.drop(df[(df['Length'] <0.1) &
                  (df['age'] < 5)].index, inplace = True)
       df.drop(df[(df['Length']<0.8) & (
       df['age'] > 25)].index, inplace = True)
       df.drop(df[(df['Length']>=0.8) & (
       df['age'] < 25)].index, inplace = True)
```



7. Categorical columns

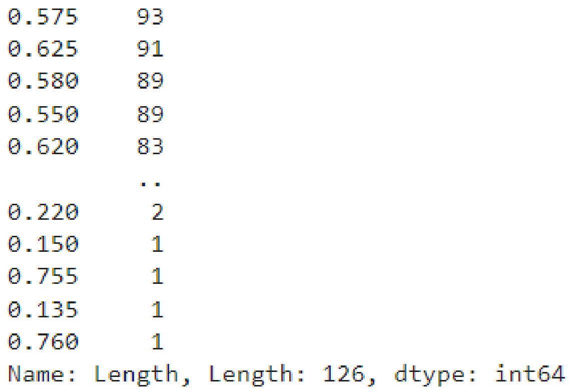
```
IN[]:numerical_features = df.select_dtypes(include = [np.number]).columns
     categorical_features = df.select_dtypes(include = [np.object]).columns

     /usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:2:
     DeprecationWarning: `np.object` is a deprecated alias for the builtin
     `object`. To silence this warning, use `object` by itself. Doing this
     will not modify any behavior and is safe.
     Deprecated in NumPy 1.20; for more details and guidance:
     https://numpy.org/devdocs/release/1.20.0-notes.html#deprecations


     numerical_features
OUT[]:Index(['Length', 'Diameter', 'Height', 'Whole weight', 'Shucked
weight',
        'Viscera weight', 'Shell weight', 'age', 'Sex_F', 'Sex_I', 'Sex_M'],
       dtype='object')
categorical_features
OUT[]:Index([], dtype='object')
```

ENCODING

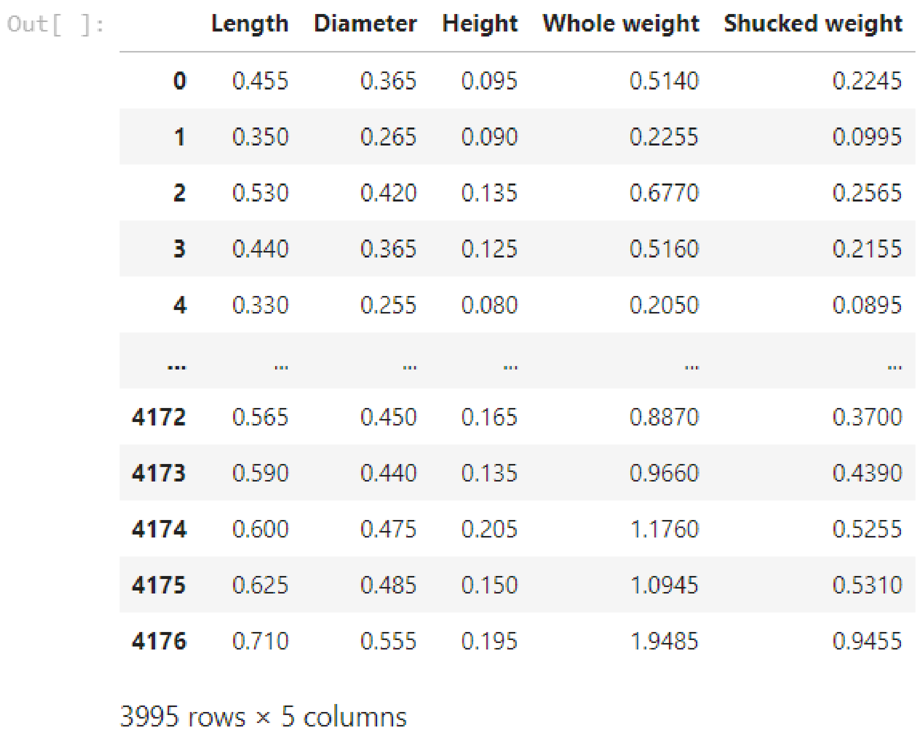
```
IN[]:from sklearn.preprocessing import LabelEncoder
      le=LabelEncoder()
      print(df.Length.value_counts())
```



```
0.575    93
0.625    91
0.580    89
0.550    89
0.620    83
         ..
0.220     2
0.150     1
0.755     1
0.135     1
0.760     1
Name: Length, Length: 126, dtype: int64
```

8. Split the dependent and independent variables

```
IN[]: x=df.iloc[:,:5]
      X
```

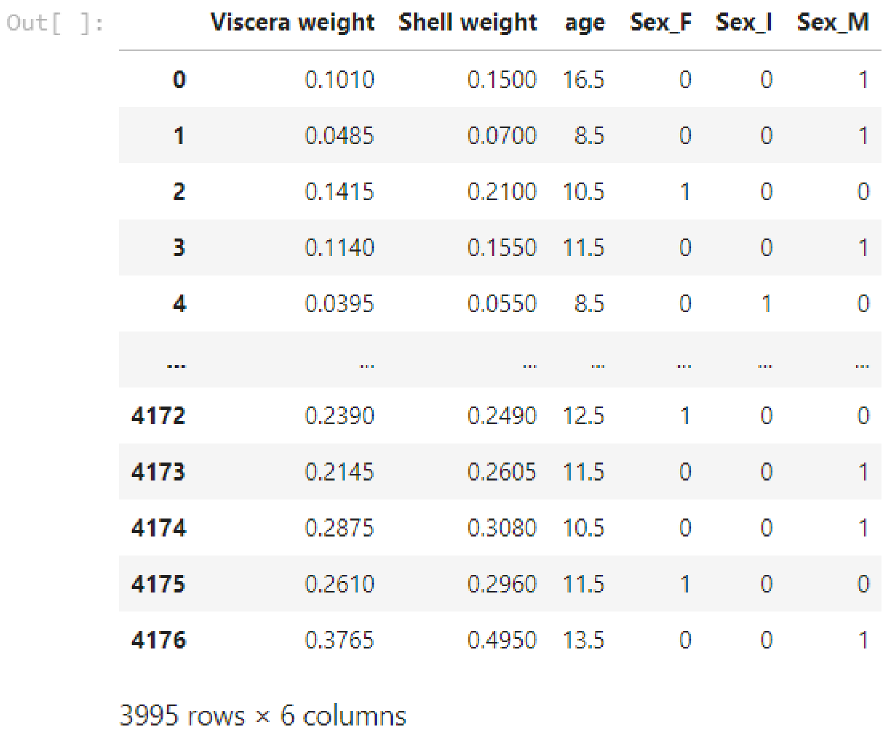


Out[ ]:

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

3995 rows × 5 columns

```
IN[]:y=df.iloc[:,5:]
      Y
```



Out[ ]:

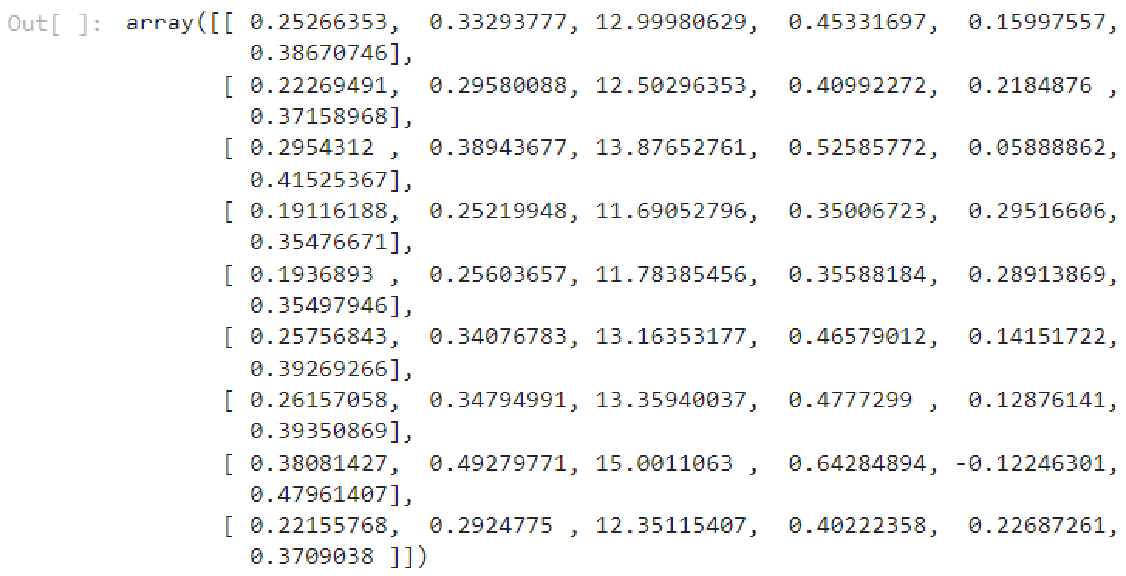
	Viscera weight	Shell weight	age	Sex_F	Sex_I	Sex_M
0	0.1010	0.1500	16.5	0	0	1
1	0.0485	0.0700	8.5	0	0	1
2	0.1415	0.2100	10.5	1	0	0
3	0.1140	0.1550	11.5	0	0	1
4	0.0395	0.0550	8.5	0	1	0
...	...	...	...	...	...	...
4172	0.2390	0.2490	12.5	1	0	0
4173	0.2145	0.2605	11.5	0	0	1
4174	0.2875	0.3080	10.5	0	0	1
4175	0.2610	0.2960	11.5	1	0	0
4176	0.3765	0.4950	13.5	0	0	1

3995 rows × 6 columns

9. Feature Scaling

```
IN[]:from sklearn.preprocessing import StandardScaler
     ss=StandardScaler()
     x_train=ss.fit_transform(x_train)
IN[]:mlrpred=mlr.predict(x_test[0:9])


/usr/local/lib/python3.7/dist-packages/sklearn/base.py:444: UserWarning: X
    has feature names, but LinearRegression was fitted without feature names
  f"X has feature names, but {self.__class__.__name__} was fitted without"
IN[]:mlrpred
```



```
Out[ ]: array([[ 0.25266353,  0.33293777, 12.99980629,  0.45331697,  0.15997557,
                 0.38670746],
               [ 0.22269491,  0.29580088, 12.50296353,  0.40992272,  0.2184876 ,
                 0.37158968],
               [ 0.2954312 ,  0.38943677, 13.87652761,  0.52585772,  0.05888862,
                 0.41525367],
               [ 0.19116188,  0.25219948, 11.69052796,  0.35006723,  0.29516606,
                 0.35476671],
               [ 0.1936893 ,  0.25603657, 11.78385456,  0.35588184,  0.28913869,
                 0.35497946],
               [ 0.25756843,  0.34076783, 13.16353177,  0.46579012,  0.14151722,
                 0.39269266],
               [ 0.26157058,  0.34794991, 13.35940037,  0.4777299 ,  0.12876141,
                 0.39350869],
               [ 0.38081427,  0.49279771, 15.0011063 ,  0.64284894, -0.12246301,
                 0.47961407],
               [ 0.22155768,  0.2924775 , 12.35115407,  0.40222358,  0.22687261,
                 0.3709038 ]])
```

10. Train , Test , Split

```
IN[]:from sklearn.model_selection import train_test_split
     x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2)
```

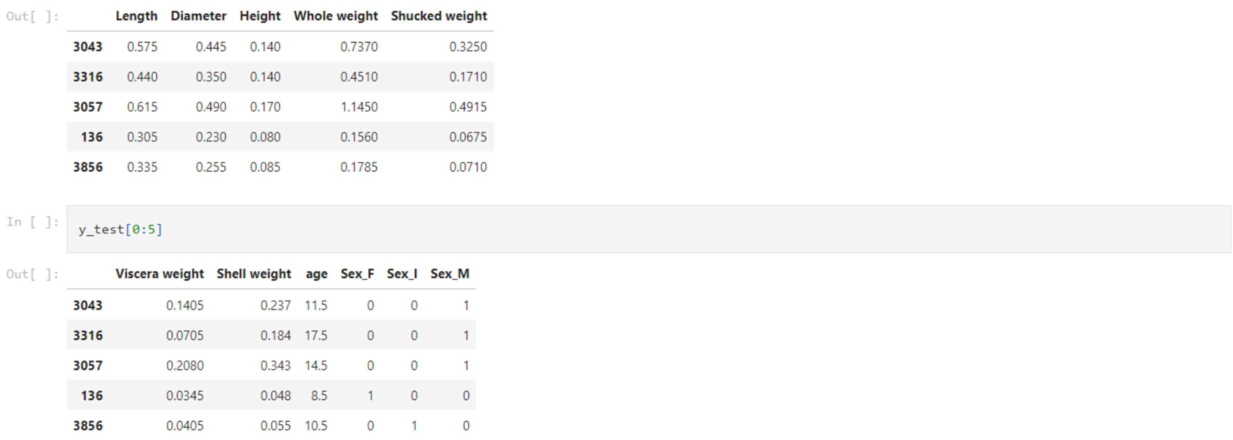
11.Model building

```
IN[]:from sklearn.linear_model import LinearRegression
     mlr=LinearRegression()
     mlr.fit(x_train,y_train)
```

```
LinearRegression()
```

12 & 13. Train and Test the model

```
IN[]:x_test[0:5]
```



Out[ ]:

	Length	Diameter	Height	Whole weight	Shucked weight
3043	0.575	0.445	0.140	0.7370	0.3250
3316	0.440	0.350	0.140	0.4510	0.1710
3057	0.615	0.490	0.170	1.1450	0.4915
136	0.305	0.230	0.080	0.1560	0.0675
3856	0.335	0.255	0.085	0.1785	0.0710

```
In [ ]: y_test[0:5]
```

Out[ ]:

	Viscera weight	Shell weight	age	Sex_F	Sex_I	Sex_M
3043	0.1405	0.237	11.5	0	0	1
3316	0.0705	0.184	17.5	0	0	1
3057	0.2080	0.343	14.5	0	0	1
136	0.0345	0.048	8.5	1	0	0
3856	0.0405	0.055	10.5	0	1	0

14. Measure the performance using metrics

```
IN[]:from sklearn.metrics import r2_score
     r2_score(mlr.predict(x_test),y_test)
```

```
/usr/local/lib/python3.7/dist-packages/sklearn/base.py:444: UserWarning: X
has feature names, but LinearRegression was fitted without feature names
  f"X has feature names, but {self.__class__.__name__} was fitted without"
```

```
OUT[]:-53.57731200465721
```