```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
```

```
from google.colab import files
upload=files.upload()
df = pd.read_csv('abalone.csv')
```

Choose Files abalone.csv

- **abalone.csv**(text/csv) - 191962 bytes, last modified: 11/15/2022 - 100% done

```
Saving abalone.csv to abalone (1).csv
```

```
df.describe()
```

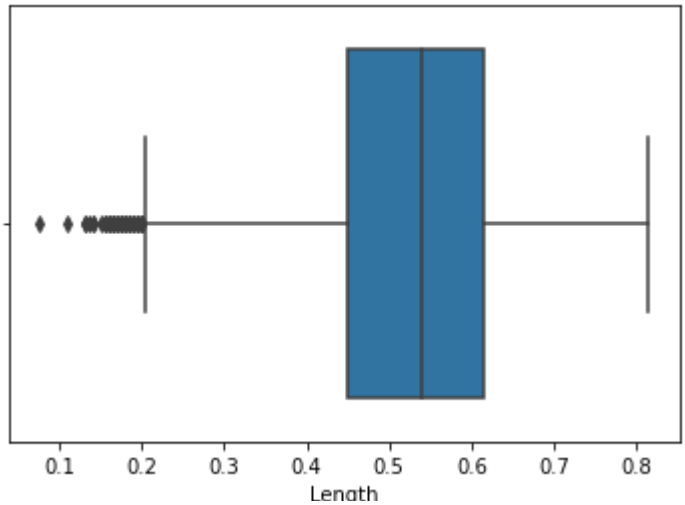
	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	
count	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4
mean	0.523992	0.407881	0.139516	0.828742	0.359367	0.180594	
std	0.120093	0.099240	0.041827	0.490389	0.221963	0.109614	
min	0.075000	0.055000	0.000000	0.002000	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	

```
df.head()
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shel
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	

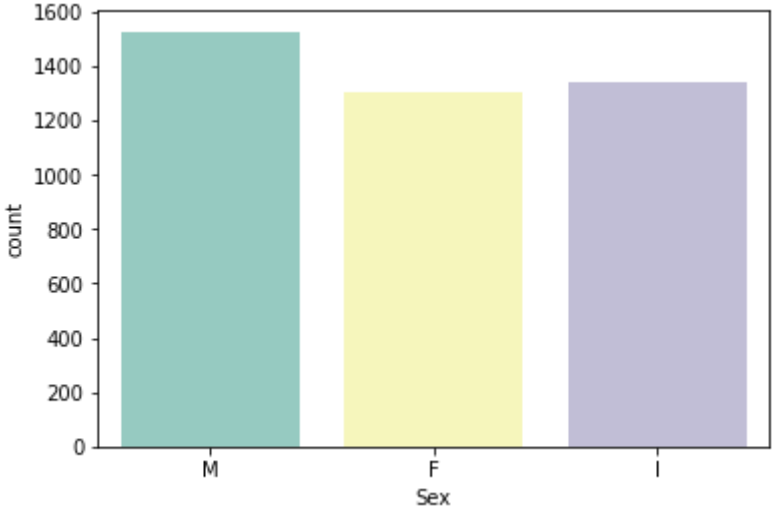
```
#Perform Visualisation
#Univariate analysis
sns.boxplot(df.Length)
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pas
  FutureWarning
<matplotlib.axes._subplots.AxesSubplot at 0x7f8011f814d0>
```




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

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f801a48b0d0>
```

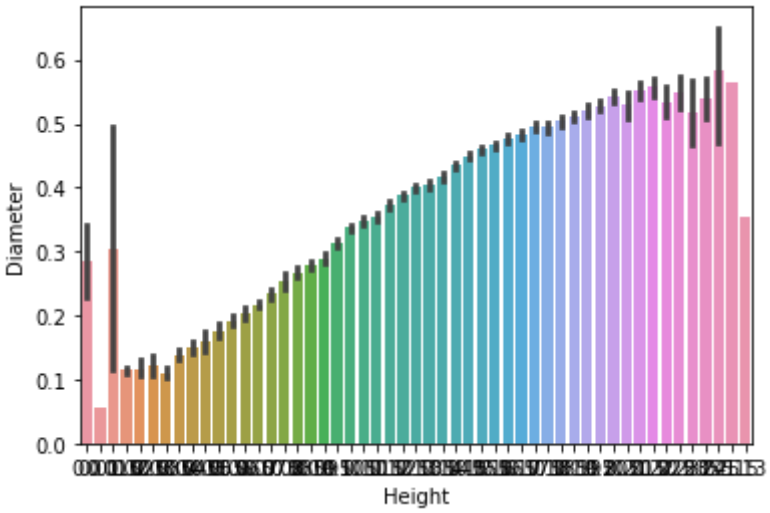



```
sns.heatmap(df.isnull())
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8019fb8710>
```

```
#Bivariate analysis
sns.barplot(x=df.Height,y=df.Diameter)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8017677690>
```




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

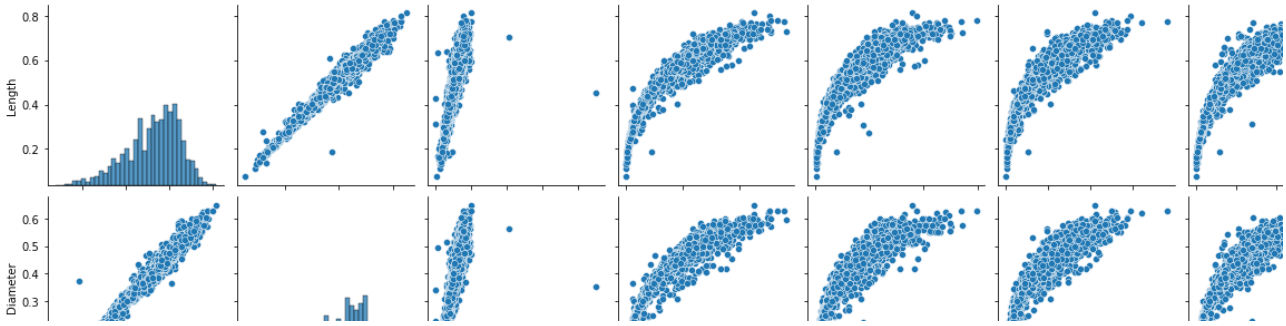
```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:2: DeprecationWarning:
Deprecated in NumPy 1.20; for more details and guidance: https://numpy.org/devdocs/r
```

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

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8017436490>
```

```
#Multivariate analysis
sns.pairplot(df)
```

```
<seaborn.axisgrid.PairGrid at 0x7f80172fb350>
```




```
#Perform descriptive model on the dataset
df['Height'].describe()
```

```
count    4177.000000
mean        0.139516
std         0.041827
min         0.000000
25%         0.115000
50%         0.140000
75%         0.165000
max         1.130000
Name: Height, dtype: float64
```

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

```
0.13951639932966242
```

```
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
Rings                29
dtype: object
```

```
df['Sex'].value_counts()
```

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

```
df[df.Height == 0]
```

```
df['Shucked weight'].kurtosis()
```

```
0.5951236783694207
```

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

```
0.425
```

```
df['Shucked weight'].skew()
```

```
0.7190979217612694
```

```
#Missing values
df.isna().any()
```

```
Sex               False
Length            False
Diameter          False
Height            False
Whole weight      False
Shucked weight    False
Viscera weight    False
Shell weight      False
Rings             False
dtype: bool
```

```
missing_values = df.isnull().sum().sort_values(ascending = False)
percentage_missing_values = (missing_values/len(df))*100
pd.concat([missing_values, percentage_missing_values], axis = 1, keys= ['Missing values',
```

	Missing values	% Missing
Sex	0	0.0
Length	0	0.0
Diameter	0	0.0
Height	0	0.0
Whole weight	0	0.0
Shucked weight	0	0.0
Viscera weight	0	0.0
Shell weight	0	0.0
Rings	0	0.0

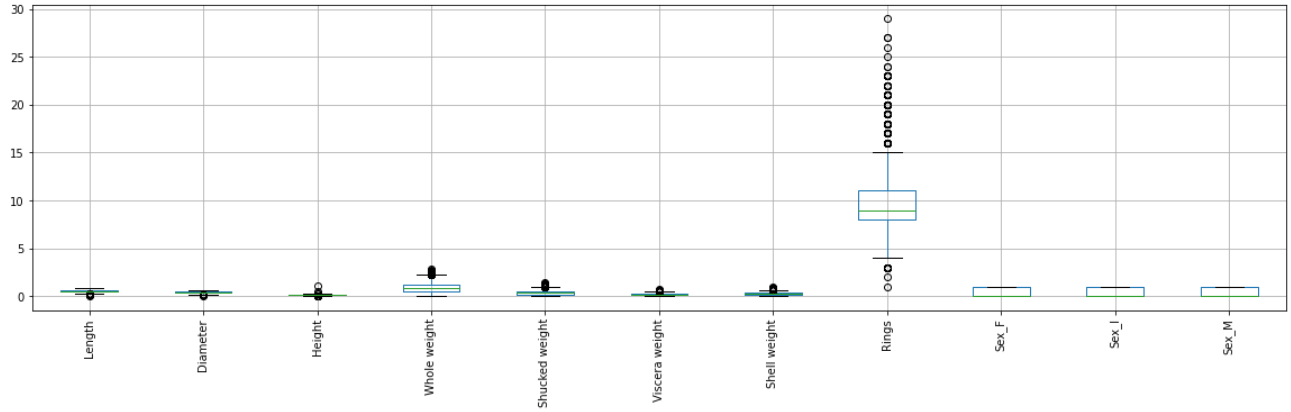
```
#Finding the outliers
q1=df.Rings.quantile(0.25)
q2=df.Rings.quantile(0.75)
```

```
iqr=q2-q1
print(iqr)
```

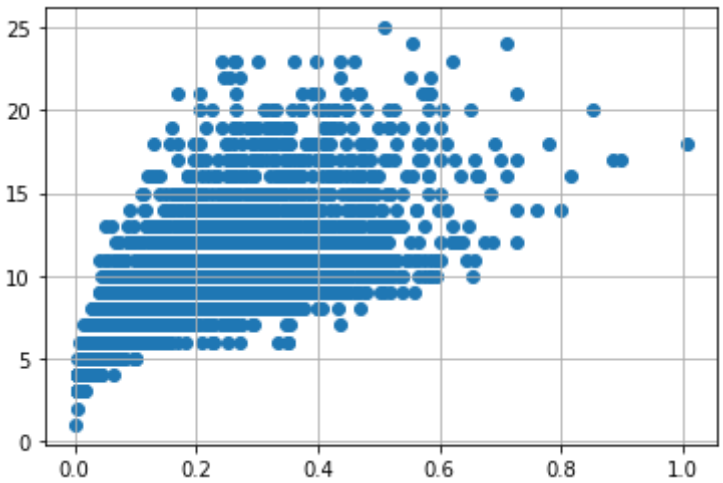
```
3.0
```

```
df = pd.get_dummies(df)
dummy_df = df
df.boxplot( rot = 90, figsize=(20,5))
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8013056e90>
```




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



```
#Check for categorical columns and perform encoding
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:3: DeprecationWarning:
Deprecated in NumPy 1.20; for more details and guidance: https://numpy.org/devdocs/r
  This is separate from the ipykernel package so we can avoid doing imports until
```

```
numerical_features
categorical_features
```

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

```
abalone_numeric = df[['Length', 'Diameter', 'Height', 'Whole weight', 'Shucked weight','Vi
abalone_numeric.head()
```

	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	age	S
0	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15	
1	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7	
2	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9	
3	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10	
4	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7	

```
#Dependent and Independent Variables
x = df.iloc[:, 0:1].values
y = df.iloc[:, 1]
y
```

```
0       0.365
1       0.265
2       0.420
3       0.365
4       0.255
        ...
4172    0.450
4173    0.440
4174    0.475
4175    0.485
4176    0.555
Name: Diameter, Length: 4150, dtype: float64
```

```
#Scaling the Independent Variables
print ("\n Original Values: \n\n", x,y)
```

```
 Original Values:

 [[0.455]
 [0.35 ]
```

```
        [0.53 ]
        ...
        [0.6  ]
        [0.625]
        [0.71 ]] 0       0.365
       1       0.265
       2       0.420
       3       0.365
       4       0.255
               ...
       4172    0.450
       4173    0.440
       4174    0.475
       4175    0.485
       4176    0.555
       Name: Diameter, Length: 4150, dtype: float64
```

```
from sklearn import preprocessing
min_max_scaler = preprocessing.MinMaxScaler(feature_range =(0, 1))
new_y= min_max_scaler.fit_transform(x,y)
print ("\n Values after Min and Max Scaling: \n\n", new_y)
```

```
       Values after Min and Max Scaling:

       [[0.51351351]
       [0.37162162]
       [0.61486486]
       ...
       [0.70945946]
       [0.74324324]
       [0.85810811]]
```

```
#Split the data into Training and Testing
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)
X_train
```

```
      array([[0.45 , 0.35 , 0.13 , ..., 0.   , 0.   , 1.   ],
             [0.435, 0.35 , 0.125, ..., 1.   , 0.   , 0.   ],
             [0.35 , 0.27 , 0.09 , ..., 0.   , 1.   , 0.   ],
             ...,
             [0.58 , 0.455, 0.135, ..., 0.   , 0.   , 1.   ],
```

```
       [0.515, 0.395, 0.165, ..., 1.   , 0.   , 0.   ],
       [0.2  , 0.145, 0.05 , ..., 0.   , 1.   , 0.   ]])
```

```
y_train
```

```
2050     8
3250     9
817      6
3679    10
962      8
        ..
1661    10
3321    11
1338    10
2491    10
2458     4
Name: age, Length: 3112, dtype: int64
```

```
# Build the model
# Linear Regression
from sklearn import linear_model as lm
from sklearn.linear_model import LinearRegression
model=lm.LinearRegression()
results=model.fit(X_train,y_train)
accuracy = model.score(X_train, y_train)
print('Accuracy of the model:', accuracy)
```

```
Accuracy of the model: 0.533531801965699
```

```
#Training the model
lm = LinearRegression()
lm.fit(X_train, y_train)
y_train_pred = lm.predict(X_train)
y_train_pred
```

```
array([ 9.109375,  9.265625,  7.171875, ...,  9.28125 , 13.96875 ,
        5.234375])
```

```
X_train
```

```
array([[0.45 , 0.35 , 0.13 , ..., 0.   , 0.   , 1.   ],
       [0.435, 0.35 , 0.125, ..., 1.   , 0.   , 0.   ],
       [0.35 , 0.27 , 0.09 , ..., 0.   , 1.   , 0.   ],
       ...,
       [0.58 , 0.455, 0.135, ..., 0.   , 0.   , 1.   ],
       [0.515, 0.395, 0.165, ..., 1.   , 0.   , 0.   ],
       [0.2  , 0.145, 0.05 , ..., 0.   , 1.   , 0.   ]])
```

```
y_train
```

```
2050     8
3250     9
817      6
```

```
3679    10
962      8
        ..
1661    10
3321    11
1338    10
2491    10
2458     4
Name: age, Length: 3112, dtype: int64
```

```
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)
```

```
Mean Squared error of training set :4.835827
```

```
#Testing the model
y_train_pred = lm.predict(X_train)
y_test_pred = lm.predict(X_test)
```

```
y_test_pred
```

```
array([ 8.4375  , 12.703125,  8.296875, ..., 11.296875,  9.296875,
       10.453125])
```

```
X_test
```

```
array([[0.37 , 0.28 , 0.105, ..., 0.   , 0.   , 1.   ],
       [0.63 , 0.5  , 0.185, ..., 1.   , 0.   , 0.   ],
       [0.48 , 0.355, 0.125, ..., 0.   , 1.   , 0.   ],
       ...,
       [0.535, 0.45 , 0.135, ..., 1.   , 0.   , 0.   ],
       [0.62 , 0.465, 0.14 , ..., 1.   , 0.   , 0.   ],
       [0.415, 0.345, 0.135, ..., 0.   , 0.   , 1.   ]])
```

```
y_test
```

```
3404     8
187     10
3547     9
2606    10
472      9
        ..
1451     8
103     10
2296    13
2789     9
615     13
Name: age, Length: 1038, dtype: int64
```

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

```
Mean Squared error of testing set :4.325509
```

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

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

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

```
R2 Score of testing set:0.54
```