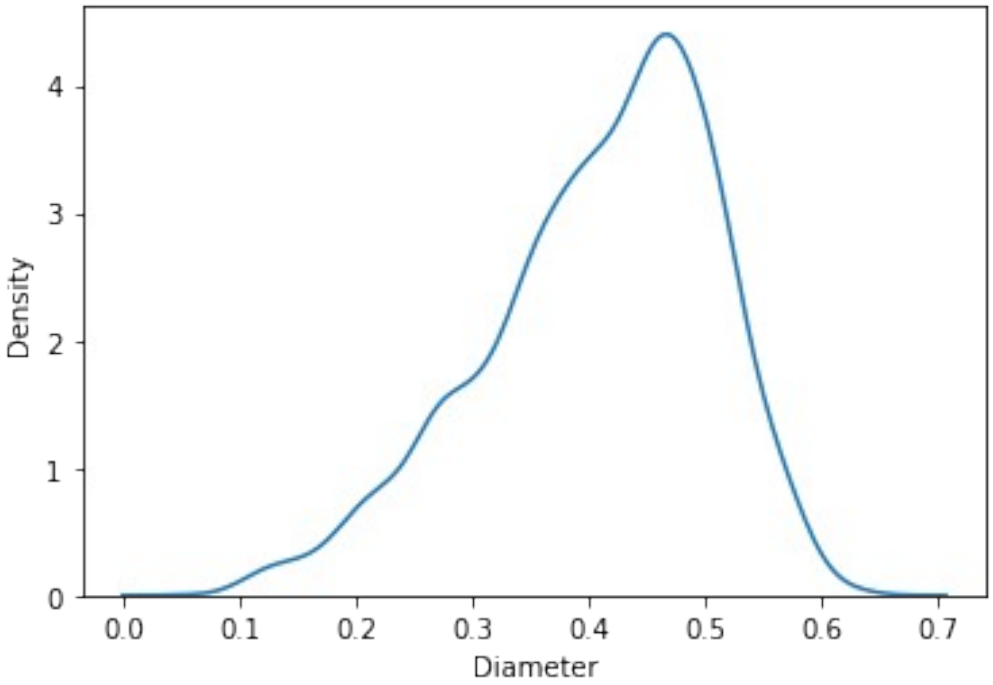
```
import numpy as pn
import pandas as dp
import matplotlib.pyplot as tlp
%matplotlib inline
import seaborn as ss

a = dp.read_csv('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
```

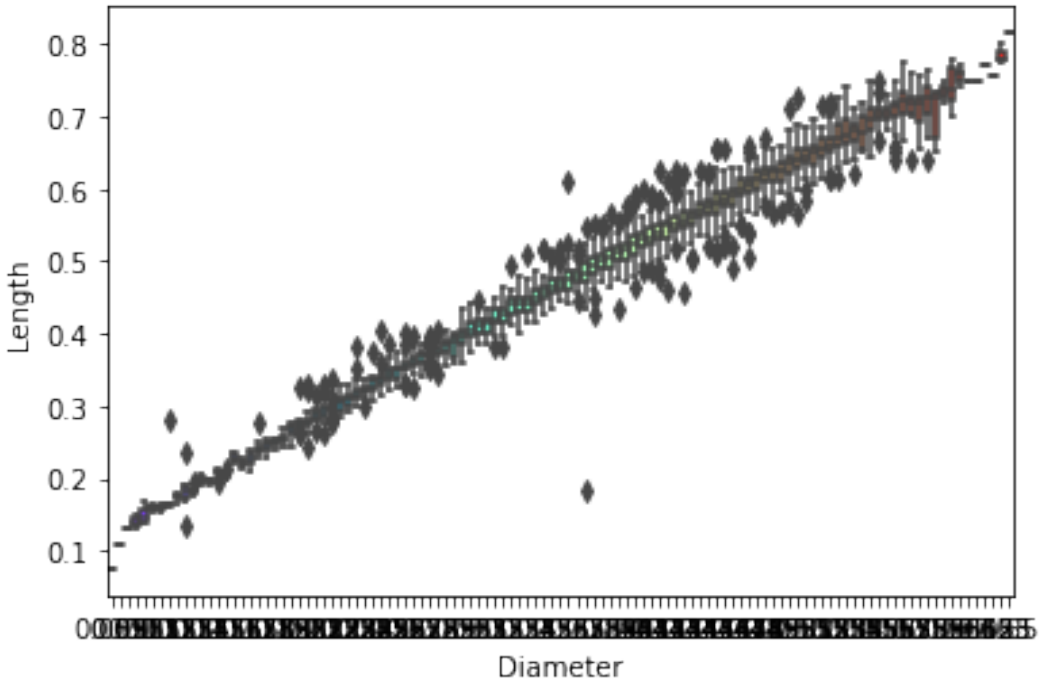
```
a['age'] = a['Rings']+1.5
a = a.drop('Rings',axis = 1)

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

```
<matplotlib.axes._subplots.AxesSubplot at 0x7efdb9ad7590>
```



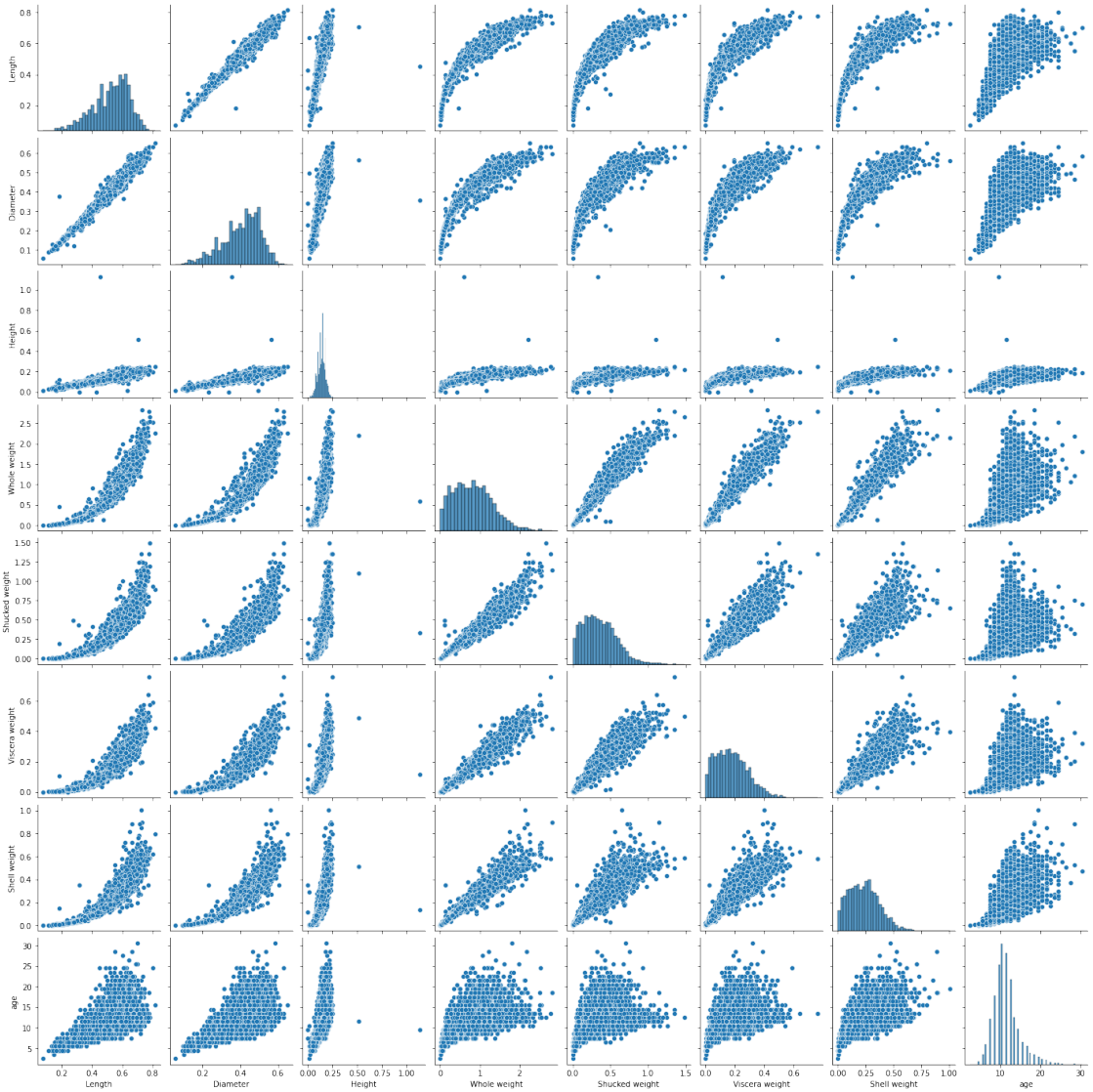

```
ss.boxplot(x=a.Diameter,y=a.Length,palette='rainbow')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7efdb9a3abd0>
```




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

```
<seaborn.axisgrid.PairGrid at 0x7efdb8a6d3d0>
```




```
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()
```

```
M    1528
I    1342
F    1307
Name: Sex, dtype: int64
```

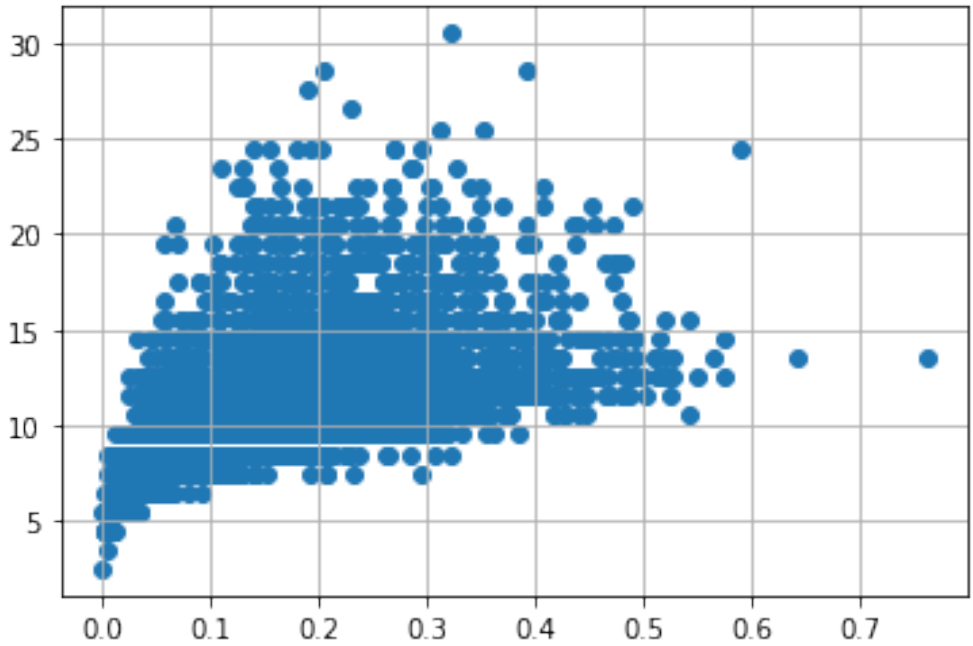
```
a.isnull()
```

```
        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]
```

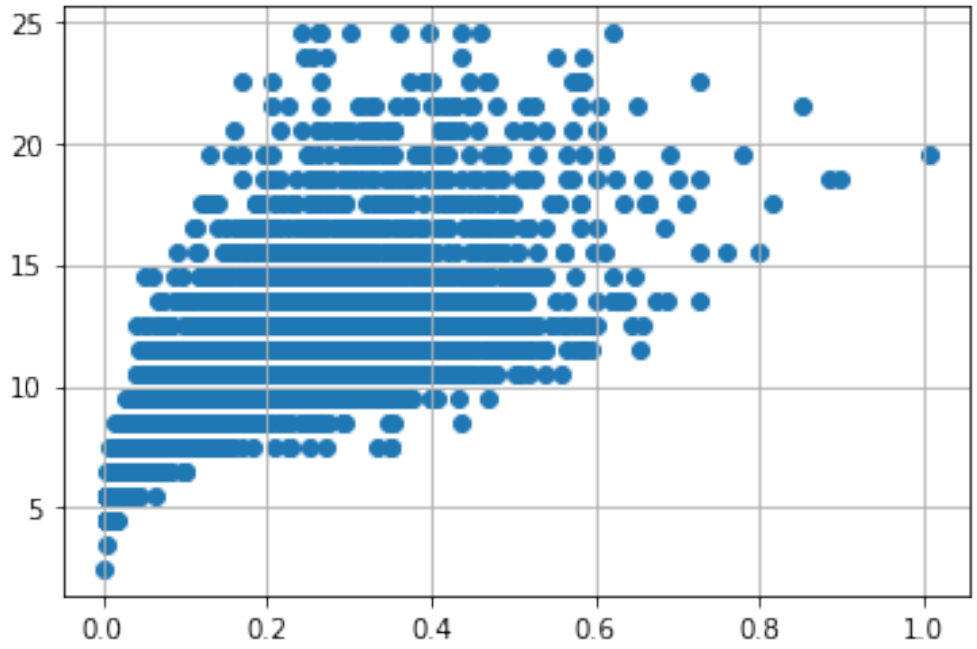
```
a.isnull().sum()
```

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

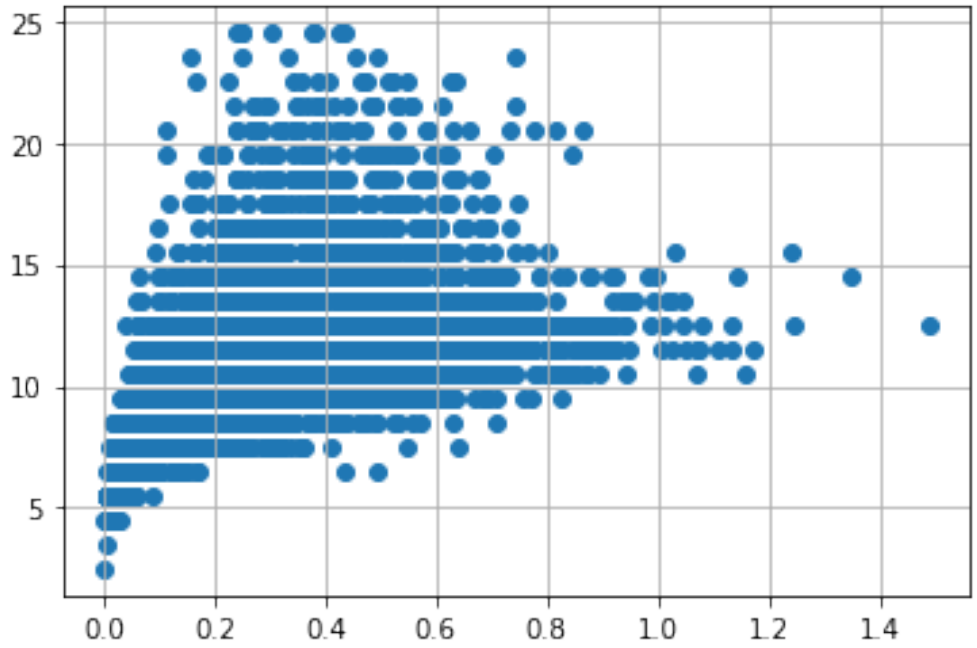
```
# outlier handling
a = dp.get_dummies(a)
dummy_a = a

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



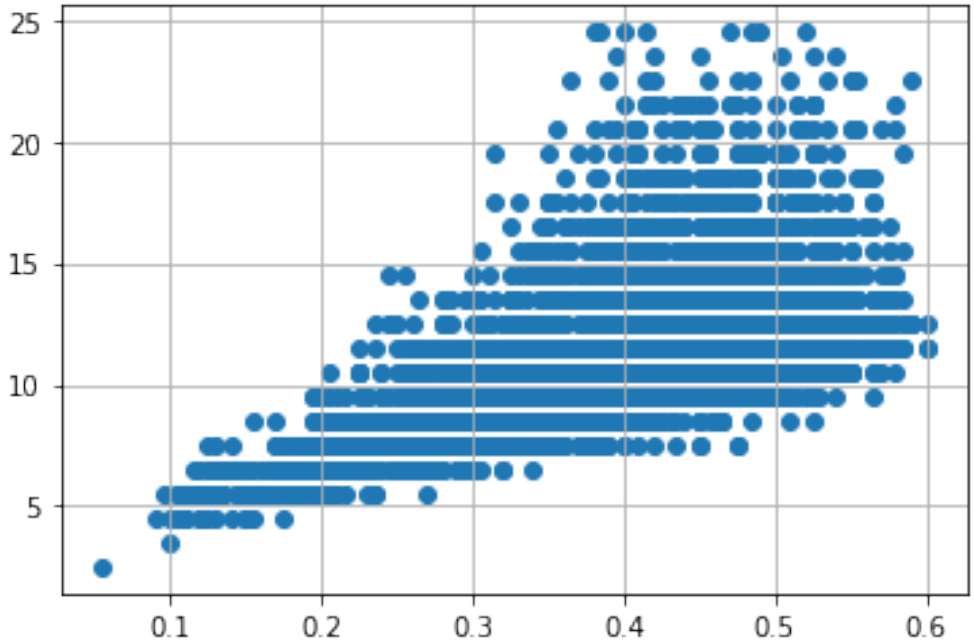

```
a.drop(a[(a['Viscera weight'] > 0.5) &
          (a['age'] < 20)].index, inplace = True)
a.drop(a[(a['Viscera weight']<0.5) & (
a['age'] > 25)].index, inplace = True)

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



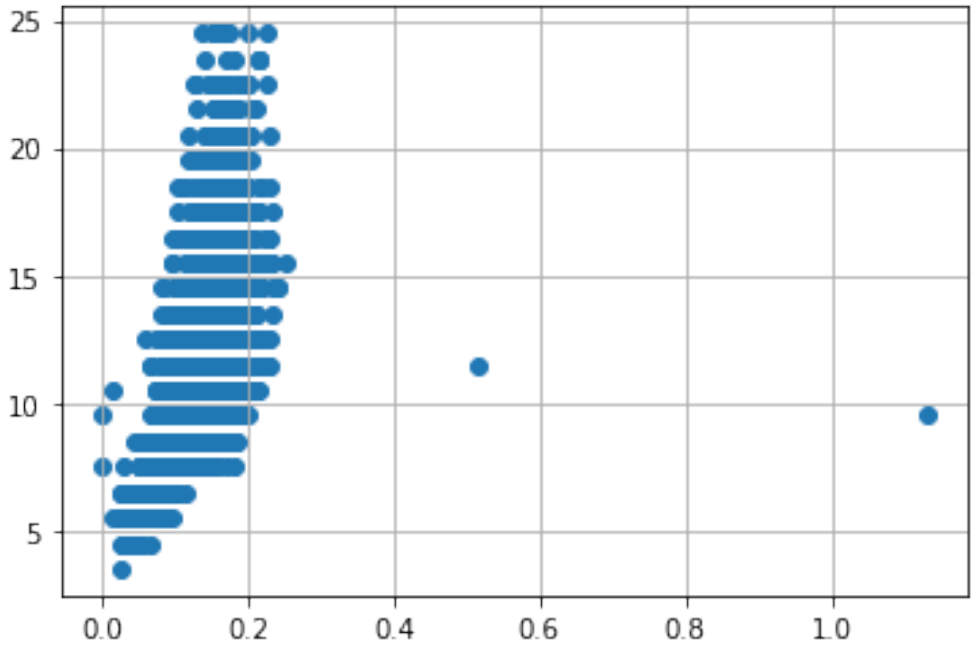

```
a.drop(a[(a['Shell weight'] > 0.6) &
          (a['age'] < 25)].index, inplace = True)
a.drop(a[(a['Shell weight']<0.8) & (
a['age'] > 25)].index, inplace = True)

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



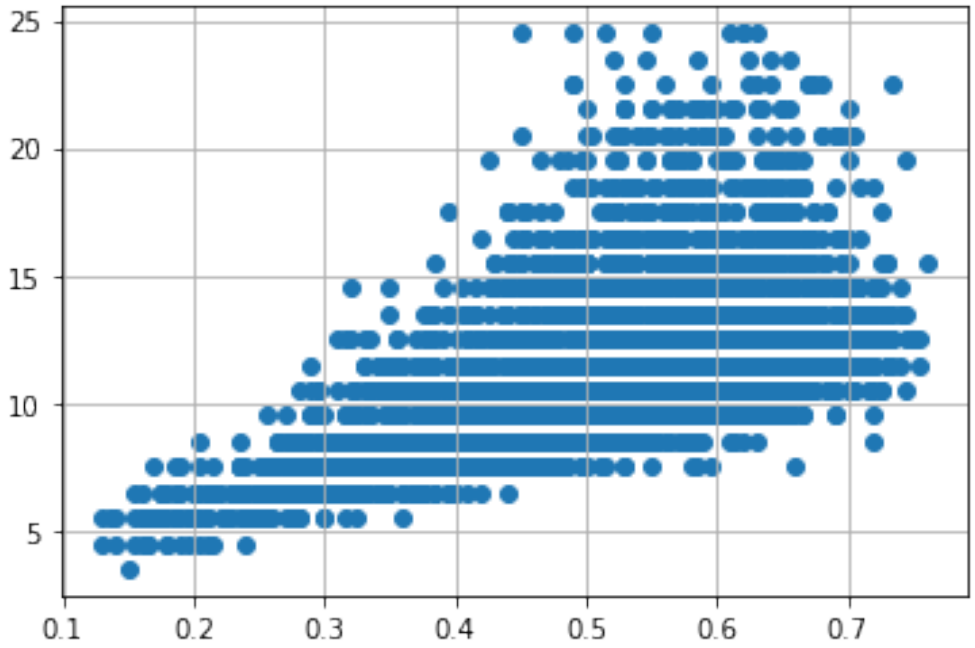
```
a.drop(a[(a['Whole weight'] >= 2.5) &
          (a['age'] < 25)].index, inplace = True)
a.drop(a[(a['Whole weight']<2.5) & (
a['age'] > 25)].index, inplace = True)

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



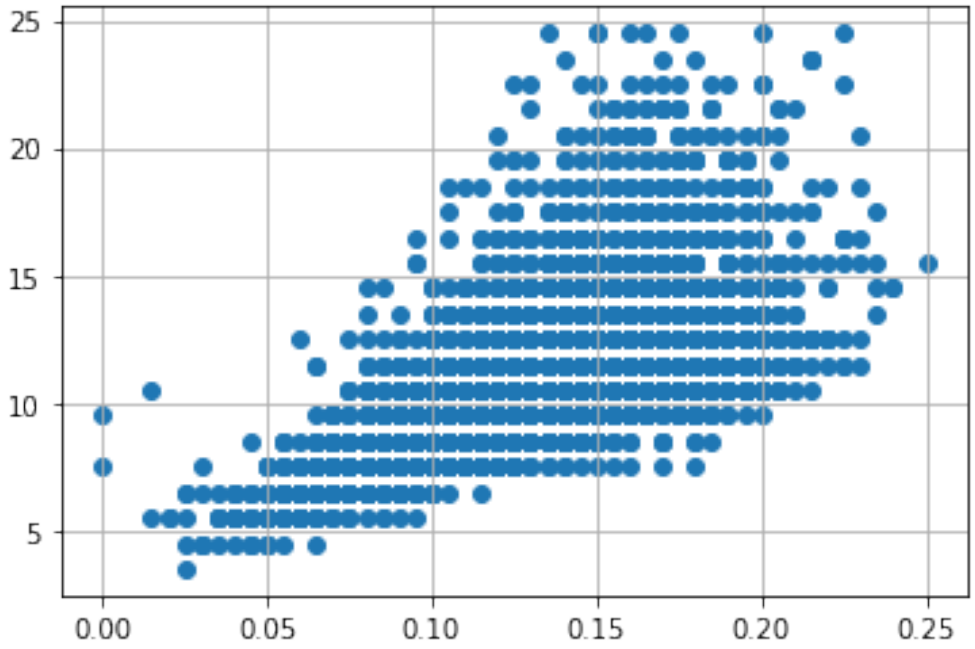

```
a.drop(a[(a['Diameter'] <0.1) &
          (a['age'] < 5)].index, inplace = True)
a.drop(a[(a['Diameter']<0.6) & (
a['age'] > 25)].index, inplace = True)
a.drop(a[(a['Diameter']>=0.6) & (
a['age'] < 25)].index, inplace = True)

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



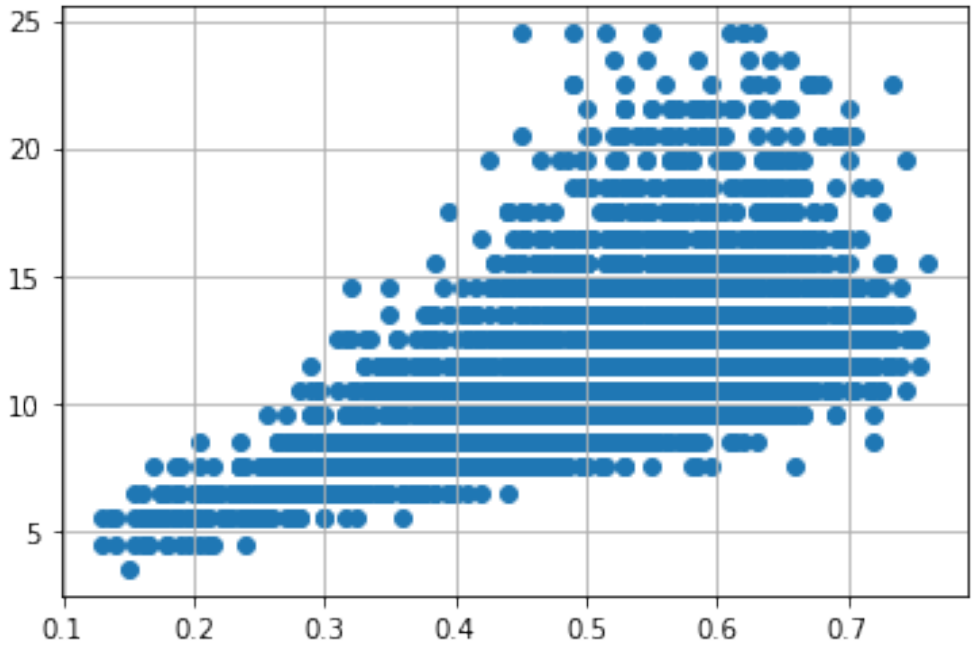

```
a.drop(a[(a['Height'] > 0.4) &
          (a['age'] < 15)].index, inplace = True)
a.drop(a[(a['Height']<0.4) & (
a['age'] > 25)].index, inplace = True)

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



```
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)

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

```
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]
```

```
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)
```

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

```
LinearRegression()
```

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

| | Length | Diameter | Height | Whole weight | Shucked weight |
|---|---|---|---|---|---|
| 3597 | 0.685 | 0.530 | 0.170 | 1.5600 | 0.6470 |

```
2899   0.550     0.425   0.130        0.6640          0.2695
659    0.585     0.475   0.185        0.9585          0.4145
3963   0.270     0.205   0.075        0.1180          0.0590
3028   0.515     0.385   0.125        0.5720          0.2370
```

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

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

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

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

```
1.0
```