```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sbn
%matplotlib inline
```

```
path = "/content/abalone.csv"
df = pd.read_csv(path)
df.head()
```

	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	0.150	15
1	M	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	M	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10
4	I	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7


```
df.describe()
```

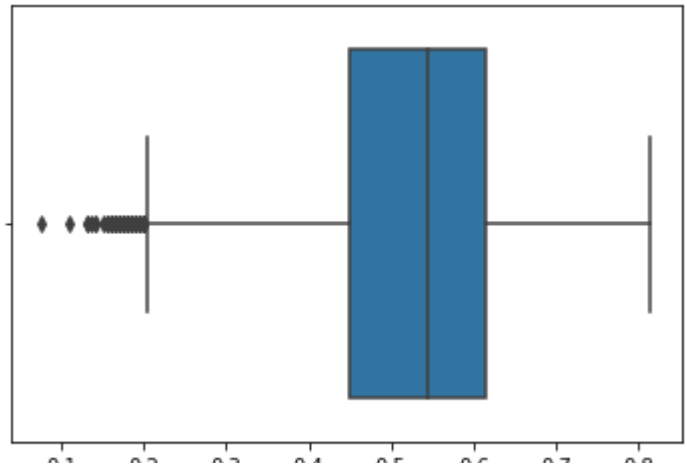
	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	
count	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	41
mean	0.523992	0.407881	0.139516	0.828742	0.359367	0.180594	
std	0.120093	0.099240	0.041827	0.490389	0.221963	0.109614	
min	0.075000	0.055000	0.000000	0.002000	0.001000	0.000500	
25%	0.450000	0.350000	0.115000	0.441500	0.186000	0.093500	
50%	0.545000	0.425000	0.140000	0.799500	0.336000	0.171000	
75%	0.615000	0.480000	0.165000	1.153000	0.502000	0.253000	
max	0.815000	0.650000	1.130000	2.825500	1.488000	0.760000	

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

VIZUALIZATIONS

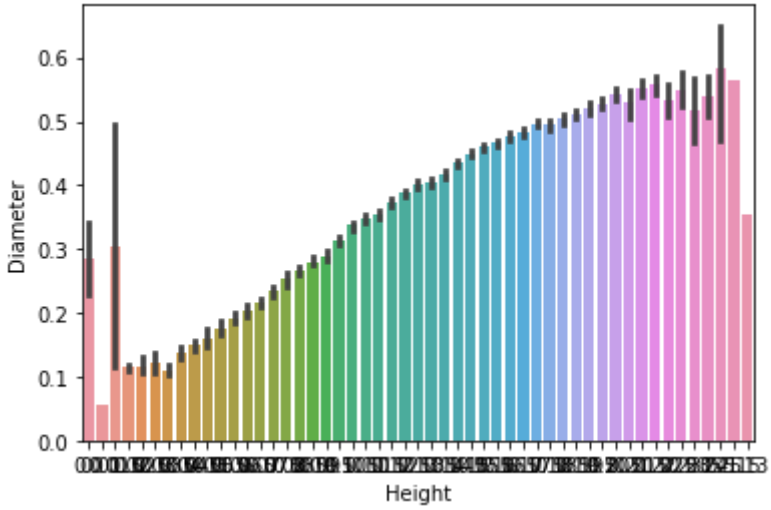
```
#Univariate Analysis
sbn.boxplot(df.Length)
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass
  FutureWarning
<matplotlib.axes._subplots.AxesSubplot at 0x7fe4ec70b710>
```



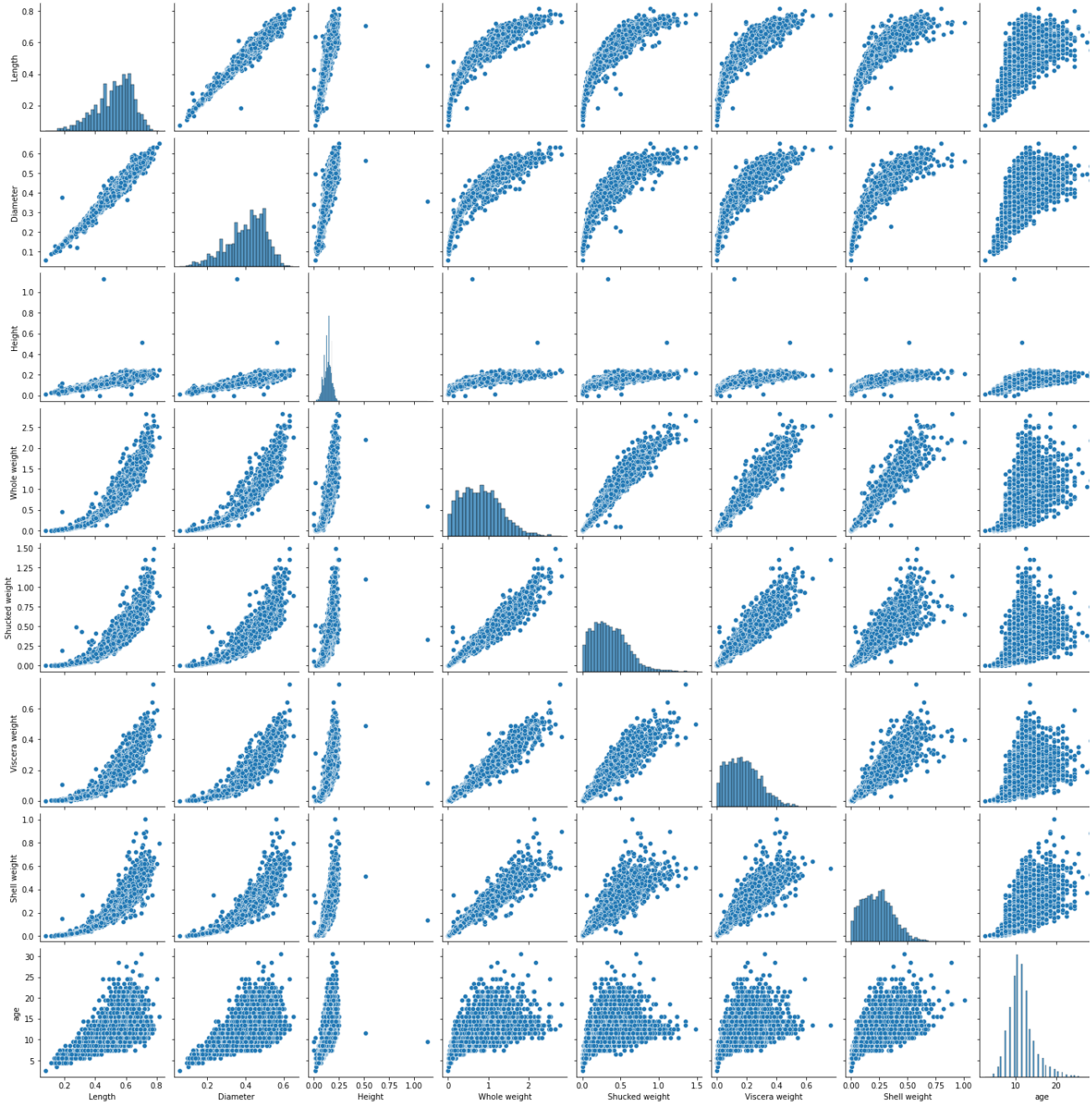
```
#Bi-Variant Analysis
sbn.barplot(x=df.Height,y=df.Diameter)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fe4ec14bc90>
```




```
#Multi-Variant Analysis
sbn.pairplot(df)
```

```
<seaborn.axisgrid.PairGrid at 0x7fe4ec088950>
```



Perform Descriptive Analysis On The Dataset

```
df.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
```

```
df['Height'].mean()
```

```
0.13951639932966242
```

```
df['Diameter'].median()
```

```
0.425
```

```
df['Length'].mode()
```

```
0    0.550
1    0.625
dtype: float64
```

```
df.max()
```

```
Sex                   M
Length            0.815
Diameter           0.65
Height             1.13
Whole weight     2.8255
Shucked weight    1.488
Viscera weight     0.76
Shell weight      1.005
age                30.5
dtype: object
```

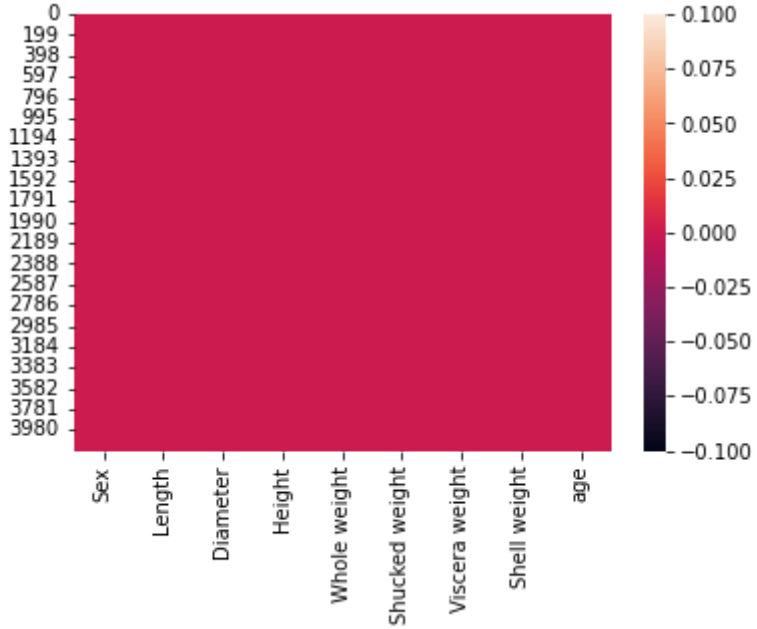
```
df.min()
```

```
Sex                   F
Length            0.075
Diameter          0.055
Height              0.0
Whole weight      0.002
Shucked weight    0.001
Viscera weight   0.0005
Shell weight     0.0015
age                 2.5
dtype: object
```

Check For Missing Values & Deal With Them

```
#EDA
sbn.heatmap(df.isnull())
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fe4e77a5490>
```




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

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:2: DeprecationWarning: `
Deprecated in NumPy 1.20; for more details and guidance: https://numpy.org/devdocs/re

---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
<ipython-input-15-ca6fa5e17761> in <module>
      1 numerical_features = df.select_dtypes(include = [np.number]).columns
----> 2 categorical_features = df.select_dtypes(include = [np.object]).col

/usr/local/lib/python3.7/dist-packages/pandas/core/generic.py in __getattr__(self,
name)
   5485         ):
   5486             return self[name]
-> 5487         return object.__getattribute__(self, name)
   5488
   5489     def __setattr__(self, name: str, value) -> None:

AttributeError: 'DataFrame' object has no attribute 'col'
```

SEARCH STACK OVERFLOW

```
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: `
Deprecated in NumPy 1.20; for more details and guidance: https://numpy.org/devdocs/re
```

```
numerical_features
```

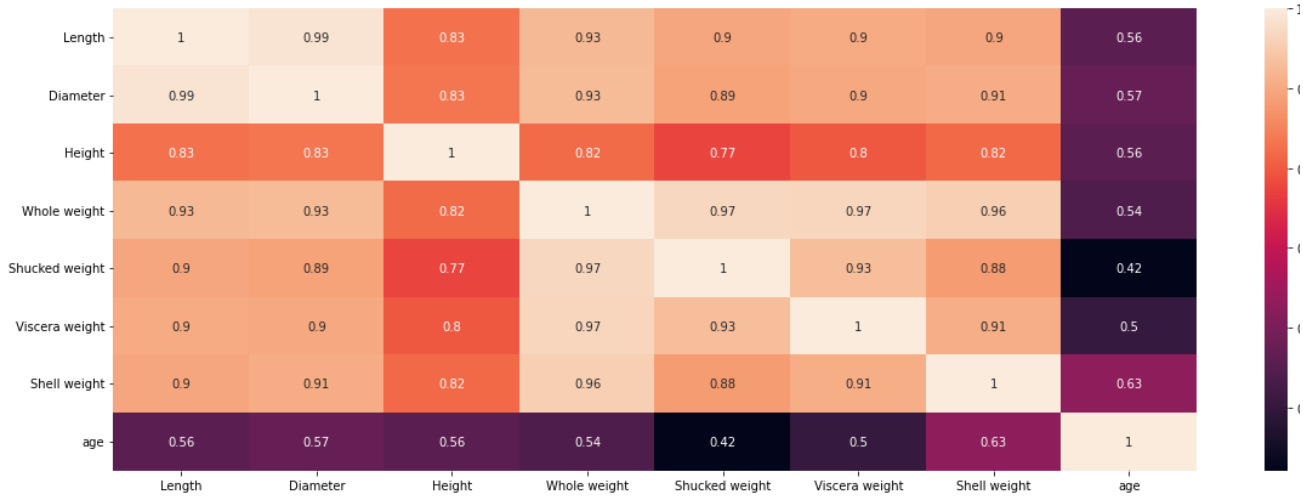
```
Index(['Length', 'Diameter', 'Height', 'Whole weight', 'Shucked weight',
       'Viscera weight', 'Shell weight', 'age'],
      dtype='object')
```

```
categorical_features
```

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

```
plt.figure(figsize = (20,7))
sbn.heatmap(df[numerical_features].corr(),annot = True)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fe4e5f34510>
```



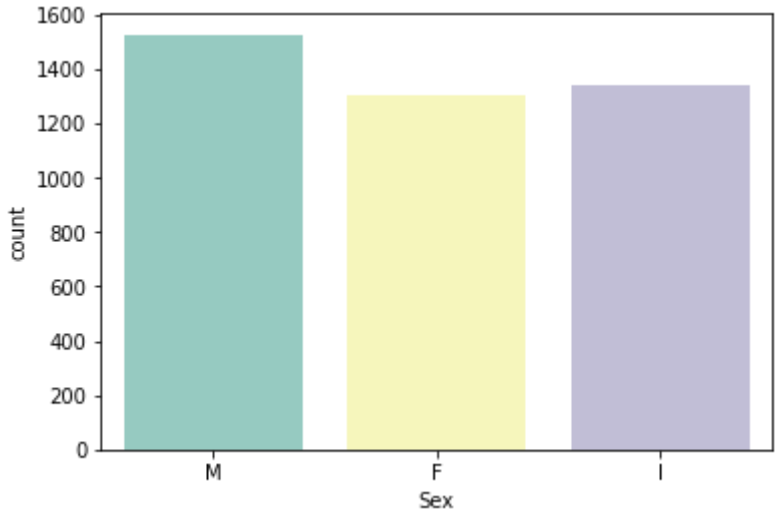
Whole Weight is almost linearly varying with all other features except age. Height has least linearity with remaining features. Age is most linearly proprtional with Shell Weight followed by Diameter and length. Age is least correlated with Shucked Weight.

KEY INSIGHT All numerical features but 'sex'

Though features are not normaly distributed, are close to normality None of the features have minimum = 0 except Height (requires re-check) Each feature has difference scale range

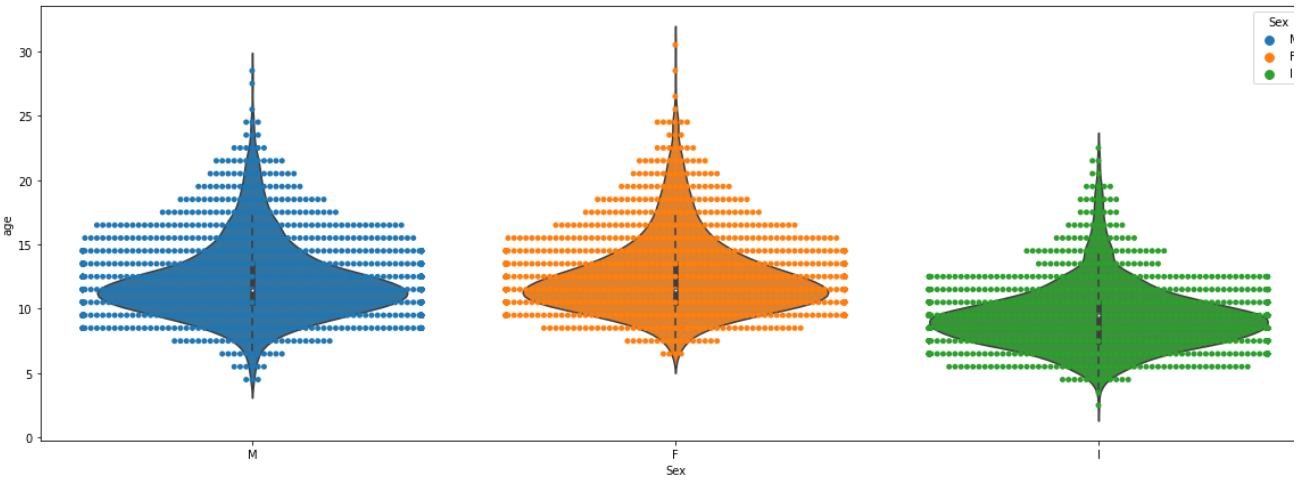
```
sbn.countplot(x = 'Sex', data = df, palette = 'Set3')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fe4e5cb44d0>
```




```
plt.figure(figsize = (20,7))
sbn.swarmplot(x = 'Sex', y = 'age', data = df, hue = 'Sex')
sbn.violinplot(x = 'Sex', y = 'age',data = df)
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/categorical.py:1296: UserWarning: 56.2
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/categorical.py:1296: UserWarning: 52.2
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/categorical.py:1296: UserWarning: 58.5
  warnings.warn(msg, UserWarning)
<matplotlib.axes._subplots.AxesSubplot at 0x7fe4e7a29050>
```



Male : age majority lies in between 7.5 years to 19 years

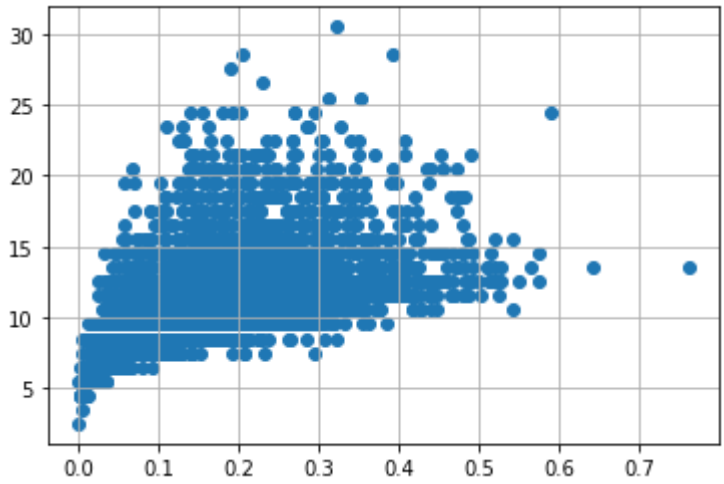
Female: age majority lies in between 8 years to 19 years

Immature: age majority lies in between 6 years to < 10 years

Find The Outliers & Replace Them

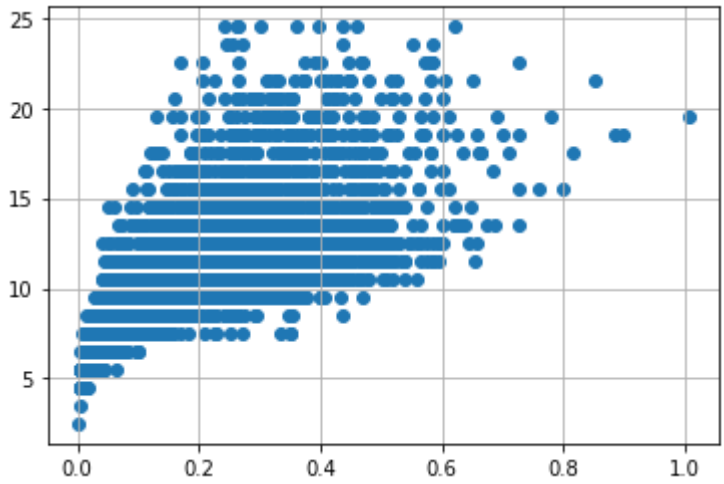
```
#Data Preprocessing
#Outlier handling
df = pd.get_dummies(df)
dummy_df = df
```

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




```
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)
```

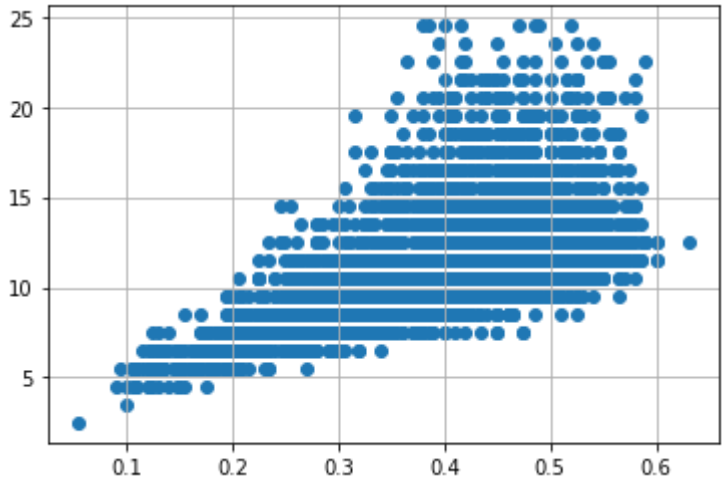
```
var = 'Shell weight'
plt.scatter(x = df[var], y = df['age'])
plt.grid(True)
```




```
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)
```

```
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)
```

Feature Selection and Standardization

```
X = df.drop('age', axis = 1)
y = df['age']
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split, cross_val_score
from sklearn.feature_selection import SelectKBest
standardScale = StandardScaler()
standardScale.fit_transform(X)

selectkBest = SelectKBest()
X_new = selectkBest.fit_transform(X, y)

X_train, X_test, y_train, y_test = train_test_split(X_new, y, test_size = 0.25)
```

MODEL Linear regression

```
from sklearn.linear_model import LinearRegression
```

```
lm = LinearRegression()
lm.fit(X_train, y_train)
```

```
     LinearRegression()
```

```
y_train_pred = lm.predict(X_train)
```

```
y_test_pred = lm.predict(X_test)


from sklearn.metrics import mean_absolute_error, mean_squared_error
s = mean_squared_error(y_train, y_train_pred)
print('Mean Squared Error of training set :%2f'%s)

p = mean_squared_error(y_test, y_test_pred)
print('Mean Squared Error of testing set :%2f'%p)
```

```
     Mean Squared Error of training set :4.486953
     Mean Squared Error of testing set :4.904506
```

```
from sklearn.metrics import r2_score
s = r2_score(y_train, y_train_pred)
print('R2 Score of training set:%.2f'%s)

p = r2_score(y_test, y_test_pred)
print('R2 Score of testing set:%.2f'%p)
```

```
     R2 Score of training set:0.53
     R2 Score of testing set:0.50
```