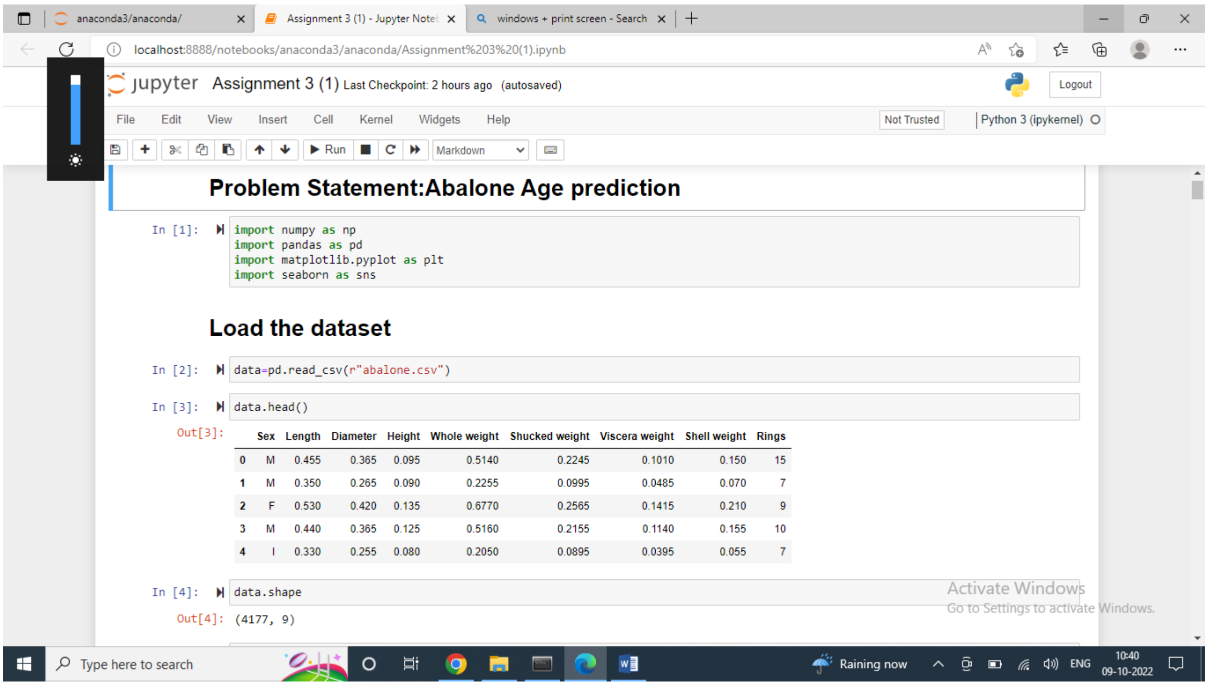
ASSIGNMENT-3

Applied Data Science

Assignment Date	30 September 2022
Student Name	Ms. Subavarshini S
Student Roll Number	721719104081
Maximum Marks	2 Marks



Problem Statement:Abalone Age prediction

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

Load the dataset

In [2]:
```
data=pd.read_csv(r"abalone.csv")
```

In [3]:
```
data.head()
```

Out[3]:

	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

In [4]:
```
data.shape
```

Out[4]:
```
(4177, 9)
```

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In [5]:
```
data.size
```
Out[5]: 37593

In [6]:
```
data.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   Rings           4177 non-null   int64
dtypes: float64(7), int64(1), object(1)
memory usage: 293.8+ KB
```

Data Analysis & Visualization

Univariate Analysis

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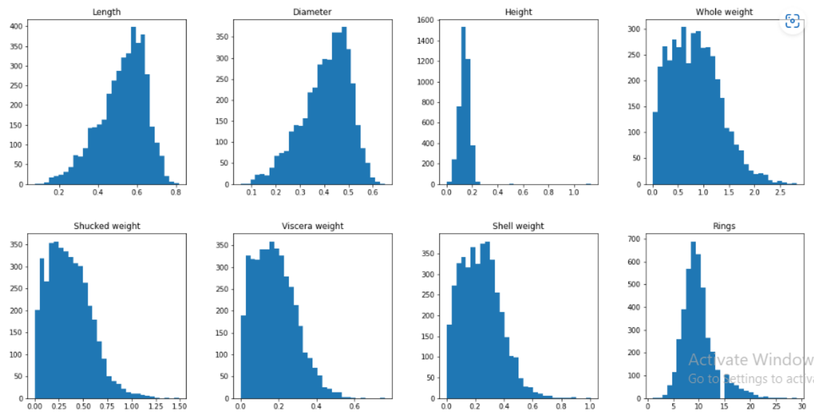
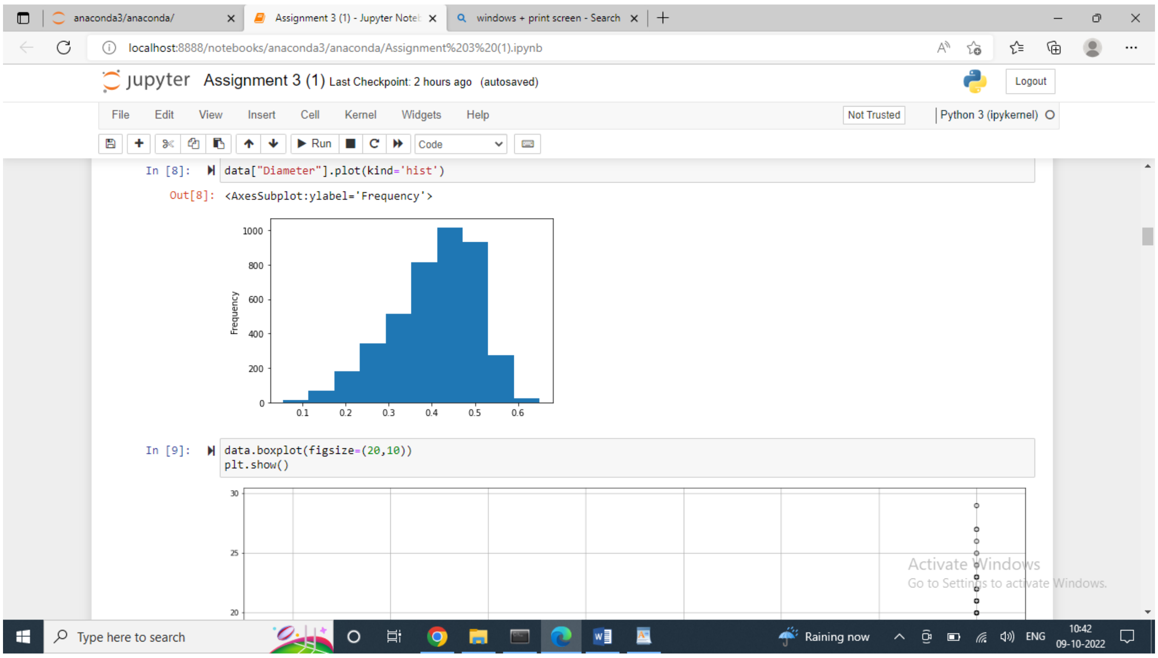
In [7]:
```
data.hist(figsize=(20,10), grid=False, layout=(2,4), bins=30)
plt.show()
```





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jupyter Assignment 3 (1) Last Checkpoint: 2 hours ago (autosaved)
Logout
File Edit View Insert Cell Kernel Widgets Help
Not Trusted
Python 3 (ipykernel)
Run
Code
In [8]: data["Diameter"].plot(kind='hist')
Out[8]: <AxesSubplot:ylabel='Frequency'>
Frequency
1000
800
600
400
200
0
0.1 0.2 0.3 0.4 0.5 0.6
In [9]: data.boxplot(figsize=(20,10))
plt.show()
30
25
20
Activate Windows
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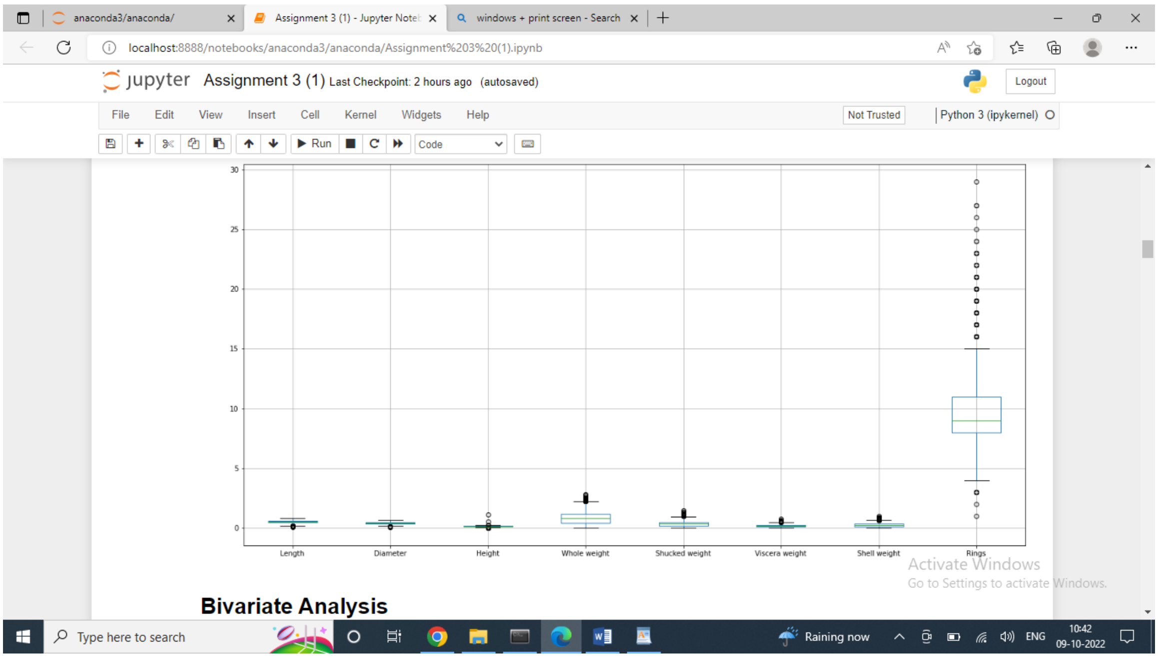
Raining now
ENG
10:42
09-10-2022



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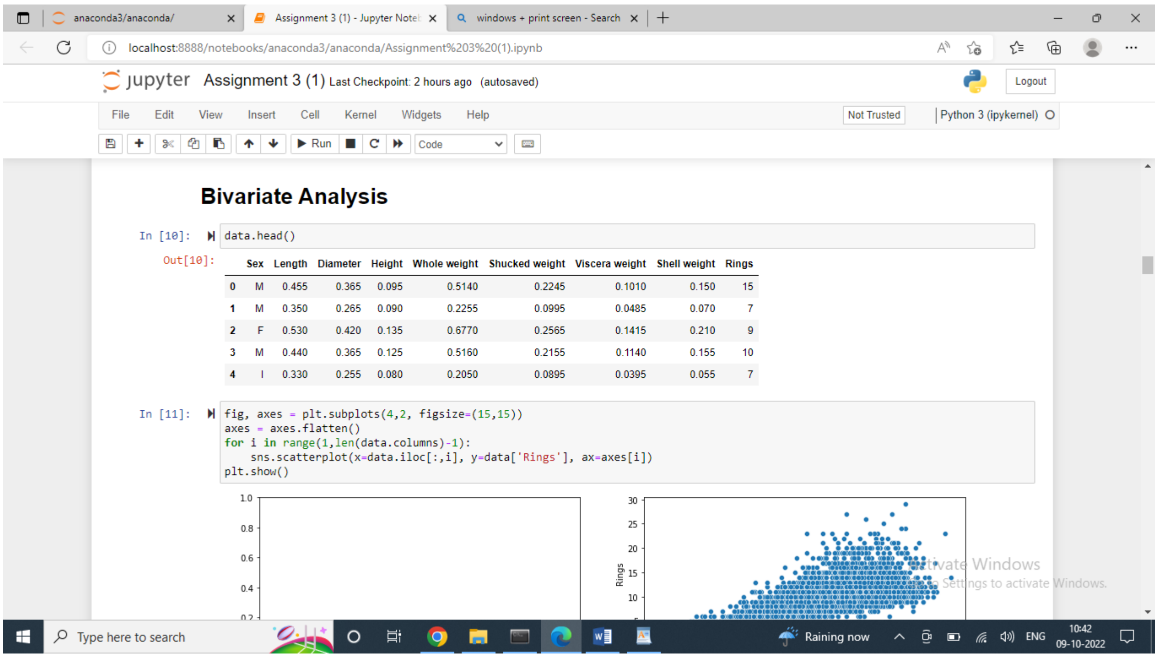
File Edit View Insert Cell Kernel Widgets Help
Not Trusted
Python 3 (ipykernel)
Run
Code
30
25
20
15
10
5
0
Length
Diameter
Height
Whole weight
Shucked weight
Viscera weight
Shell weight
Rings
Activate Windows
Go to Settings to activate Windows.
Bivariate Analysis
Type here to search
Raining now
ENG
10:42
09-10-2022



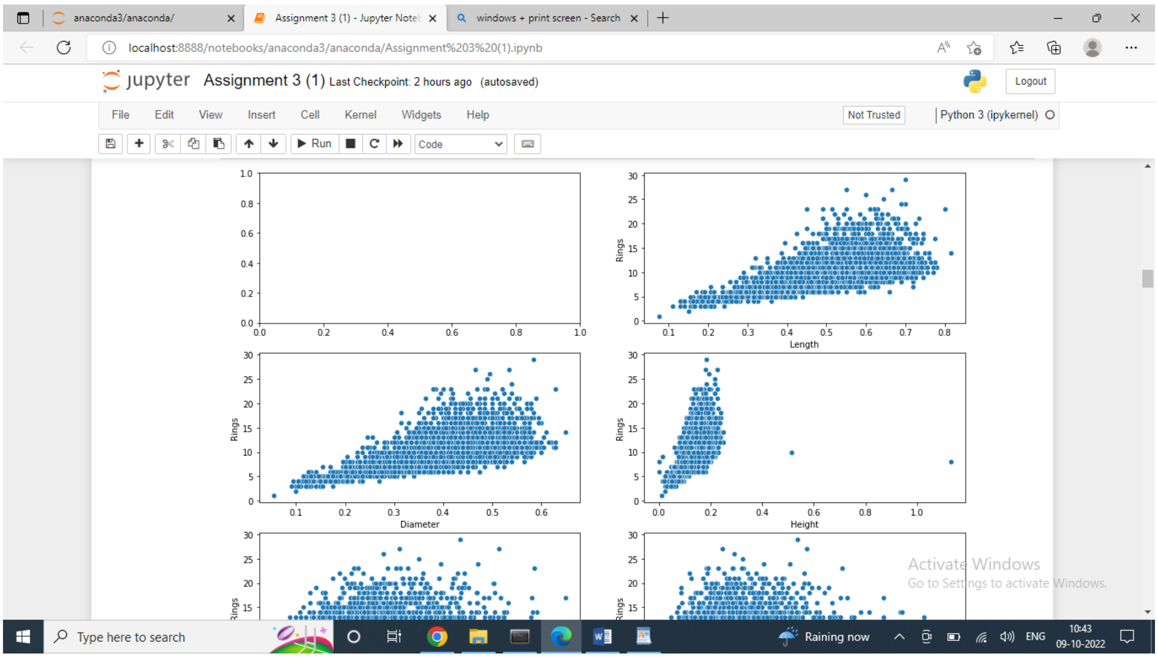
Bivariate Analysis

In [10]:
```
data.head()
```

Out[10]:

	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

In [11]:
```
fig, axes = plt.subplots(4,2, figsize=(15,15))
axes = axes.flatten()
for i in range(1,len(data.columns)-1):
    sns.scatterplot(x=data.iloc[:,i], y=data['Rings'], ax=axes[i])
plt.show()
```



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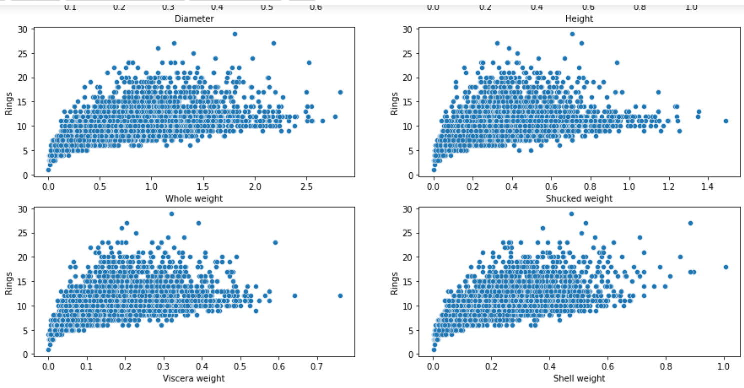


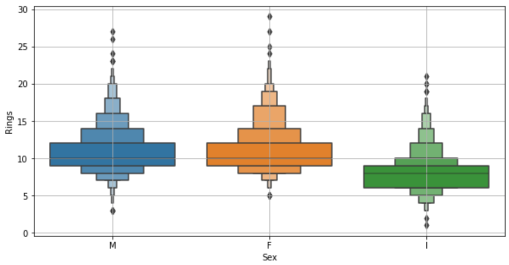
In [12]:

```
plt.figure(figsize=(10,5))
sns.boxenplot(y=data['Rings'], x=data['Sex'])
plt.grid()
plt.show()
```


jupyter Assignment 3 (1) Last Checkpoint: 2 hours ago (autosaved)

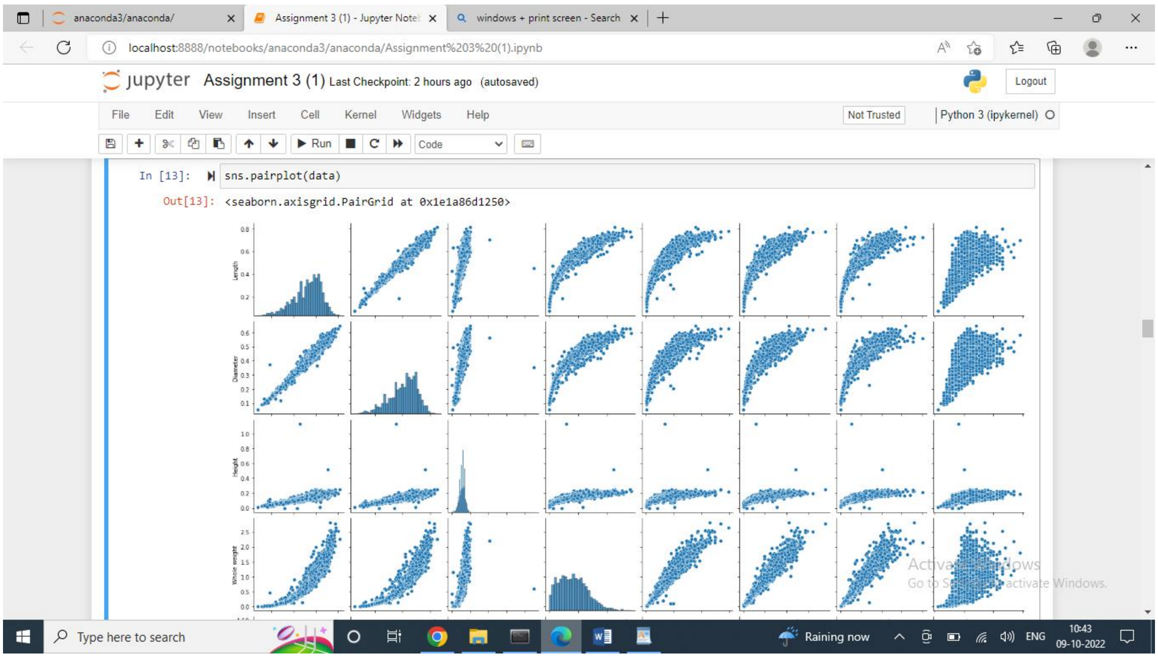
In [12]:

```
plt.figure(figsize=(10,5))
sns.boxenplot(y=data['Rings'], x=data['Sex'])
plt.grid()
plt.show()
data.groupby('Sex')['Rings'].describe()
```



Out[12]:

Sex	count	mean	std	min	25%	50%	75%	max
F	1307.0	11.129304	3.104256	5.0	9.0	10.0	12.0	29.0
I	1342.0	7.890462	2.511554	1.0	6.0	8.0	9.0	21.0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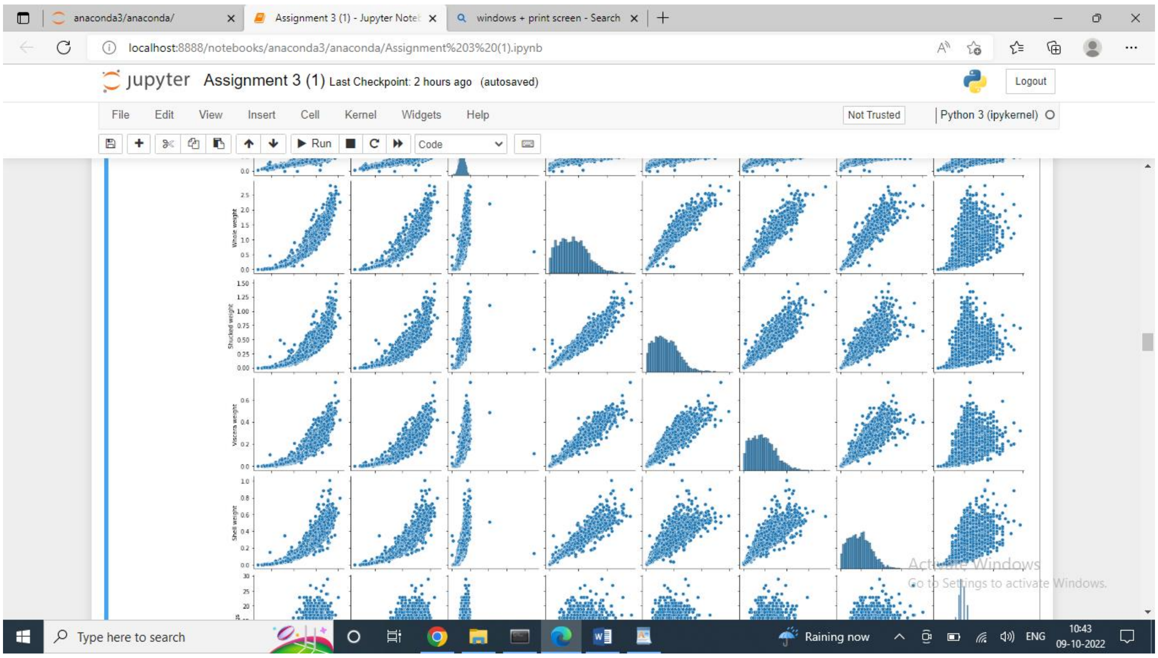
Logout
File Edit View Insert Cell Kernel Widgets Help
Not Trusted
Python 3 (ipykernel)
Run
Code
In [13]: sns.pairplot(data)
Out[13]: <seaborn.axisgrid.PairGrid at 0x1e1a86d1250>
Activate Windows
Type here to search
Raining now
ENG
10:43
09-10-2022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Assignment 3 (1) - Jupyter Note
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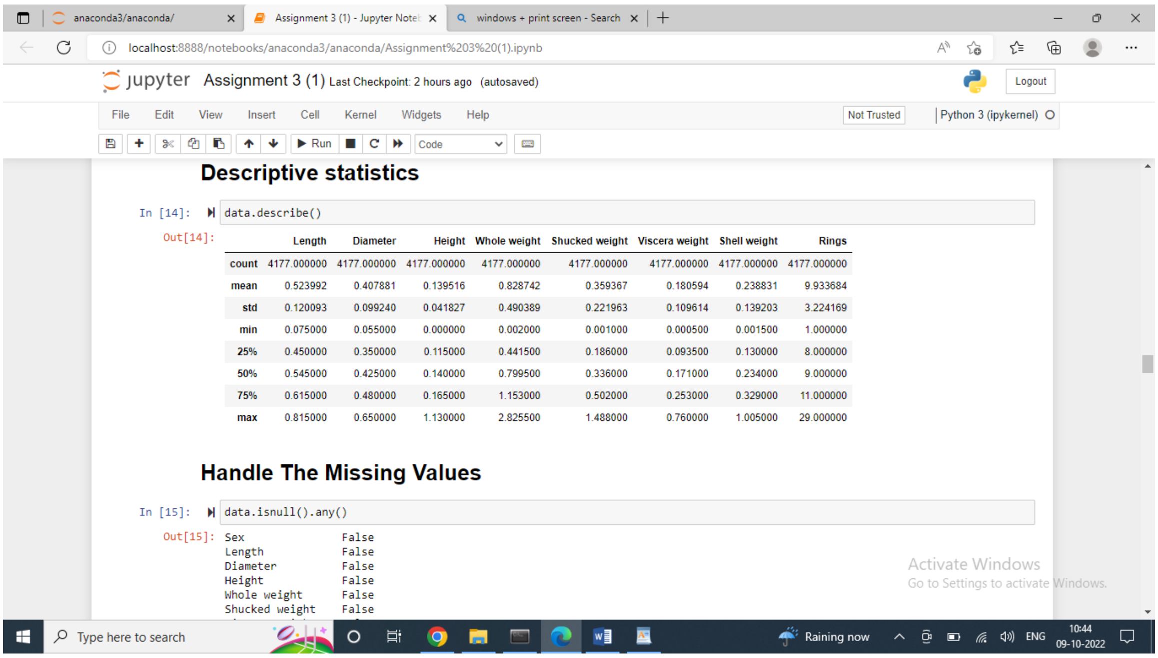
localhost:8888/notebooks/anaconda3/anaconda/Assignment%203%20(1).ipynb
jupyter Assignment 3 (1) Last Checkpoint: 2 hours ago (autosaved)
Logout
File Edit View Insert Cell Kernel Widgets Help
Not Trusted
Python 3 (ipykernel)
Run
Code
Activate Windows
Go to Settings to activate Windows.
Type here to search
Raining now
ENG
10:43
09-10-2022



Descriptive statistics

In [14]:
```
data.describe()
```

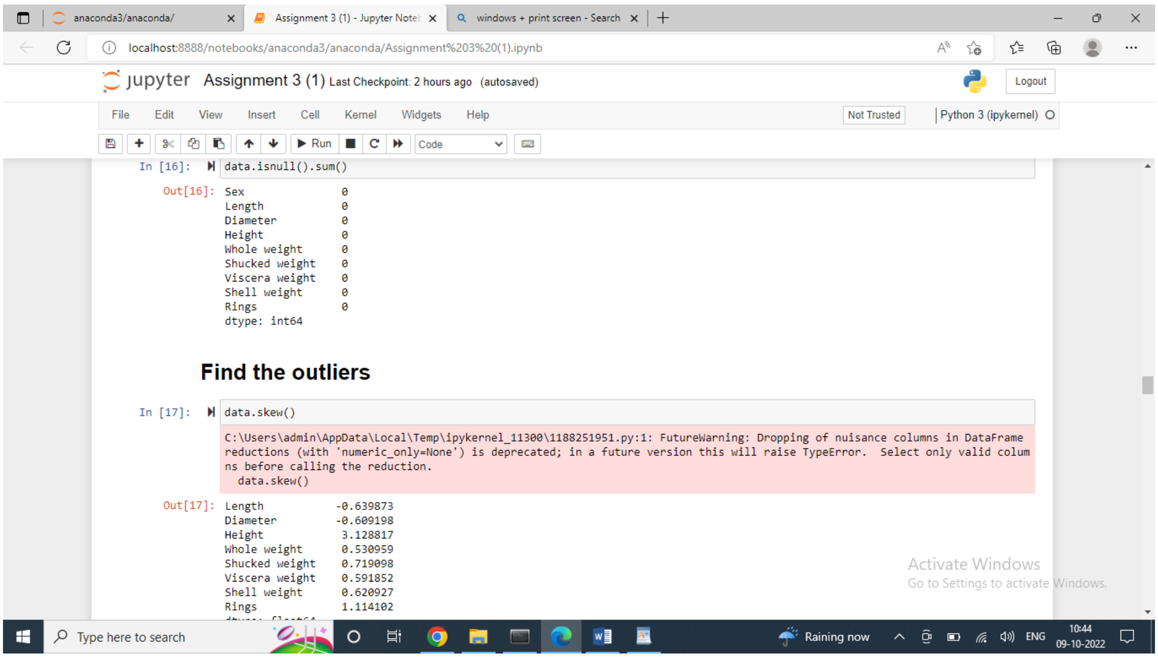
Out[14]:

	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
count	4177.000000	4177.000000	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	0.238831	9.933684
std	0.120093	0.099240	0.041827	0.490389	0.221963	0.109614	0.139203	3.224169
min	0.075000	0.055000	0.000000	0.002000	0.001000	0.000500	0.001500	1.000000
25%	0.450000	0.350000	0.115000	0.441500	0.186000	0.093500	0.130000	8.000000
50%	0.545000	0.425000	0.140000	0.799500	0.336000	0.171000	0.234000	9.000000
75%	0.615000	0.480000	0.165000	1.153000	0.502000	0.253000	0.329000	11.000000
max	0.815000	0.650000	1.130000	2.825500	1.488000	0.760000	1.005000	29.000000

Handle The Missing Values

In [15]:
```
data.isnull().any()
```

Out[15]:
```
Sex               False
Length            False
Diameter          False
Height            False
Whole weight      False
Shucked weight    False
```



In [16]:
```
data.isnull().sum()
```

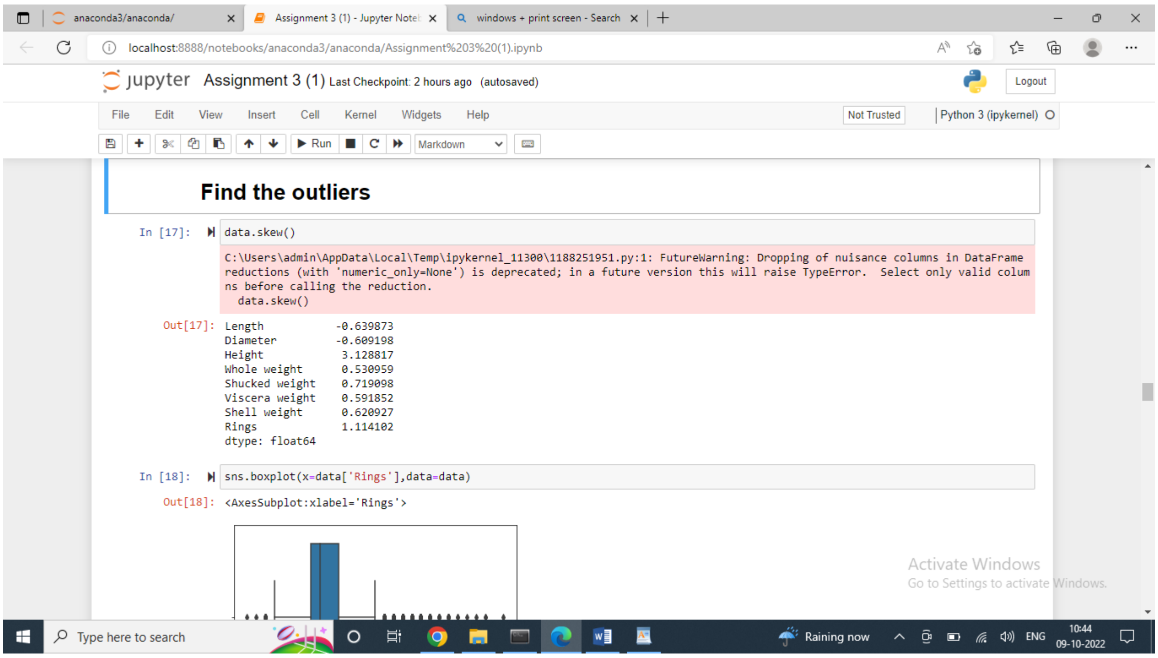
Out[16]:
```
Sex               0
Length            0
Diameter          0
Height            0
Whole weight      0
Shucked weight    0
Viscera weight    0
Shell weight      0
Rings             0
dtype: int64
```

Find the outliers

In [17]:
```
data.skew()
```

```
C:\Users\admin\AppData\Local\Temp\ipykernel_11300\1188251951.py:1: FutureWarning: Dropping of nuisance columns in DataFrame
reductions (with 'numeric_only=None') is deprecated; in a future version this will raise TypeError.  Select only valid colum
ns before calling the reduction.
  data.skew()
```

Out[17]:
```
Length           -0.639873
Diameter         -0.609198
Height            3.128817
Whole weight      0.530959
Shucked weight    0.719098
Viscera weight    0.591852
Shell weight      0.620927
Rings             1.114102
```



Find the outliers

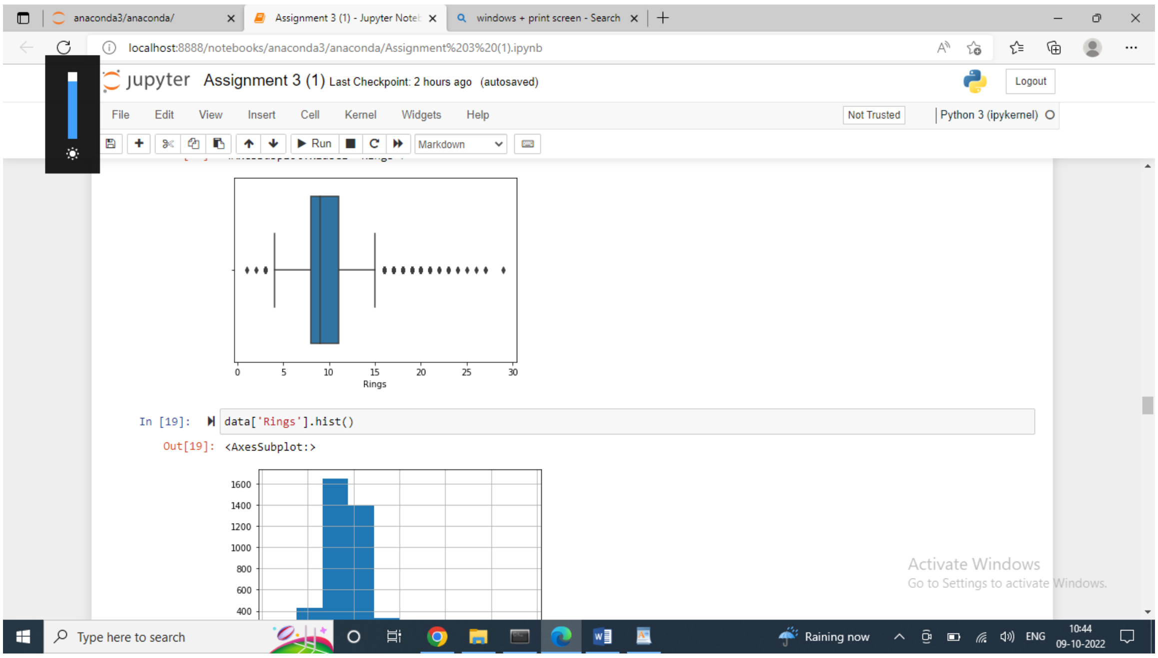
In [17]:
```
data.skew()
```

```
C:\Users\admin\AppData\Local\Temp\ipykernel_11300\1188251951.py:1: FutureWarning: Dropping of nuisance columns in DataFrame reductions (with 'numeric_only=None') is deprecated; in a future version this will raise TypeError.  Select only valid columns before calling the reduction.
  data.skew()
```

Out[17]:
```
Length           -0.639873
Diameter         -0.609198
Height            3.128817
Whole weight      0.530959
Shucked weight    0.719098
Viscera weight    0.591852
Shell weight      0.620927
Rings             1.114102
dtype: float64
```

In [18]:
```
sns.boxplot(x=data['Rings'],data=data)
```

Out[18]: <AxesSubplot:xlabel='Rings'>



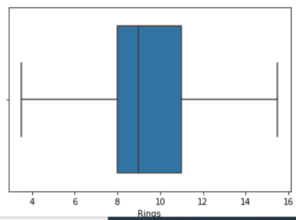
In [19]:
```
data['Rings'].hist()
```

Out[19]: <AxesSubplot:>

In [20]:
```python
print('skewness value of Age: ',data['Rings'].skew())
```
```
skewness value of Age:  1.114101898355677
```

In [21]:
```python
Q1 = data['Rings'].quantile(0.25)
Q3 = data['Rings'].quantile(0.75)
IQR = Q3 - Q1
whisker_width = 1.5
lower_whisker = Q1 -(whisker_width*IQR)
upper_whisker = Q3 +(whisker_width*IQR)
data['Rings']=np.where(data['Rings']>upper_whisker,upper_whisker,np.where(data['Rings']<lower_whisker,lower_whisker,data['Rir
```

In [23]:
```python
sns.boxplot(x=data['Rings'],data=data)
```
Out[23]: <AxesSubplot:xlabel='Rings'>



Categorical encoding

In [24]:
```python
data.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   Rings           4177 non-null   float64
dtypes: float64(8), object(1)
memory usage: 293.8+ KB
```

In [25]:
```python
from sklearn.preprocessing import LabelEncoder

le=LabelEncoder()

data['Sex']=le.fit_transform(data['Sex'])
```

In [26]:
```python
data.head()
```

In [25]:
```python
from sklearn.preprocessing import LabelEncoder

le=LabelEncoder()

data['Sex']=le.fit_transform(data['Sex'])
```

In [26]:
```python
data.head()
```

Out[26]:

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	2	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15.0
1	2	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7.0
2	0	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9.0
3	2	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10.0
4	1	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7.0

In [28]:
```python
data["Sex"].unique()
```

Out[28]: array([2, 0, 1])

Split the data into training and testing

In [29]:
```python
data.head(5)
```

Out[29]:

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	2	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15.0

Split the data into training and testing

In [29]:
```python
data.head(5)
```

Out[29]:

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	2	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15.0
1	2	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7.0
2	0	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9.0
3	2	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10.0
4	1	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7.0

In [30]:
```python
x=data.iloc[:,0:7]
y=data.iloc[:,-1]
```

In [31]:
```python
x
```

Out[31]:

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight
0	2	0.455	0.365	0.095	0.5140	0.2245	0.1010
1	2	0.350	0.265	0.090	0.2255	0.0995	0.0485
2	0	0.530	0.420	0.135	0.6770	0.2565	0.1415
3	2	0.440	0.365	0.125	0.5160	0.2155	0.1140
4	1	0.330	0.255	0.080	0.2050	0.0895	0.0395

4177 rows × 7 columns

In [32]:
```
y
```

Out[32]:
```
0        15.0
1         7.0
2         9.0
3        10.0
4         7.0
         ...
4172     11.0
4173     10.0
4174      9.0
4175     10.0
4176     12.0
Name: Rings, Length: 4177, dtype: float64
```

In [33]:
```
y.shape
```

Out[33]: (4177,)

Scale the independent variables

In [36]:
```
from sklearn.preprocessing import StandardScaler
ss = StandardScaler()
x_scaled = ss.fit_transform(x)
```

Out[33]: (4177,)

Scale the independent variables

In [36]:
```
from sklearn.preprocessing import StandardScaler
ss = StandardScaler()
x_scaled = ss.fit_transform(x)
```

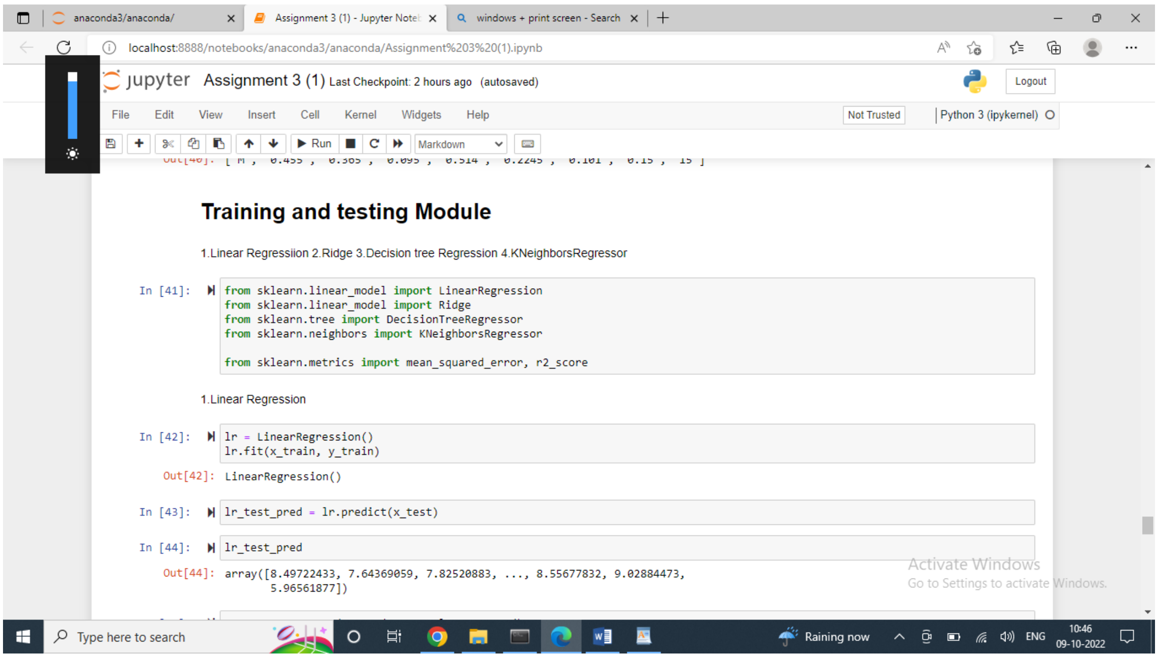

Split the data into training and testing

In [39]:
```
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x_scaled, y, test_size = 0.3, random_state = 1)
```

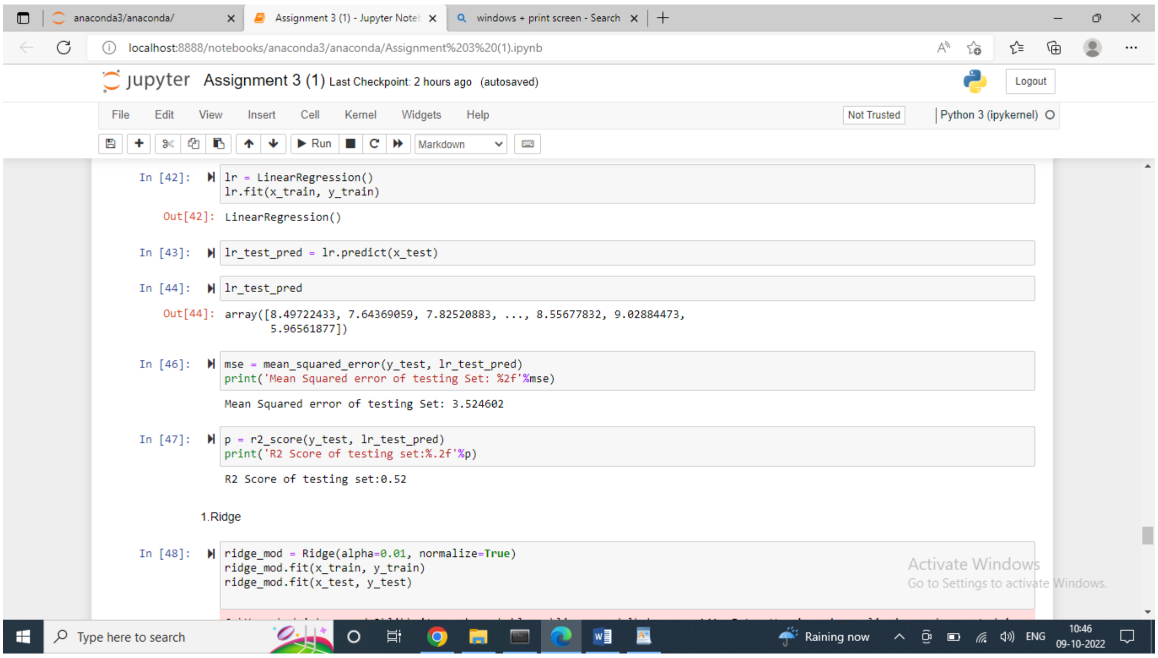
Build the model

Training the model and testing the model

In [40]:
```
import csv
with open("abalone.csv") as csv_file:
    csv_reader = csv.reader(csv_file)
    data = pd.DataFrame([csv_reader], index = None)
for val in list(data[1]):
    print(val)
['M', '0.455', '0.365', '0.095', '0.514', '0.2245', '0.101', '0.15', '15']
```



jupyter Assignment 3 (1) Last Checkpoint: 2 hours ago (autosaved)
Training and testing Module
1.Linear Regressiion 2.Ridge 3.Decision tree Regression 4.KNeighborsRegressor
In [41]:
from sklearn.linear_model import LinearRegression
from sklearn.linear_model import Ridge
from sklearn.tree import DecisionTreeRegressor
from sklearn.neighbors import KNeighborsRegressor
from sklearn.metrics import mean_squared_error, r2_score
1.Linear Regression
In [42]:
lr = LinearRegression()
lr.fit(x_train, y_train)
Out[42]: LinearRegression()
In [43]:
lr_test_pred = lr.predict(x_test)
In [44]:
lr_test_pred
Out[44]: array([8.49722433, 7.64369059, 7.82520883, ..., 8.55677832, 9.02884473,
5.96561877])



jupyter Assignment 3 (1) Last Checkpoint: 2 hours ago (autosaved)
In [42]:
lr = LinearRegression()
lr.fit(x_train, y_train)
Out[42]: LinearRegression()
In [43]:
lr_test_pred = lr.predict(x_test)
In [44]:
lr_test_pred
Out[44]: array([8.49722433, 7.64369059, 7.82520883, ..., 8.55677832, 9.02884473,
5.96561877])
In [46]:
mse = mean_squared_error(y_test, lr_test_pred)
print('Mean Squared error of testing Set: %2f'%mse)
Mean Squared error of testing Set: 3.524602
In [47]:
p = r2_score(y_test, lr_test_pred)
print('R2 Score of testing set:%.2f'%p)
R2 Score of testing set:0.52
1.Ridge
In [48]:
ridge_mod = Ridge(alpha=0.01, normalize=True)
ridge_mod.fit(x_train, y_train)
ridge_mod.fit(x_test, y_test)

jupyter Assignment 3 (1) Last Checkpoint: 2 hours ago (autosaved)

```
Out[48]: Ridge(alpha=0.01, normalize=True)

In [49]: ridge_model_pred = ridge_mod.predict(x_test)

In [50]: ridge_model_pred

Out[50]: array([8.54031033, 8.48463396, 7.96838487, ..., 8.77493484, 9.03881023,
               5.83582085])

In [51]: acc = r2_score(y_test, ridge_model_pred)
         print('Score of testing Set: %2f'%acc)

         Score of testing Set: 0.523227
```

1.Decision Tree Regression

```
In [52]: dt =  DecisionTreeRegressor()
         dt.fit(x_train, y_train)

Out[52]: DecisionTreeRegressor()

In [53]: dt_test_pred = dt.predict(x_test)

In [54]: dt_test_pred

Out[54]: array([12.,  9., 10., ...,  6.,  9.,  4.])

In [55]: dacc = mean_squared_error(y_test, dt_test_pred)
```

jupyter Assignment 3 (1) Last Checkpoint: 2 hours ago (autosaved)

```
In [55]: dacc = mean_squared_error(y_test, dt_test_pred)
         print('Mean Squared Error of testing Set: %2f'%dacc)

         Mean Squared Error of testing Set: 6.182217
```

1.KNN Regression

```
In [56]: knn = KNeighborsRegressor(n_neighbors = 4 )
         knn.fit(x_train, y_train)
         knn.fit(x_test, y_test)

Out[56]: KNeighborsRegressor(n_neighbors=4)

In [57]: knn_test_pred = knn.predict(x_test)

In [58]: knn_test_pred

Out[58]: array([ 8.75,  9.5 , 10.5 , ...,  8.  ,  7.5 ,  5.  ])

In [59]: kacc= r2_score(knn_test_pred,y_test)
         print('Score of testing Set: %2f'%kacc)

         Score of testing Set: 0.400555

In [60]: kmse = mean_squared_error(knn_test_pred,y_test)
         print('Score of testing Set: %2f'%kmse)

         Score of testing Set: 2.602460
```