Assignment 4 - 727619BIT026.ipy | IBM-Project-2330-1658469808/

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# Assignment 4 - 727619BIT026.ipynb

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```
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] from google.colab import drive
    drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

```
[6] df=pd.read_csv("/content/drive/MyDrive/abalone.csv")
```

```
[7] df
```

| | Sex | Length | Diameter | Height | Whole weight | Shucked weight | Viscera weight | Shell weight | Rings |
|---|---|---|---|---|---|---|---|---|---|
| 0 | M | 0.455 | 0.365 | 0.095 | 0.5140 | 0.2245 | 0.1010 | 0.1500 | 15 |
| 1 | M | 0.350 | 0.265 | 0.090 | 0.2255 | 0.0995 | 0.0485 | 0.0700 | 7 |
| 2 | F | 0.530 | 0.420 | 0.135 | 0.6770 | 0.2565 | 0.1415 | 0.2100 | 9 |
| 3 | M | 0.440 | 0.365 | 0.125 | 0.5160 | 0.2155 | 0.1140 | 0.1550 | 10 |
| 4 | I | 0.330 | 0.255 | 0.080 | 0.2050 | 0.0895 | 0.0395 | 0.0550 | 7 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |

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# Assignment 4 - 727619BIT026.ipynb

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[7] df

| | Sex | Length | Diameter | Height | Whole weight | Shucked weight | Viscera weight | Shell weight | Rings |
|---|---|---|---|---|---|---|---|---|---|
| 0 | M | 0.455 | 0.365 | 0.095 | 0.5140 | 0.2245 | 0.1010 | 0.1500 | 15 |
| 1 | M | 0.350 | 0.265 | 0.090 | 0.2255 | 0.0995 | 0.0485 | 0.0700 | 7 |
| 2 | F | 0.530 | 0.420 | 0.135 | 0.6770 | 0.2565 | 0.1415 | 0.2100 | 9 |
| 3 | M | 0.440 | 0.365 | 0.125 | 0.5160 | 0.2155 | 0.1140 | 0.1550 | 10 |
| 4 | I | 0.330 | 0.255 | 0.080 | 0.2050 | 0.0895 | 0.0395 | 0.0550 | 7 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 4172 | F | 0.565 | 0.450 | 0.165 | 0.8870 | 0.3700 | 0.2390 | 0.2490 | 11 |
| 4173 | M | 0.590 | 0.440 | 0.135 | 0.9660 | 0.4390 | 0.2145 | 0.2605 | 10 |
| 4174 | M | 0.600 | 0.475 | 0.205 | 1.1760 | 0.5255 | 0.2875 | 0.3080 | 9 |
| 4175 | F | 0.625 | 0.485 | 0.150 | 1.0945 | 0.5310 | 0.2610 | 0.2960 | 10 |
| 4176 | M | 0.710 | 0.555 | 0.195 | 1.9485 | 0.9455 | 0.3765 | 0.4950 | 12 |

4177 rows × 9 columns

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

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

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# Assignment 4 - 727619BIT026.ipynb

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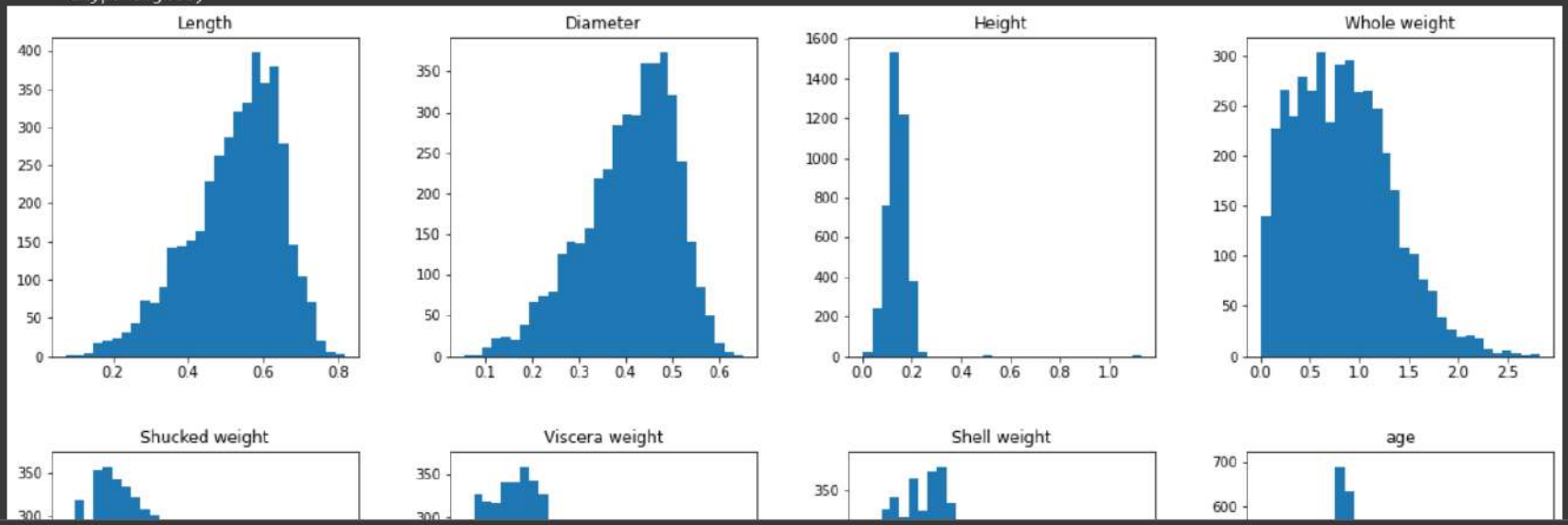
```
df.hist(figsize=(20,10), grid=False, layout=(2, 4), bins = 30)
```

```
array([[<matplotlib.axes._subplots.AxesSubplot object at 0x7fb713862c50>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x7fb71272eb90>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x7fb7126751d0>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x7fb7126aa7d0>],
       [<matplotlib.axes._subplots.AxesSubplot object at 0x7fb712661dd0>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x7fb712625410>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x7fb7125dba90>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x7fb712592fd0>]],
      dtype=object)
```

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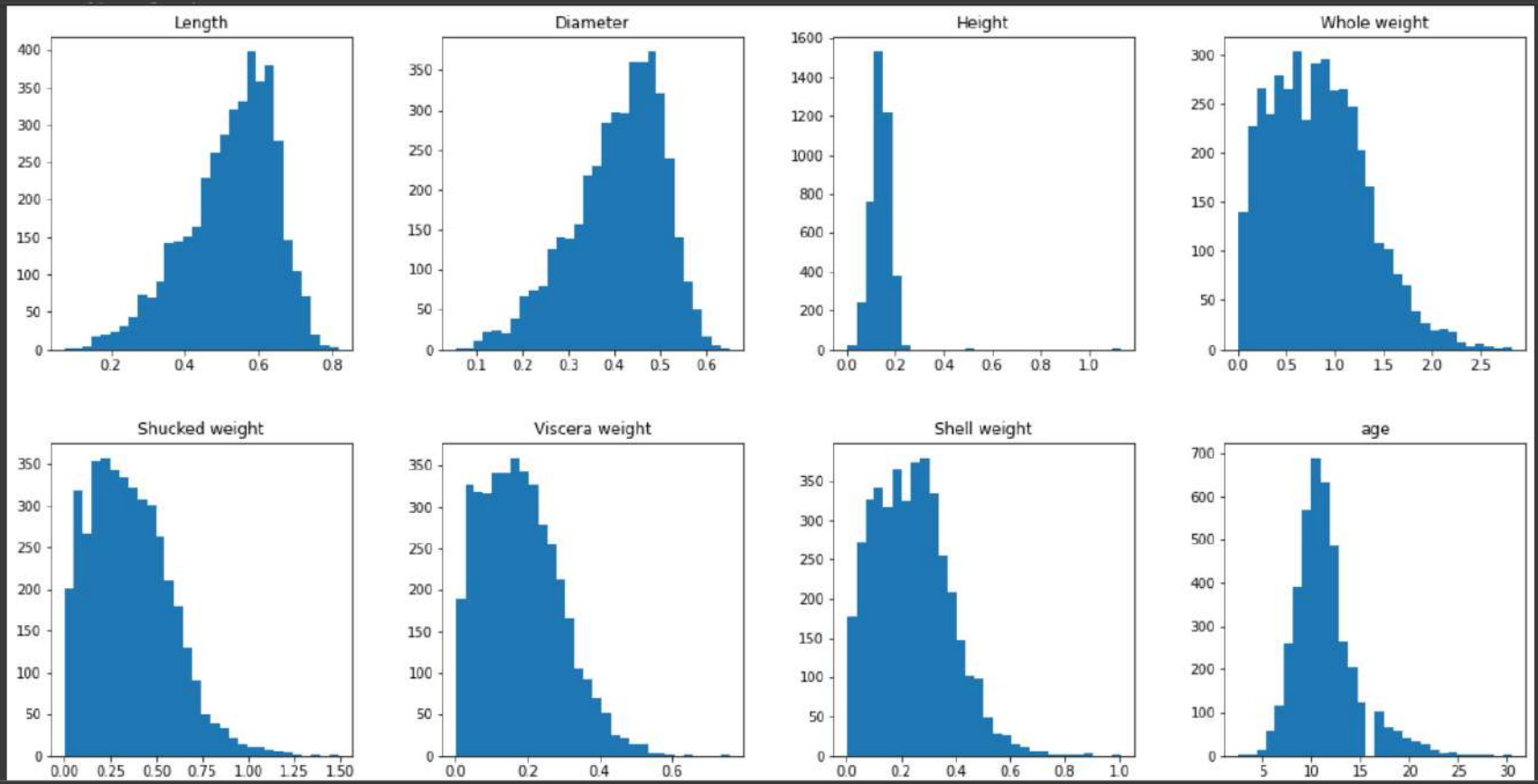

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# Assignment 4 - 727619BIT026.ipynb

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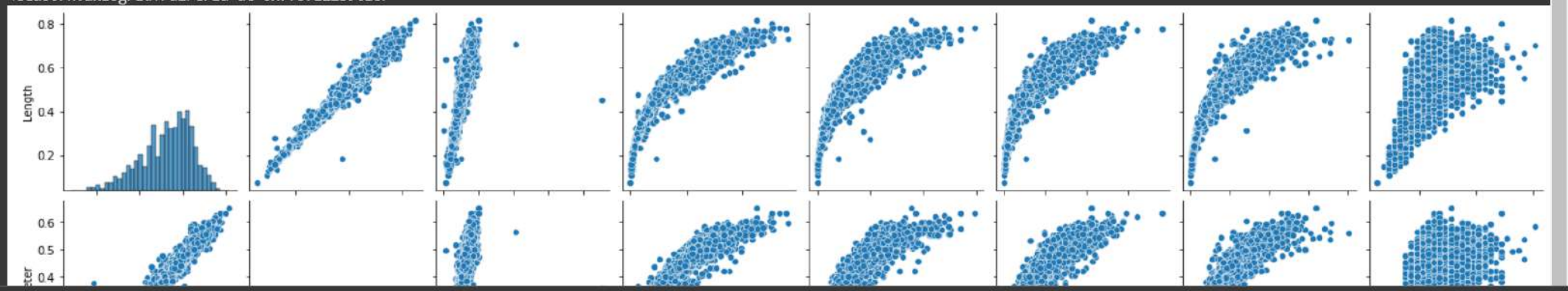
```
df.groupby('Sex')[['Length', 'Diameter', 'Height', 'Whole weight', 'Shucked weight',
       'Viscera weight', 'Shell weight', 'age']].mean().sort_values('age')
```

| Sex | Length | Diameter | Height | Whole weight | Shucked weight | Viscera weight | Shell weight | age |
|---|---|---|---|---|---|---|---|---|
| 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 |

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

```
<seaborn.axisgrid.PairGrid at 0x7fb7122b9c10>
```

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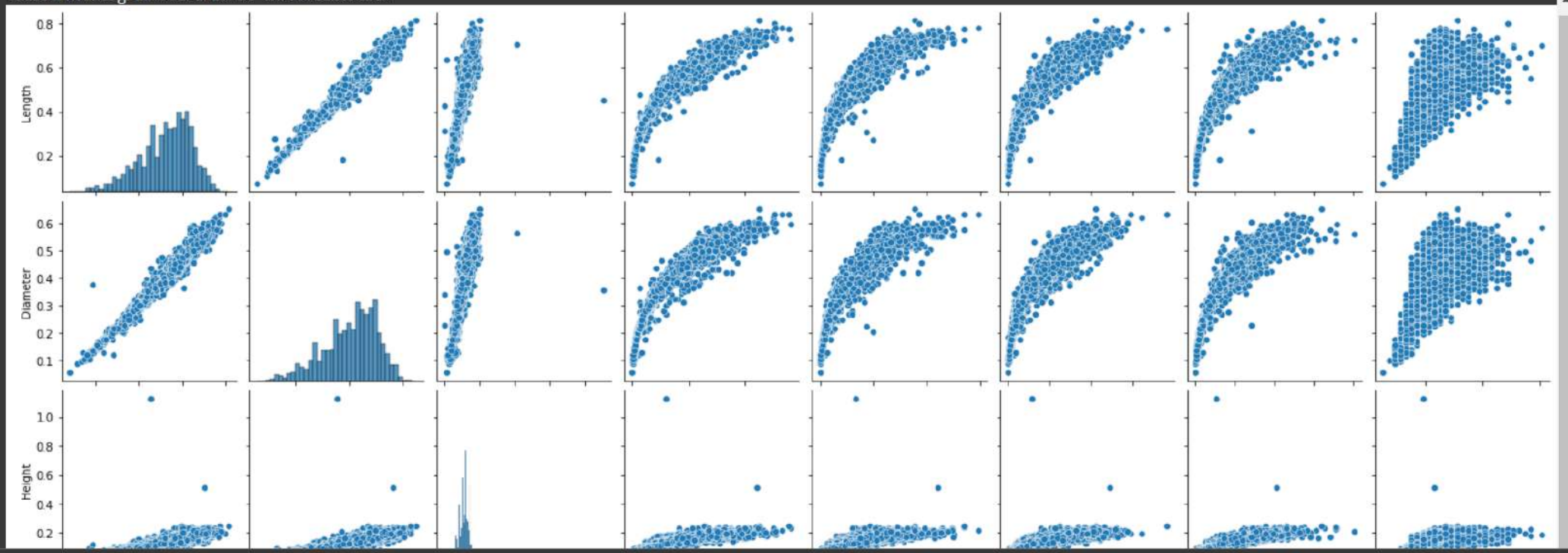
```
[11] numerical_features = df.select_dtypes(include = [np.number]).columns
     sns.pairplot(df[numerical_features])
```

```
<seaborn.axisgrid.PairGrid at 0x7fb7122b9c10>
```

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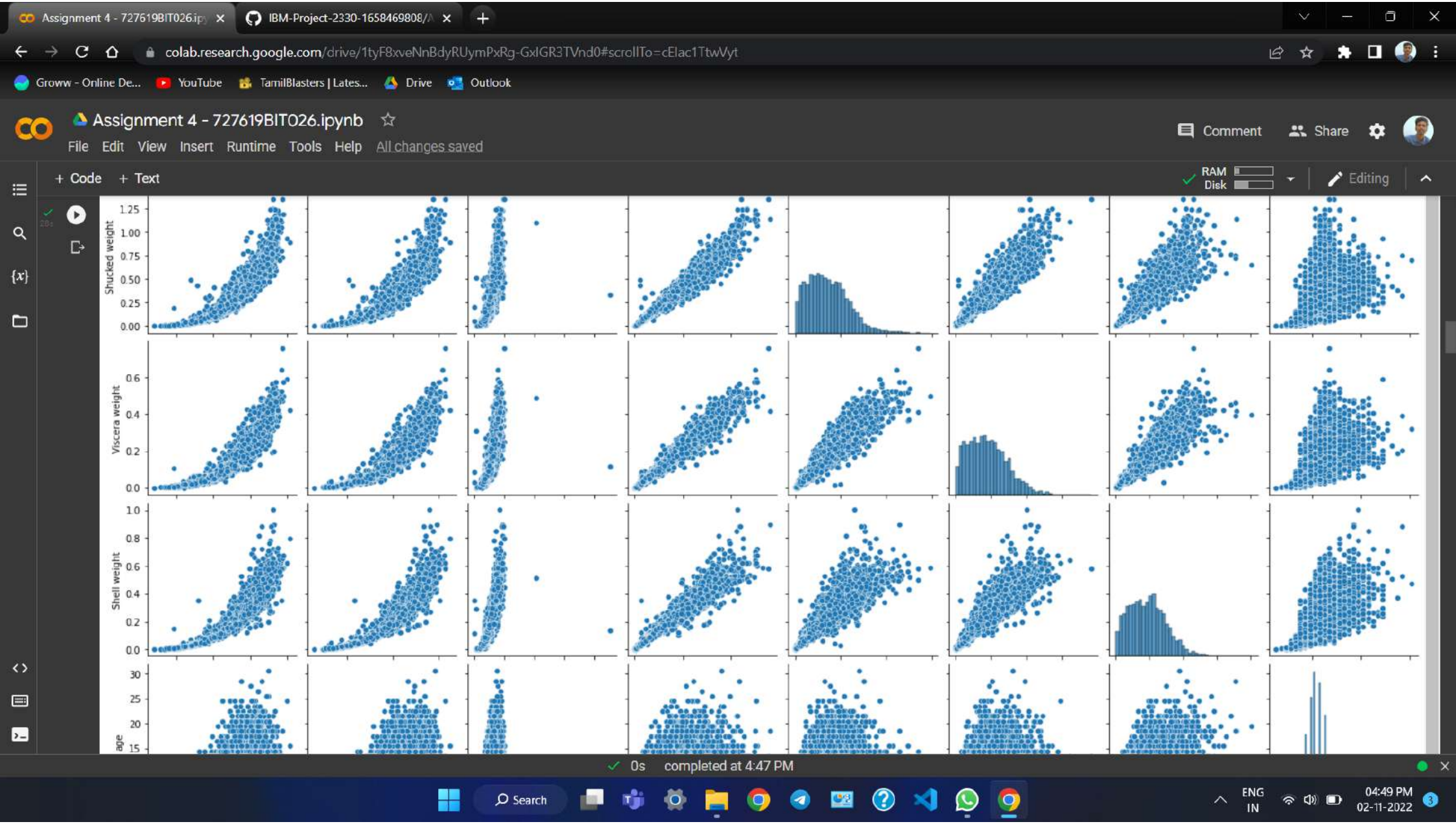
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```
df.describe()
```

| | 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 |

```
[13] 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
```

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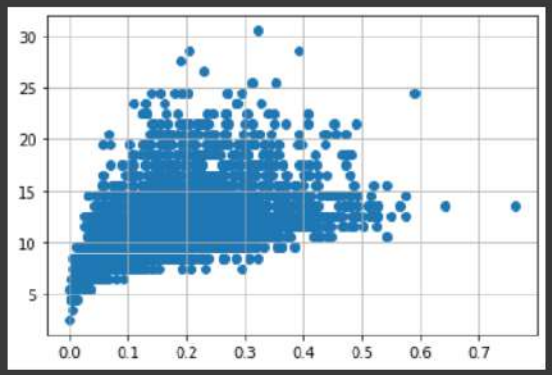
```
[14] df = pd.get_dummies(df)
     dummy_data = df.copy()
```

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




```
[16] 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)
```

```
[17] var = 'Shell weight'
     plt.scatter(x = df[var], y = df['age'],)
     plt.grid(True)
     #Outliers removal
```

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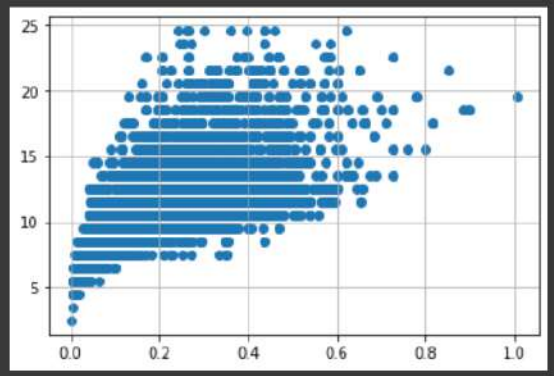
```
var = 'Shell weight'
plt.scatter(x = df[var], y = df['age'],)
plt.grid(True)
#Outliers removal
df.drop(df[(df['Shell weight']> 0.6) & (df['age'] < 25)].index, inplace=True)
df.drop(df[(df['Shell weight']<0.8) & (df['age'] > 25)].index, inplace=True)
```




```
[18] 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)
```

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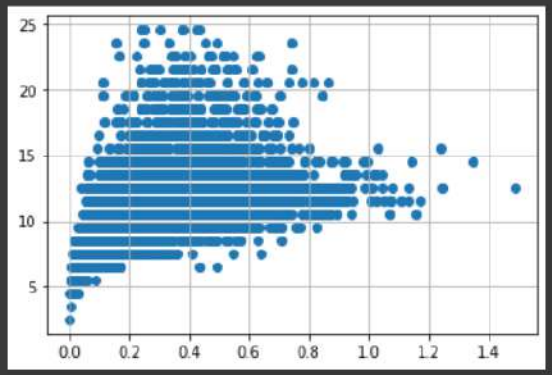


[19]
```
var = 'Whole weight'
plt.scatter(x = df[var], y = df['age'])
plt.grid(True)

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)
```


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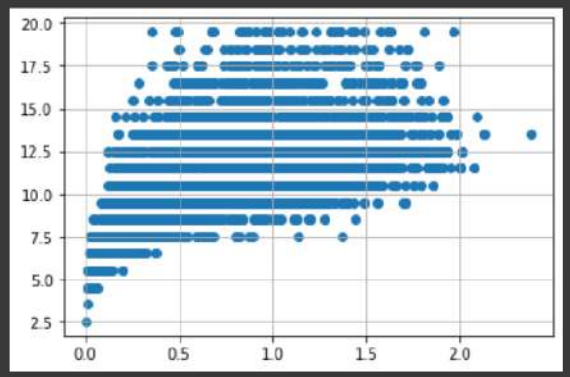
```
            (df['age'] < 25)].index, inplace = True)
df.drop(df[(df['Whole weight']<2.5) & (
df['age'] > 25)].index, inplace = True)
```




```
[20] 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)
```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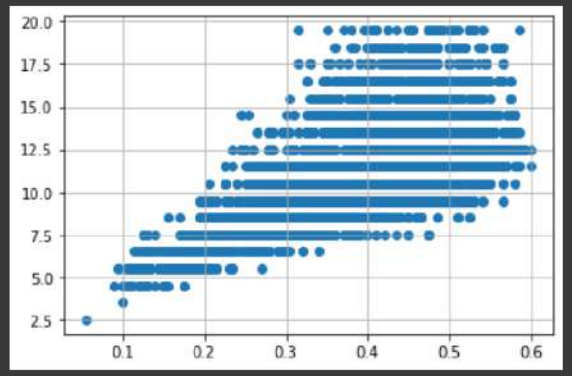
```
            (df['age'] < 5)].index, inplace = True)
df.drop(df[(df['Diameter']<0.6) & (
df['age'] > 25)].index, inplace = True)
df.drop(df[(df['Diameter']>=0.6) & (
df['age'] < 25)].index, inplace = True)
```




[21]
```
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)
```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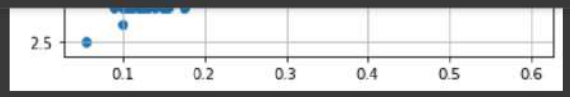
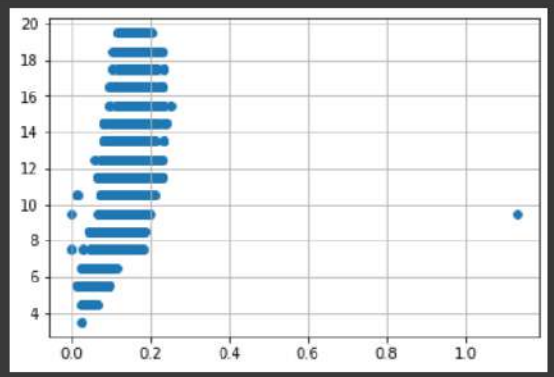
[20]




```
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)
```




[22]

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

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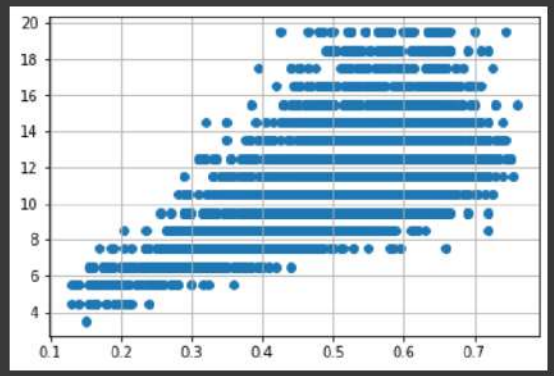
```
[22] var = 'Length'
     plt.scatter(x = df[var], y = df['age'])
     plt.grid(True)

     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)
```




```
[23] 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
Deprecated in NumPy 1.20; for more details and guidance: https://numpy.org/devdocs/release/1.20.0-notes.html#deprecations
```

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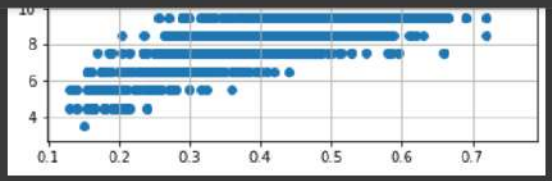
[22]




```
[23] 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
Deprecated in NumPy 1.20; for more details and guidance: https://numpy.org/devdocs/release/1.20.0-notes.html#deprecations
```

```
[24] numerical_features
```

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

```
[25] categorical_features
```

```
Index([], dtype='object')
```

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

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[24] numerical_features

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

[25] categorical_features

```
Index([], dtype='object')
```

```
[ ] 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
```

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# Assignment 4 - 727619BIT026.ipynb

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```
0.760     1
Name: Length, Length: 126, dtype: int64
```

[26]
```
x=df.iloc[:,:5]
x
```

| | 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

[27]
```
y=df.iloc[:,5:]
```

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```
[27] y=df.iloc[:,5:]
     y
```

| | 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

```
[28] 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)
```

```
[29] from sklearn.linear_model import LinearRegression
```

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```
[28] 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)
```

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

```
LinearRegression()
```

```
[30] x_test[0:5]
```

| | Length | Diameter | Height | Whole weight | Shucked weight |
|---|---|---|---|---|---|
| **1809** | 0.640 | 0.475 | 0.140 | 1.0725 | 0.4895 |
| **2506** | 0.375 | 0.300 | 0.075 | 0.1440 | 0.0590 |
| **2369** | 0.560 | 0.440 | 0.170 | 0.9445 | 0.3545 |
| **3577** | 0.600 | 0.475 | 0.230 | 1.1570 | 0.5220 |
| **2869** | 0.370 | 0.280 | 0.085 | 0.1980 | 0.0805 |

```
[31] y_test[0:5]
```

| | Viscera weight | Shell weight | age | Sex_F | Sex_I | Sex_M |
|---|---|---|---|---|---|---|
| **1809** | 0.2295 | 0.310 | 9.5 | 1 | 0 | 0 |

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[31] y_test[0:5]

| | Viscera weight | Shell weight | age | Sex_F | Sex_I | Sex_M |
|---|---|---|---|---|---|---|
| **1809** | 0.2295 | 0.310 | 9.5 | 1 | 0 | 0 |
| **2506** | 0.0300 | 0.044 | 8.5 | 0 | 1 | 0 |
| **2369** | 0.2175 | 0.300 | 13.5 | 0 | 1 | 0 |
| **3577** | 0.2235 | 0.360 | 12.5 | 0 | 0 | 1 |
| **2869** | 0.0455 | 0.058 | 6.5 | 0 | 1 | 0 |

[32]
```
from sklearn.preprocessing import StandardScaler
ss=StandardScaler()
x_train=ss.fit_transform(x_train)
```

[33] mlrpred=mlr.predict(x_test[0:9])

[34] mlrpred

```
array([[ 0.23724206,  0.28762719, 11.33779331,  0.32597418,  0.263786  ,
         0.41023982],
       [ 0.02800235,  0.05602483,  8.95920642,  0.09936378,  0.71899922,
         0.18163701],
       [ 0.21233191,  0.29619422, 13.23170802,  0.44369084,  0.14988261,
         0.40642655],
       [ 0.25581777,  0.34225978, 13.56715107,  0.52538667, -0.04653311,
         0.52114644],
```

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RAM Disk Editing

```
mlrpred
```

```
array([[ 0.23724206,  0.28762719, 11.33779331,  0.32597418,  0.263786  ,
         0.41023982],
       [ 0.02800235,  0.05602483,  8.95920642,  0.09936378,  0.71899922,
         0.18163701],
       [ 0.21233191,  0.29619422, 13.23170802,  0.44369084,  0.14988261,
         0.40642655],
       [ 0.25581777,  0.34225978, 13.56715107,  0.52538667, -0.04653311,
         0.52114644],
       [ 0.04284146,  0.06607175,  8.9115833 ,  0.09880874,  0.70608811,
         0.19510315],
       [ 0.12993526,  0.18904414, 11.3359012 ,  0.29656264,  0.38645424,
         0.31698312],
       [ 0.24608307,  0.3097537 , 11.87958685,  0.38981072,  0.16508757,
         0.44510171],
       [ 0.33539203,  0.41945829, 13.66126541,  0.54167171, -0.10682847,
         0.56515676],
       [ 0.16836738,  0.22441874, 11.35510508,  0.30963623,  0.33582888,
         0.35453489]])
```

```
from sklearn.metrics import r2_score
r2_score(mlr.predict(x_test),y_test)
```

```
-3.2397564414374376
```

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