```
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')
df.describe()
```

Choose Files abalone.csv

- **abalone.csv**(text/csv) - 191962 bytes, last modified: 10/29/2022 - 100% done

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

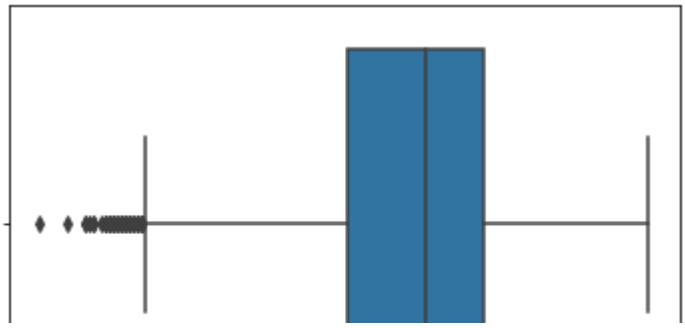
	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight
count	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000
mean	0.523992	0.407881	0.139516	0.828742	0.359367	0.180594
std	0.120093	0.099240	0.041827	0.490389	0.221963	0.109614
min	0.075000	0.055000	0.000000	0.002000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

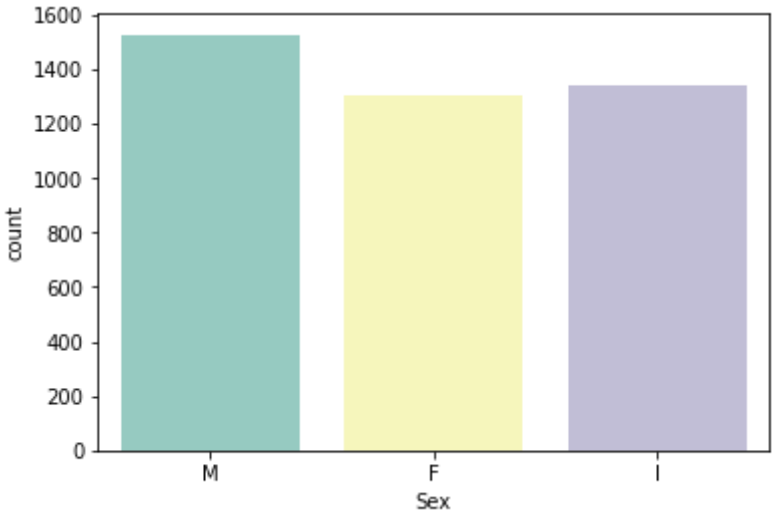
```
sns.boxplot(df.Length)
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: P
  FutureWarning
<matplotlib.axes._subplots.AxesSubplot at 0x7f59db184c10>
```



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

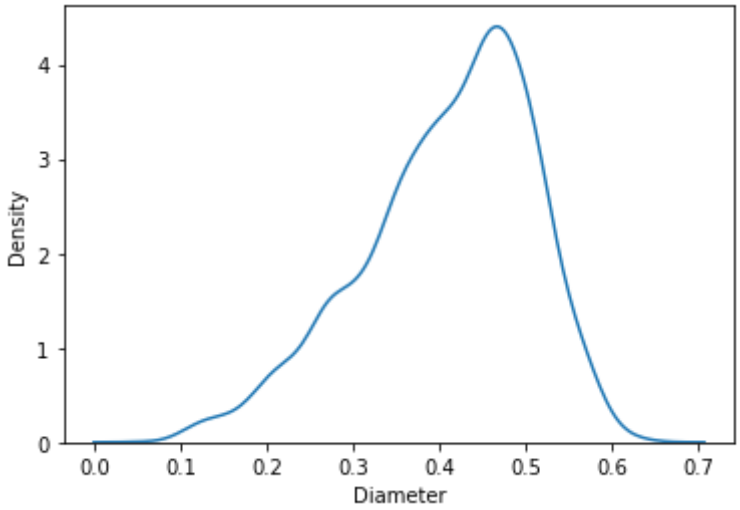
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f59c3df1950>
```




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

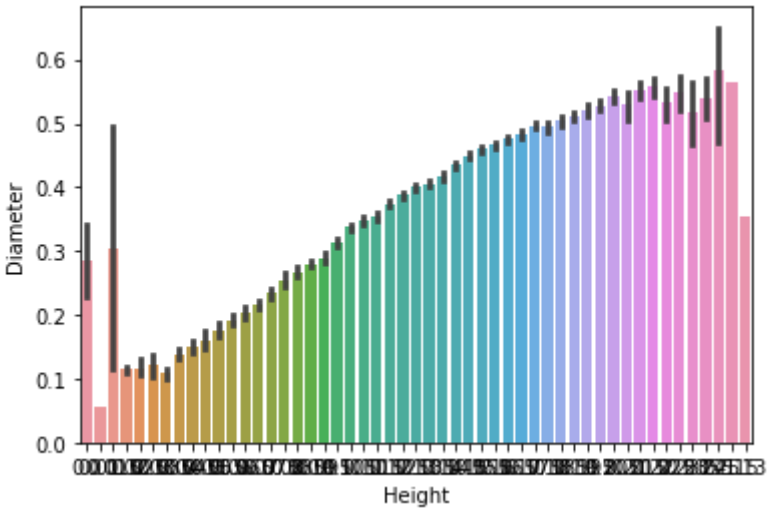
```
a['age']=a['Rings']+1.5
a=a.drop('Rings',axis=1)
sns.kdeplot(a['Diameter'])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f59c393de10>
```



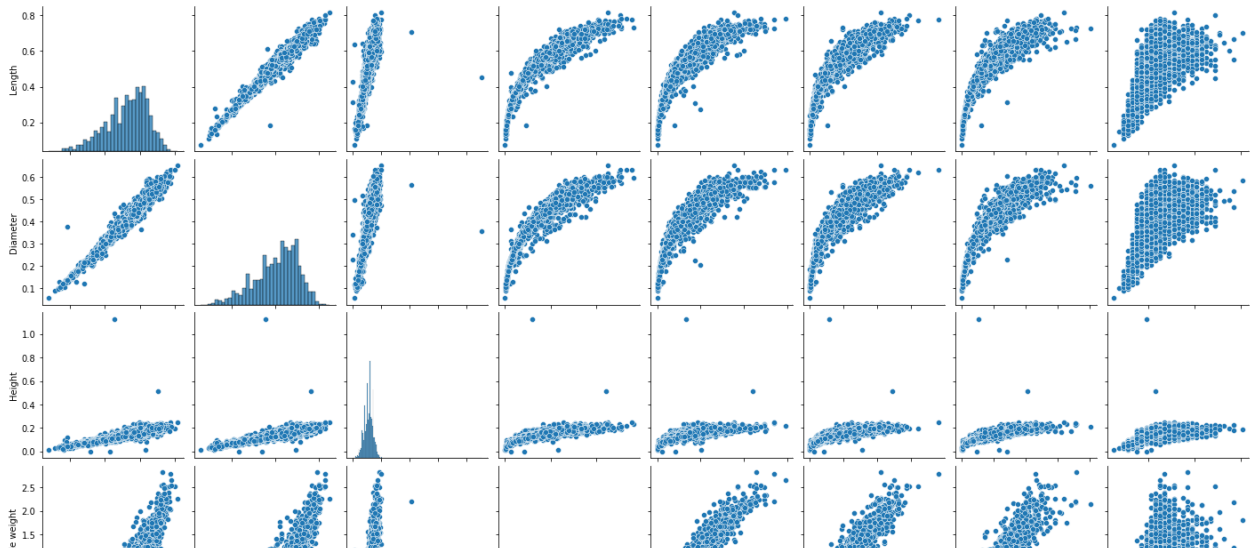

```
sns.barplot(x=df.Height,y=df.Diameter)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f59c386c410>
```



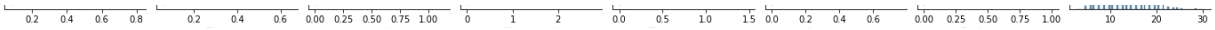

```
sns.pairplot(a)
```

```
<seaborn.axisgrid.PairGrid at 0x7f59c3862b10>
```




```
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
```

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

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
1257	I	0.430	0.34	0.0	0.428	0.2065	0.0860	0.1150	8
3996	I	0.315	0.23	0.0	0.134	0.0575	0.0285	0.3505	6

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

```
0.425
```

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

```
0.7190979217612694
```

```
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','%'])
```

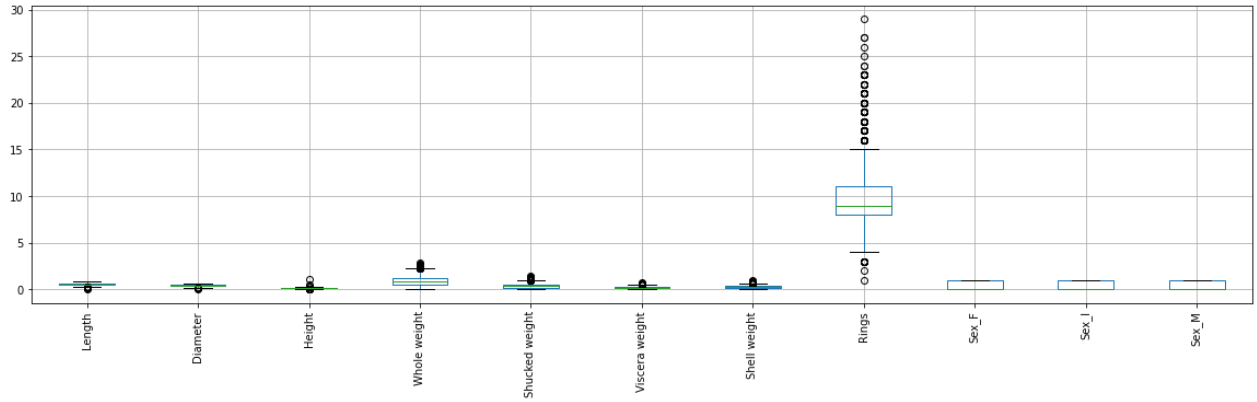
	Missing values	%
Sex	0	0.0
Length	0	0.0
Diameter	0	0.0
Height	0	0.0
Whole weight	0	0.0
Shucked weight	0	0.0
Viscera weight	0	0.0
Shell weight	0	0.0
Rings	0	0.0

```
q1=df.Rings.quantile(0.25)
q2=df.Rings.quantile(0.75)
iqr=q1-q2
print(iqr)
```

```
-3.0
```

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

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f59bfa8afd0>
```

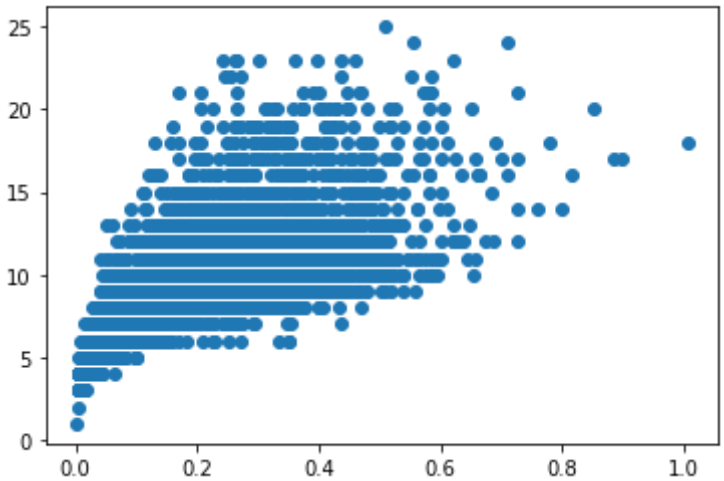



```
df['age']=df['Rings']
df=df.drop('Rings',axis=1)
```

```
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'])
```

```
<matplotlib.collections.PathCollection at 0x7f59bca69c10>
```




```
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
```

```
abalone_numeric=df[['Length','Diameter','Height','Whole weight','Shucked weight','Viscera
```

```
abalone_numeric.head()
```

	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	age
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

```
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
```

```
print("\n ORIGNAL VALUES:\n\n", x,y )
```

```
 ORIGNAL 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 max scaling: \n\n", new_y)
```

```
 Values after min max scaling:

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

```
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)
```

```
array([[-0.56736455, -0.42395732, -1.05992592, ..., -0.67424712,
        -0.69131775,  1.32156176],
       [-1.44754363, -1.43820927, -1.1801252 , ..., -0.67424712,
        -0.69131775,  1.32156176],
       [ 0.0613348 ,  0.13388126, -0.0983317 , ...,  1.48313573,
        -0.69131775, -0.75668049],
       ...,
       [ 0.64812085,  0.69171983,  1.58445819, ..., -0.67424712,
        -0.69131775,  1.32156176],
       [ 0.8576873 ,  0.79314503,  0.26226613, ...,  1.48313573,
        -0.69131775, -0.75668049],
       [ 1.57021323,  1.50312139,  1.34405963, ..., -0.67424712,
        -0.69131775,  1.32156176]])
```

```
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([[0.72 , 0.565, 0.17 , ..., 1.   , 0.   , 0.   ],
       [0.62 , 0.49 , 0.16 , ..., 1.   , 0.   , 0.   ],
```

```
       [0.715, 0.55 , 0.175, ..., 0.   , 0.   , 1.   ],
       ...,
       [0.44 , 0.34 , 0.1  , ..., 0.   , 1.   , 0.   ],
       [0.295, 0.215, 0.085, ..., 0.   , 1.   , 0.   ],
       [0.485, 0.355, 0.12 , ..., 0.   , 0.   , 1.   ]])
```

```
y_train
```

```
2861    12
2079     9
2971    11
2376     8
1822    11
        ..
540     15
3831    10
2636     7
295      6
751     10
Name: age, Length: 3112, dtype: int64
```

```
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: 0.5281282409146209
```

```
from matplotlib.ticker import LinearLocator
lm=LinearRegression()
lm.fit(x_train,y_train)
y_train_pred=lm.predict(x_train)
y_train_pred
```

```
array([12.6476467 , 10.29587453,  9.20319968, ...,  7.37740614,
        6.38387132,  9.12993864])
```

```
x_train
```

```
array([[0.72 , 0.565, 0.17 , ..., 1.   , 0.   , 0.   ],
       [0.62 , 0.49 , 0.16 , ..., 1.   , 0.   , 0.   ],
       [0.715, 0.55 , 0.175, ..., 0.   , 0.   , 1.   ],
       ...,
       [0.44 , 0.34 , 0.1  , ..., 0.   , 1.   , 0.   ],
       [0.295, 0.215, 0.085, ..., 0.   , 1.   , 0.   ],
       [0.485, 0.355, 0.12 , ..., 0.   , 0.   , 1.   ]])
```

```
y_train
```

```
2861    12
2079     9
```

```
2971    11
2376     8
1822    11
        ..
540     15
3831    10
2636     7
295      6
751     10
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:4.752659
```

```
y_train_pred=lm.predict(x_train)
y_test_pred=lm.predict(x_test)
y_test_pred
```

```
array([ 7.95755463,  8.89296929, 12.30924745, ...,  7.56961852,
       10.97822076, 10.44736469])
```

```
x_test
```

```
array([[0.38 , 0.32 , 0.115, ..., 1.   , 0.   , 0.   ],
       [0.465, 0.37 , 0.12 , ..., 0.   , 1.   , 0.   ],
       [0.65 , 0.525, 0.19 , ..., 0.   , 0.   , 1.   ],
       ...,
       [0.4  , 0.315, 0.1  , ..., 0.   , 1.   , 0.   ],
       [0.575, 0.4  , 0.155, ..., 0.   , 0.   , 1.   ],
       [0.525, 0.44 , 0.15 , ..., 1.   , 0.   , 0.   ]])
```

```
y_test
```

```
3720     7
1566     9
3699    11
3147    13
1127     8
        ..
2827     8
2099    10
3748     6
481     17
405     12
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:4.566287
```

```
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
```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