1.Importing Required Package

```
import pandas as pd
import seaborn as sns
import numpy as np
from matplotlib import pyplot as plt
%matplotlib inline
```

2.Loading the Dataset

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

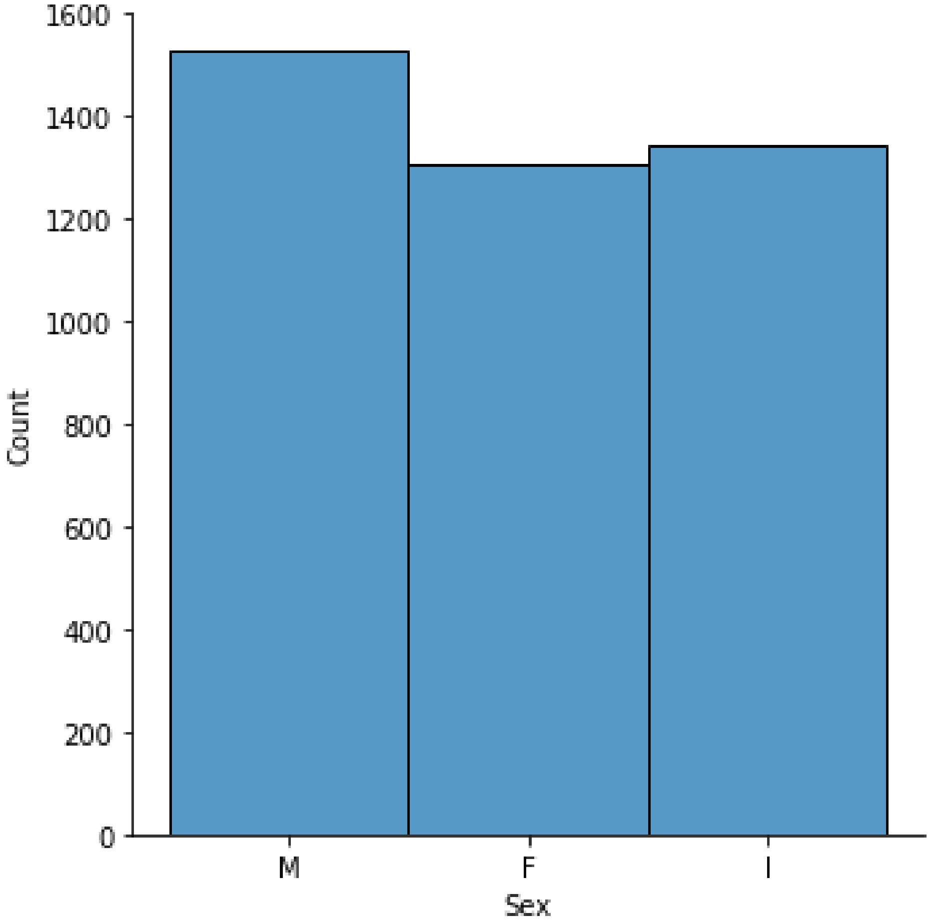
```
     Sex  Length  Diameter  Height  Whole weight  Shucked weight  \
0      M   0.455     0.365   0.095        0.5140          0.2245
1      M   0.350     0.265   0.090        0.2255          0.0995
2      F   0.530     0.420   0.135        0.6770          0.2565
3      M   0.440     0.365   0.125        0.5160          0.2155
4      I   0.330     0.255   0.080        0.2050          0.0895
...   ..     ...       ...     ...           ...             ...
4172   F   0.565     0.450   0.165        0.8870          0.3700
4173   M   0.590     0.440   0.135        0.9660          0.4390
4174   M   0.600     0.475   0.205        1.1760          0.5255
4175   F   0.625     0.485   0.150        1.0945          0.5310
4176   M   0.710     0.555   0.195        1.9485          0.9455

      Viscera weight  Shell weight  Rings
0             0.1010        0.1500     15
1             0.0485        0.0700      7
2             0.1415        0.2100      9
3             0.1140        0.1550     10
4             0.0395        0.0550      7
...              ...           ...    ...
4172          0.2390        0.2490     11
4173          0.2145        0.2605     10
4174          0.2875        0.3080      9
4175          0.2610        0.2960     10
4176          0.3765        0.4950     12

[4177 rows x 9 columns]
```

3.Visualizations

3.1 Univariate Analysis

```
sns.displot(df.Sex)
```

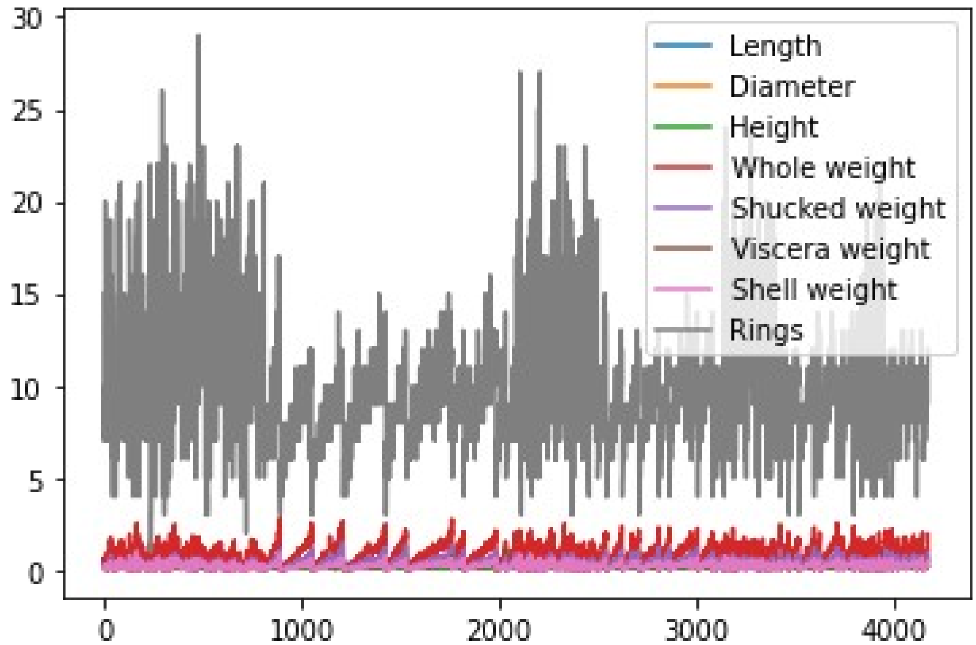
```
<seaborn.axisgrid.FacetGrid at 0x7fda18462c90>
```



3.2 Bi-Variate Analysis

```
df.plot.line()
```

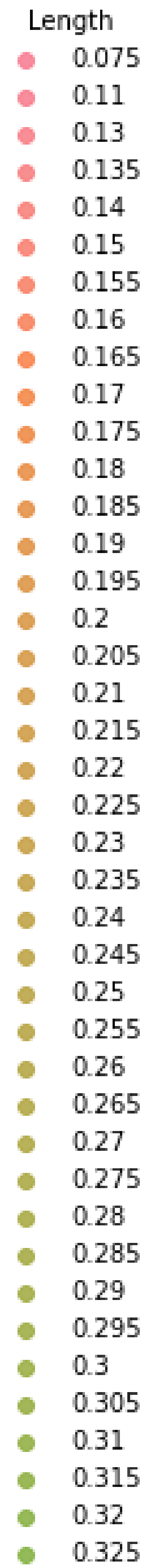
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fda155e3790>
```



3.3 Multi-Variate Analysis

```
sns.lmplot("Diameter","Length",df,hue="Length",fit_reg=False);
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43:
FutureWarning: Pass the following variables as keyword args: x, y,
data. From version 0.12, the only valid positional argument will be
`data`, and passing other arguments without an explicit keyword will
result in an error or misinterpretation.
  FutureWarning
```


Length
0.075
0.11
0.13
0.135
0.14
0.15
0.155
0.16
0.165
0.17
0.175
0.18
0.185
0.19
0.195
0.2
0.205
0.21
0.215
0.22
0.225
0.23
0.235
0.24
0.245
0.25
0.255
0.26
0.265
0.27
0.275
0.28
0.285
0.29
0.295
0.3
0.305
0.31
0.315
0.32
0.325

4.Perform descriptive statistics on the dataset.

```
df.describe()
```

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

       Viscera weight  Shell weight        Rings  
count     4177.000000   4177.000000  4177.000000  
mean         0.180594      0.238831     9.933684  
std          0.109614      0.139203     3.224169  
min          0.000500      0.001500     1.000000  
25%          0.093500      0.130000     8.000000  
50%          0.171000      0.234000     9.000000  
75%          0.253000      0.329000    11.000000  
max          0.760000      1.005000    29.000000  
```

5.Handle the Missing values

```
data=pd.read_csv("/content/abalone.csv")
pd.isnull(data["Sex"])
```

```
0       False
1       False
2       False
3       False
4       False
        ...  
4172    False
4173    False
4174    False
4175    False
4176    False
Name: Sex, Length: 4177, dtype: bool
```

6.Find the outliers and replace the outliers

```
df["Rings"]=np.where(df["Rings"]>10,np.median,df["Rings"])
df["Rings"]
```

```
0       <function median at 0x7fda32bd5cb0>
1                                         7
2                                         9
3                                        10
4                                         7
                       ...
4172    <function median at 0x7fda32bd5cb0>
4173                                     10
4174                                      9
4175                                     10
4176    <function median at 0x7fda32bd5cb0>
Name: Rings, Length: 4177, dtype: object
```

7.Check for Categorical columns and perform encoding

```
pd.get_dummies(df,columns=["Sex","Length"],prefix=["Length","Sex"]).he
ad()
```

```
   Diameter  Height  Whole weight  Shucked weight  Viscera weight  \
0     0.365   0.095        0.5140          0.2245          0.1010
1     0.265   0.090        0.2255          0.0995          0.0485
2     0.420   0.135        0.6770          0.2565          0.1415
3     0.365   0.125        0.5160          0.2155          0.1140
4     0.255   0.080        0.2050          0.0895          0.0395

   Shell weight                                Rings  Length_F
Length_I  \
0         0.150  <function median at 0x7fda32bd5cb0>         0
0
1         0.070                                    7         0
0
2         0.210                                    9         1
0
3         0.155                                   10         0
0
4         0.055                                    7         0
1

   Length_M  ...  Sex_0.745  Sex_0.75  Sex_0.755  Sex_0.76  Sex_0.765
\
0         1  ...          0         0          0         0          0

1         1  ...          0         0          0         0          0

2         0  ...          0         0          0         0          0
```

```
3         1  ...          0         0          0         0          0

4         0  ...          0         0          0         0          0


   Sex_0.77  Sex_0.775  Sex_0.78  Sex_0.8  Sex_0.815
0         0          0         0        0          0
1         0          0         0        0          0
2         0          0         0        0          0
3         0          0         0        0          0
4         0          0         0        0          0

[5 rows x 144 columns]
```

8.Split the data into dependent and independent variables

8.1 Split the data into Independent variables.

```
X=df.iloc[:,:-2].values
print(X)
```

```
[['M' 0.455 0.365 ... 0.514 0.2245 0.101]
 ['M' 0.35 0.265 ... 0.2255 0.0995 0.0485]
 ['F' 0.53 0.42 ... 0.677 0.2565 0.1415]
 ...
 ['M' 0.6 0.475 ... 1.176 0.5255 0.2875]
 ['F' 0.625 0.485 ... 1.0945 0.531 0.261]
 ['M' 0.71 0.555 ... 1.9485 0.9455 0.3765]]
```

8.2 Split the data into Dependent variables.

```
Y=df.iloc[:,-1].values
print(Y)
```

```
[<function median at 0x7fda32bd5cb0> 7 9 ... 9 10
 <function median at 0x7fda32bd5cb0>]
```

9.Scale the independen tvariables

```
import pandas as pd
from sklearn.preprocessing import MinMaxScaler
scaler=MinMaxScaler()
df[["Length"]]=scaler.fit_transform(df[["Length"]])
print(df)
```

```
     Sex    Length  Diameter  Height  Whole weight  Shucked weight  \
0      M  0.513514     0.365   0.095        0.5140          0.2245
1      M  0.371622     0.265   0.090        0.2255          0.0995
2      F  0.614865     0.420   0.135        0.6770          0.2565
3      M  0.493243     0.365   0.125        0.5160          0.2155
4      I  0.344595     0.255   0.080        0.2050          0.0895
...   ..       ...       ...     ...           ...             ...
```

```
4172   F  0.662162     0.450   0.165         0.8870          0.3700
4173   M  0.695946     0.440   0.135         0.9660          0.4390
4174   M  0.709459     0.475   0.205         1.1760          0.5255
4175   F  0.743243     0.485   0.150         1.0945          0.5310
4176   M  0.858108     0.555   0.195         1.9485          0.9455

      Viscera weight  Shell weight
Rings
0             0.1010        0.1500  <function median at
0x7fda32bd5cb0>
1             0.0485        0.0700
7
2             0.1415        0.2100
9
3             0.1140        0.1550
10
4             0.0395        0.0550
7
...              ...           ...                                  ..
.
4172          0.2390        0.2490  <function median at
0x7fda32bd5cb0>
4173          0.2145        0.2605
10
4174          0.2875        0.3080
9
4175          0.2610        0.2960
10
4176          0.3765        0.4950  <function median at
0x7fda32bd5cb0>

[4177 rows x 9 columns]
```

10.Split the data into training and testing

```
from sklearn.model_selection import train_test_split
train_size=0.8
X=df.drop(columns=['Sex']).copy()
y=df['Sex']
X_train,X_rem,y_train,y_rem=train_test_split(X,y,train_size=0.8)
test_size=0.5
X_valid,X_test,y_valid,y_test=train_test_split(X_rem,y_rem,test_size=0
.5)
print(X_train.shape),print(y_train.shape)
print(X_valid.shape),print(y_valid.shape)
print(X_test.shape),print(y_test.shape)
```

```
(3341, 8)
(3341,)
(418, 8)
(418,)
```

```
(418, 8)
(418,)

(None, None)
```

11.Build the Model

```
test_size=0.33
seed=7
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=test_size
,random_state=seed)
```

12.Train the model

```
X_train
```

```
        Length  Diameter  Height  Whole weight  Shucked weight  \
4131  0.682432     0.425   0.145        0.8300          0.3790   
3204  0.797297     0.530   0.185        1.3955          0.4560   
2622  0.844595     0.575   0.205        1.7975          0.7295   
2114  0.074324     0.095   0.035        0.0105          0.0050   
1422  0.871622     0.575   0.215        2.1730          0.9515   
...        ...       ...     ...           ...             ...   
1372  0.729730     0.475   0.165        1.0230          0.4905   
919   0.452703     0.310   0.090        0.3335          0.1635   
2550  0.277027     0.220   0.080        0.1315          0.0660   
537   0.290541     0.230   0.075        0.1165          0.0430   
1220  0.344595     0.250   0.095        0.2085          0.1020   

      Viscera weight  Shell weight                                 
Rings  
4131          0.1605        0.2575  <function median at 
0x7fda32bd5cb0>  
3204          0.3205        0.4900  <function median at 
0x7fda32bd5cb0>  
2622          0.3935        0.5165  <function median at 
0x7fda32bd5cb0>  
2114          0.0065        0.0035                                 
4  
1422          0.5640        0.5365  <function median at 
0x7fda32bd5cb0>  
...              ...           ...                                ..
.  
1372          0.1955        0.3035  <function median at 
0x7fda32bd5cb0>  
919           0.0610        0.0910                                 
6  
2550          0.0240        0.0300                                 
5  
537           0.0255        0.0400                                 
7
```

```
1220           0.0395        0.0520
7

[2798 rows x 8 columns]
```

```
y_train
```

```
4131    I
3204    F
2622    F
2114    I
1422    M
       ..
1372    F
919     I
2550    I
537     M
1220    I
Name: Sex, Length: 2798, dtype: object
```

13.Test the model

```
X_test
```

```
        Length  Diameter  Height  Whole weight  Shucked weight  \
1157  0.716216     0.470   0.165        1.1775          0.6110
1125  0.641892     0.425   0.150        0.8315          0.4110
2053  0.520270     0.345   0.110        0.4595          0.2350
3591  0.777027     0.475   0.165        1.3875          0.5800
455   0.675676     0.470   0.140        0.8375          0.3485
...        ...       ...     ...           ...             ...
3150  0.783784     0.505   0.165        1.3670          0.5835
3037  0.655405     0.450   0.145        0.8940          0.3885
2050  0.506757     0.350   0.130        0.4655          0.2075
1690  0.743243     0.500   0.170        1.0985          0.4645
253   0.675676     0.460   0.185        1.0940          0.4485

      Viscera weight  Shell weight
Rings
1157          0.2275        0.2920
9
1125          0.1765        0.2165
10
2053          0.0885        0.1160
7
3591          0.3485        0.3095
9
455           0.1735        0.2400  <function median at
0x7fda32bd5cb0>
...              ...           ...                                   ..
.
```

```
3150          0.3515        0.3960
10
3037          0.2095        0.2640
9
2050          0.1045        0.1350
8
1690          0.2200        0.3540
9
253           0.2170        0.3450  <function median at
0x7fda32bd5cb0>

[1379 rows x 8 columns]
```

```
y_test
```

```
1157    F
1125    M
2053    M
3591    F
455     M
       ..
3150    F
3037    M
2050    M
1690    M
253     F
Name: Sex, Length: 1379, dtype: object
```

14.Measure the performance using Metrics

```
from sklearn.metrics import r2_score
from sklearn.metrics import mean_absolute_error
from sklearn.metrics import mean_squared_error
X_train=[5,-1,2,10]
y_test=[3.5,-0.9,2,9.9]
print('RSquared=',r2_score(X_train,y_test))
print('MAE=',mean_absolute_error(X_train,y_test))
print('MSE=',mean_squared_error(X_train,y_test))
```

```
RSquared= 0.9656060606060606
MAE= 0.42499999999999993
MSE= 0.5674999999999999
```