1.Libraries

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```
import numpy as np
import pandas as pd
import matplotlib.pyplot as tlp
%matplotlib inline
import seaborn as ss
```

2.Loading the dataset

```
from google.colab import files
upload=files.upload()
```

```
a=pd.read_csv('/content/abalone.csv')
```

```
a.head()
```

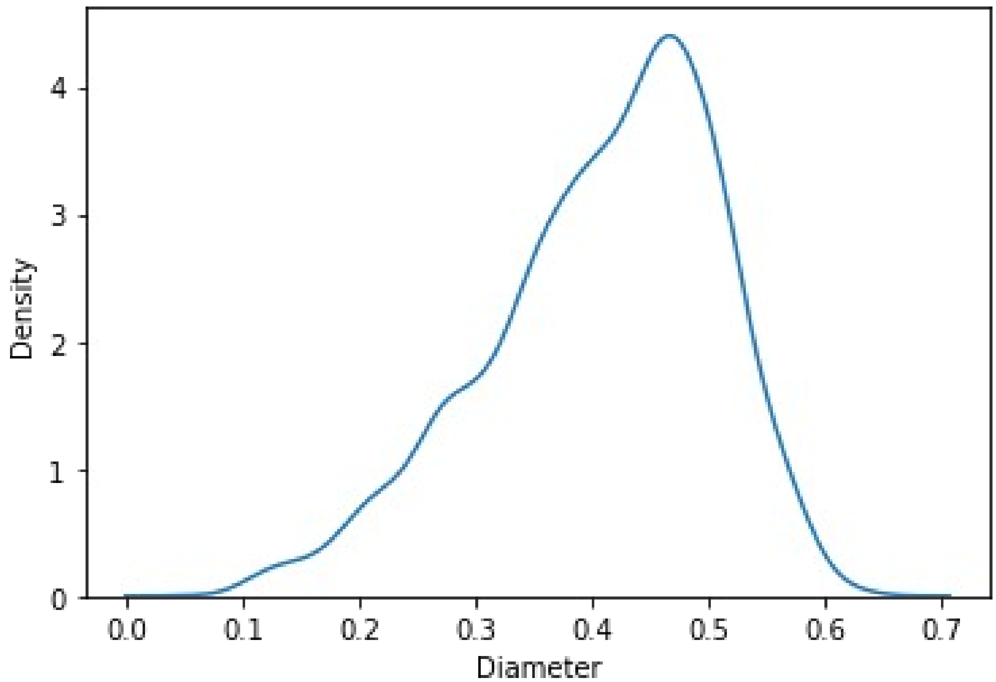
```
  Sex  Length  Diameter  Height  Whole weight  Shucked weight  Viscera
weight  \
0   M   0.455     0.365   0.095        0.5140          0.2245
0.1010
1   M   0.350     0.265   0.090        0.2255          0.0995
0.0485
2   F   0.530     0.420   0.135        0.6770          0.2565
0.1415
3   M   0.440     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
```

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

3.A. univariate Analysis

```
ss.kdeplot(a['Diameter'])
```

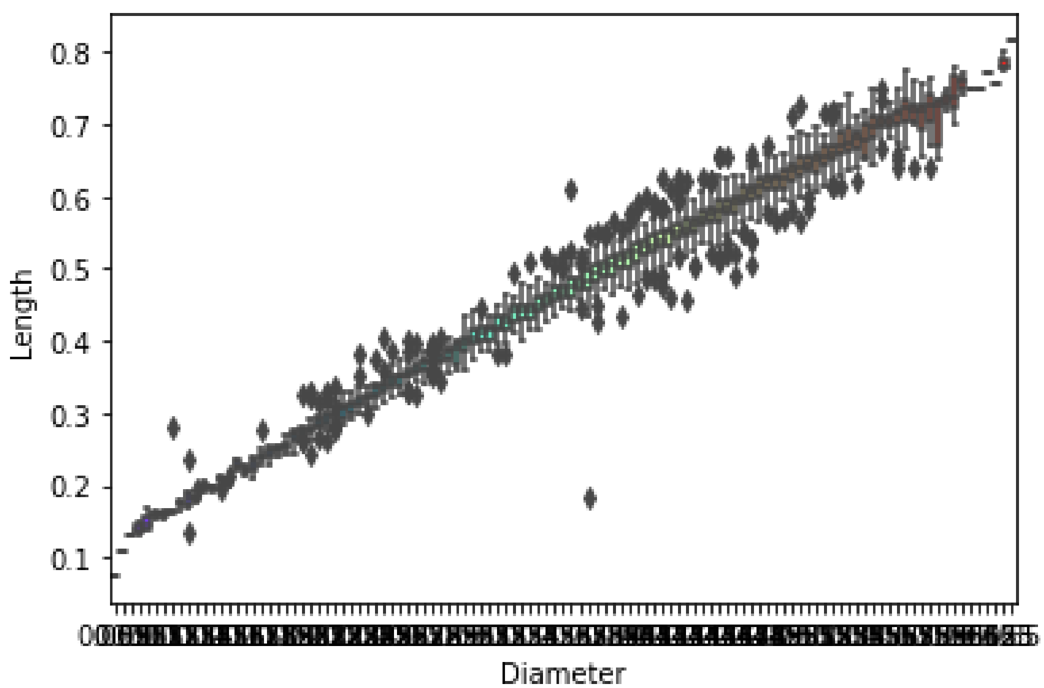
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fbad1961d90>
```



2.Bi-Variate Analysis

```
ss.boxplot(x=a.Diameter,y = a.Length, palette='rainbow')
```

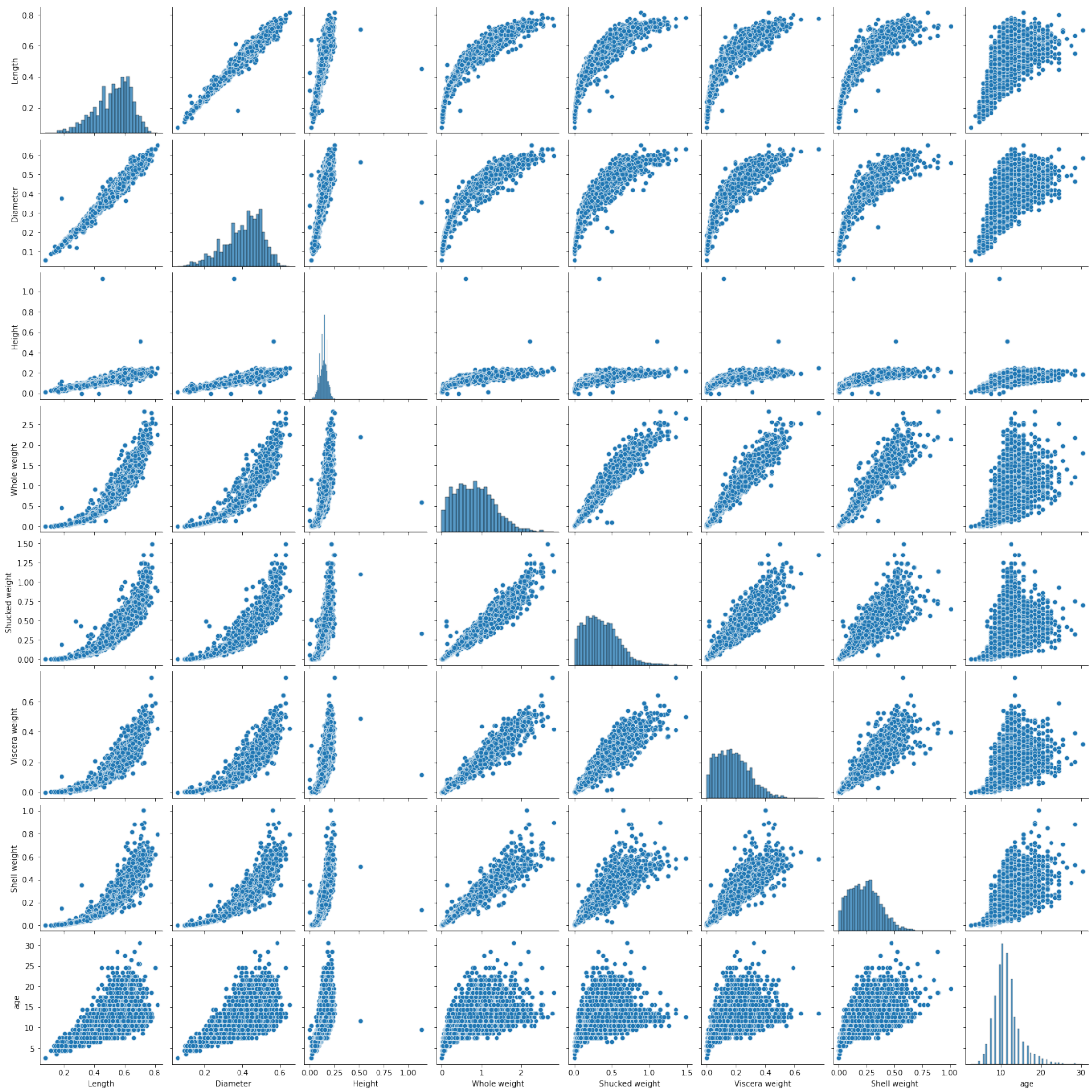
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fbad1844c50>
```



3.Multi-Variate Analysis

```
ss.pairplot(a)
```

```
<seaborn.axisgrid.PairGrid at 0x7fbad096df50>
```



4.Descriptive Statistics

```
a.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4177 entries, 0 to 4176
Data columns (total 9 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   Sex             4177 non-null   object 
 1   Length          4177 non-null   float64
 2   Diameter        4177 non-null   float64
 3   Height          4177 non-null   float64
```

```
 4   Whole weight    4177 non-null   float64
 5   Shucked weight  4177 non-null   float64
 6   Viscera weight  4177 non-null   float64
 7   Shell weight    4177 non-null   float64
 8   age             4177 non-null   float64
dtypes: float64(8), object(1)
memory usage: 293.8+ KB
```

```
a['Diameter'].describe()
```

```
count    4177.000000
mean        0.407881
std         0.099240
min         0.055000
25%         0.350000
50%         0.425000
75%         0.480000
max         0.650000
Name: Diameter, dtype: float64
```

```
a['Sex'].value_counts
```

```
<bound method IndexOpsMixin.value_counts of 0       M
1       M
2       F
3       M
4       I
       ..
4172    F
4173    M
4174    M
4175    F
4176    M
Name: Sex, Length: 4177, dtype: object>
```

5.Checking for missing values and dealing with them

```
a.isnull()
```

```
        Sex  Length  Diameter  Height  Whole weight  Shucked weight  \
0     False   False     False   False         False           False
1     False   False     False   False         False           False
2     False   False     False   False         False           False
3     False   False     False   False         False           False
4     False   False     False   False         False           False
...     ...     ...       ...     ...           ...             ...
4172  False   False     False   False         False           False
4173  False   False     False   False         False           False
4174  False   False     False   False         False           False
4175  False   False     False   False         False           False
4176  False   False     False   False         False           False
```

```
      Viscera weight  Shell weight    age
0              False         False  False
1              False         False  False
2              False         False  False
3              False         False  False
4              False         False  False
...              ...           ...    ...
4172           False         False  False
4173           False         False  False
4174           False         False  False
4175           False         False  False
4176           False         False  False

[4177 rows x 9 columns]
```

```
a.isnull().sum()
```

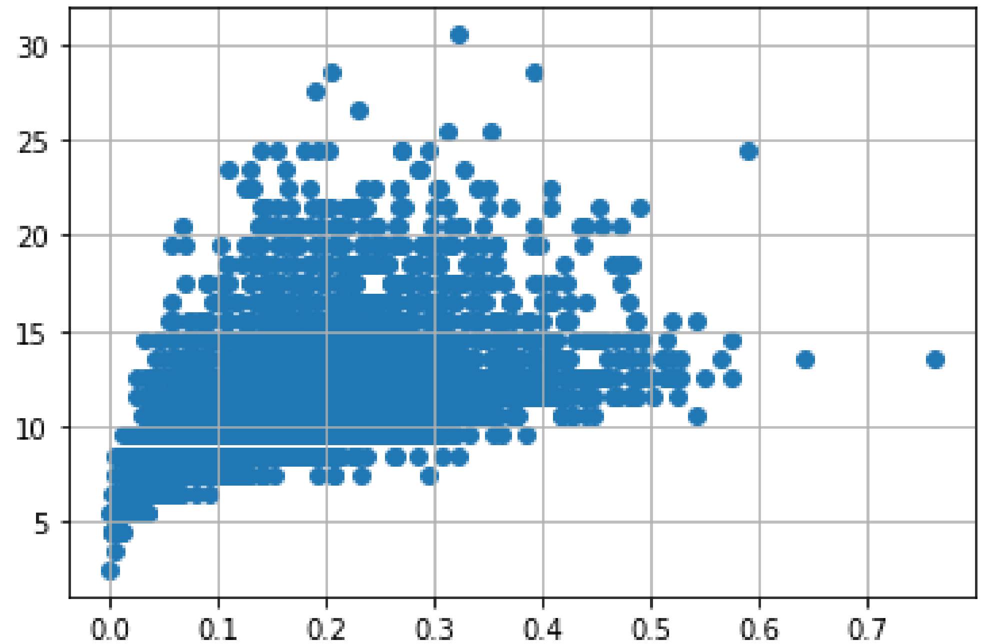
```
Length            0
Diameter          0
Height            0
Whole weight      0
Shucked weight    0
Viscera weight    0
Shell weight      0
age               0
Sex_F             0
Sex_I             0
Sex_M             0
dtype: int64
```

6.Find the outliers and replace the outliers

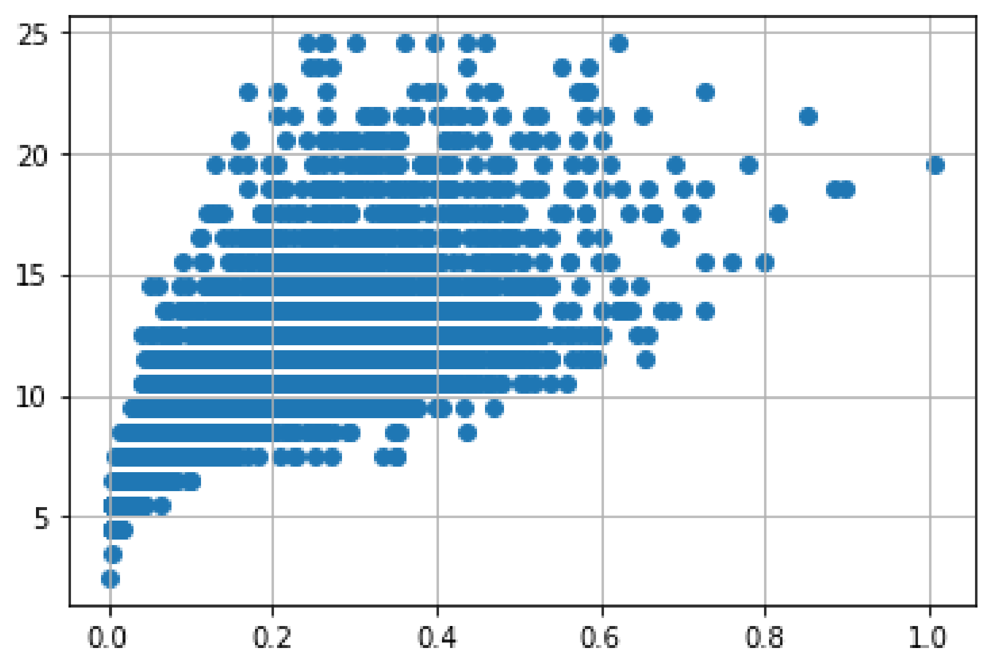
```
a=pd.get_dummies(a)
```

```
dummy_a=a
```

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

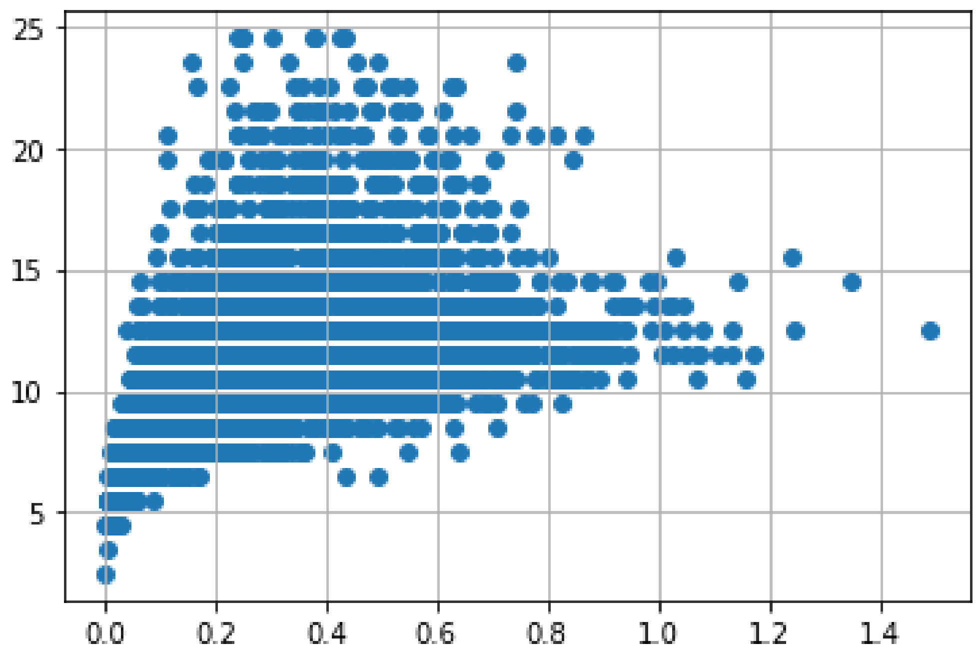



```
a.drop(a[(a['Viscera weight']>0.5)&
         (a['age']<20)].index, inplace=True)
a.drop(a[(a['Viscera weight']<0.5)&(a['age']>25)].index, inplace=True)

var='Shell weight'
tlp.scatter(x=a[var],y=a['age'])
tlp.grid(True)
```

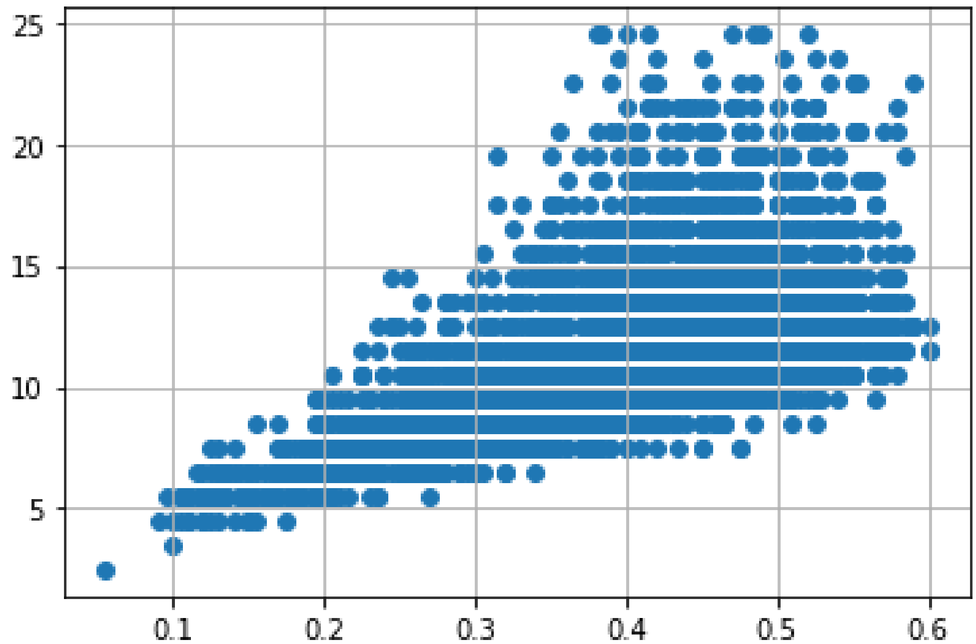



```
a.drop(a[(a['Shell weight'] > 0.6) &
          (a['age'] < 25)].index, inplace = True)
```

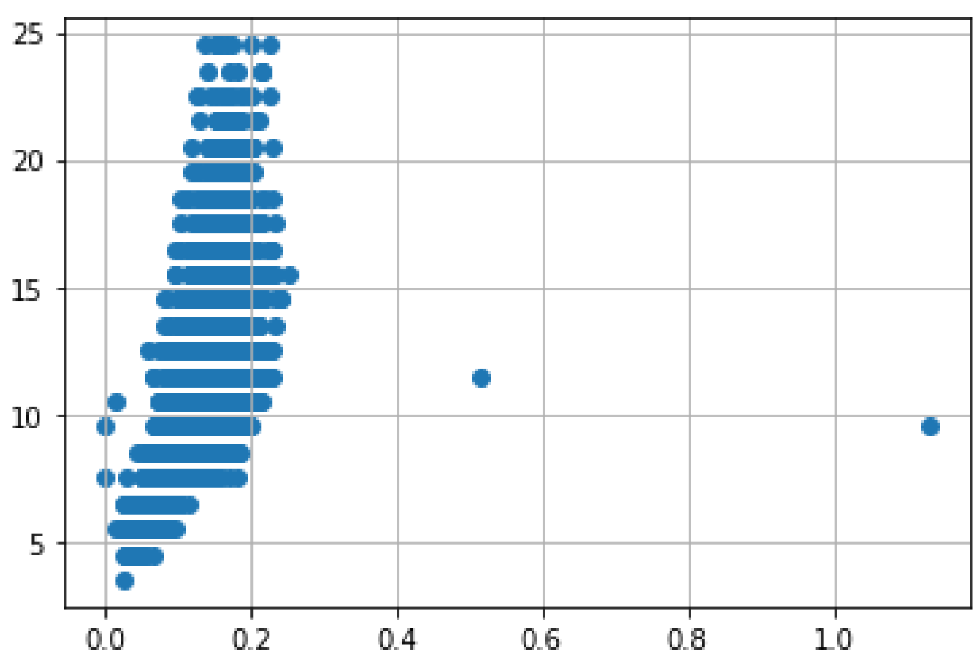
```
a.drop(a[(a['Shell weight']<0.8) & (
a['age'] > 25)].index, inplace = True)

var = 'Shucked weight'
tlp.scatter(x = a[var], y =a['age'])
tlp.grid(True)
```




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

var = 'Diameter'
tlp.scatter(x = a[var], y = a['age'])
tlp.grid(True)
```

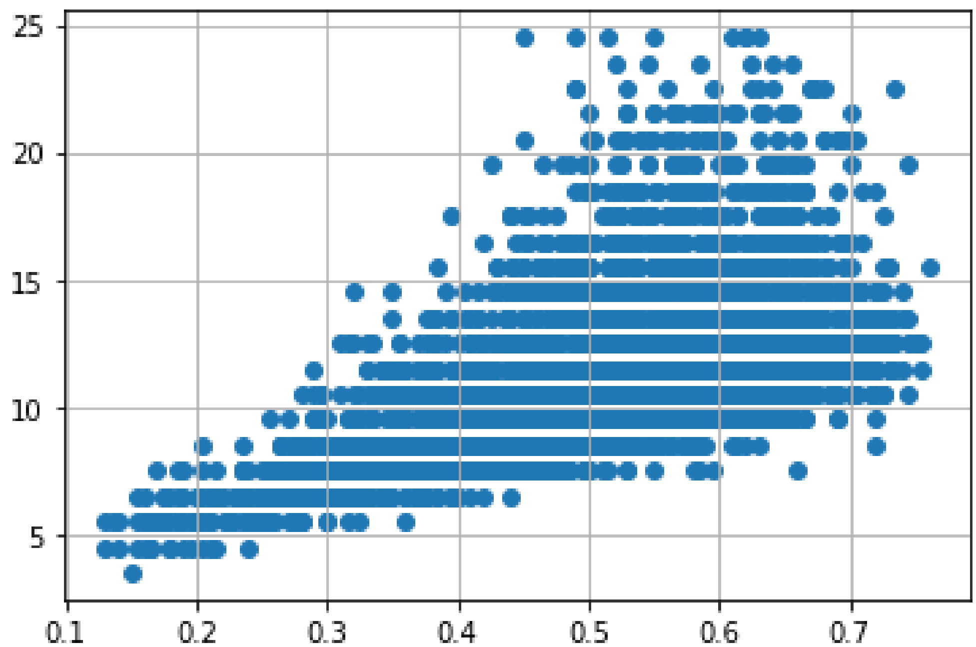



```
a.drop(a[(a['Diameter'] <0.1) &
          (a['age'] < 5)].index, inplace = True)
a.drop(a[(a['Diameter']<0.6) & (
a['age'] > 25)].index, inplace = True)
a.drop(a[(a['Diameter']>=0.6) & (
a['age'] < 25)].index, inplace = True)

var = 'Height'
tlp.scatter(x = a[var], y = a['age'])
tlp.grid(True)
```



```
a.drop(a[(a['Height'] > 0.4) &
          (a['age'] < 15)].index, inplace = True)
a.drop(a[(a['Height']<0.4) & (
a['age'] > 25)].index, inplace = True)
```

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




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

7.Checking for categorical columns

```
numerical_features = a.select_dtypes(include = [np.number]).columns
categorical_features = a.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
```

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

```
categorical_features
```

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

Encoding

```
from sklearn.preprocessing import LabelEncoder
le=LabelEncoder()
print(a.Length.value_counts())
```

```
0.550    93
0.575    93
0.625    93
0.580    92
0.600    86
         ..
0.755     2
0.220     2
0.150     1
0.135     1
0.760     1
Name: Length, Length: 126, dtype: int64
```

```
x=a.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

[4096 rows x 5 columns]
```

```
y=a.iloc[:,:5]
y
```

```
      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

[4096 rows x 5 columns]
```

9.Spliting 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,y,test_size=0.2)
```

10.Building the model

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

```
LinearRegression()
```

11.Training the model

12.Testingthe model

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

```
      Length  Diameter  Height  Whole weight  Shucked weight
2358   0.610     0.485   0.210        1.3445          0.5350
723    0.525     0.410   0.130        0.9900          0.3865
2535   0.640     0.500   0.180        1.4995          0.5930
2717   0.345     0.255   0.095        0.1830          0.0750
29     0.575     0.425   0.140        0.8635          0.3930
```

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

```
      Length  Diameter  Height  Whole weight  Shucked weight
2358   0.610     0.485   0.210        1.3445          0.5350
723    0.525     0.410   0.130        0.9900          0.3865
2535   0.640     0.500   0.180        1.4995          0.5930
2717   0.345     0.255   0.095        0.1830          0.0750
29     0.575     0.425   0.140        0.8635          0.3930
```

13.Scaling the independent variables

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

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

```
mlrpred
```

```
array([[0.61  , 0.485 , 0.21  , 1.3445, 0.535 ],
       [0.525 , 0.41  , 0.13  , 0.99  , 0.3865],
       [0.64  , 0.5   , 0.18  , 1.4995, 0.593 ],
       [0.345 , 0.255 , 0.095 , 0.183 , 0.075 ],
       [0.575 , 0.425 , 0.14  , 0.8635, 0.393 ],
       [0.57  , 0.48  , 0.18  , 0.9395, 0.399 ],
       [0.61  , 0.485 , 0.165 , 1.087 , 0.4255],
       [0.635 , 0.505 , 0.17  , 1.2635, 0.512 ],
       [0.53  , 0.41  , 0.155 , 0.7155, 0.2805]])
```

14.Measuring the performance using metrics

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

```
1.0
```