

## Problem Statement: Abalone Age Prediction

### 1. Download the dataset: Dataset

### 2. Load the dataset into the tool.

```
import numpy as np
import pandas as pd
```

```
ds=pd.read_csv("abalone.csv")
```

```
# Rings / integer / -- / +1.5 gives the age in years
```

```
ds['Age']=ds["Rings"]+1.5
```

```
ds.head(5)
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight \
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

	Shell weight	Rings	Age
0	0.150	15	16.5
1	0.070	7	8.5
2	0.210	9	10.5
3	0.155	10	11.5
4	0.055	7	8.5

### 3. Perform Below Visualizations.

#### • Univariate Analysis

#### • Bi-Variate Analysis

#### • Multi-Variate Analysis

```
# univariant analysis
```

```
#frequency table for age
```

```

ft = ds1['Age'].value_counts()

print("Frequency table for Age is given below")
print("{}\n\n\n".format(ft))

# mean

print("Mean, Median, std \n")
ma=ds1['Age'].mean() #mean of age
mh = ds1['Height'].mean() #mean of height
mel = ds1['Length'].median() #median value of length
stw = ds1['Whole weight'].std() #standard deviation of whole weight

#chart

import matplotlib.pyplot as plt # library for plot or graph
import seaborn as sns

plt.subplot(1,2,1)
ch = ds1.boxplot(column='Diameter',grid=True,color = 'red')
plt.title('Box plot')

plt.subplot(1,2,2)
DC = sns.kdeplot(ds1['Diameter'])
plt.title('Density Curve')

print("1-mean of age = ",ma)
print("2-mean of height = ",mh)
print("3-median value of length = ",mel) #
print("4-standard deviation of whole weight = ",stw)
print("5-frequency table for rings = \n {}" .format(fre))
print("\nChart\n\n6-boxplot of Diameter",flush=True)

```

Frequency table for Age is given below

11.5	32
10.5	28
8.5	20
9.5	18
13.5	17
12.5	16
14.5	13
15.5	11
16.5	10
17.5	7
6.5	6

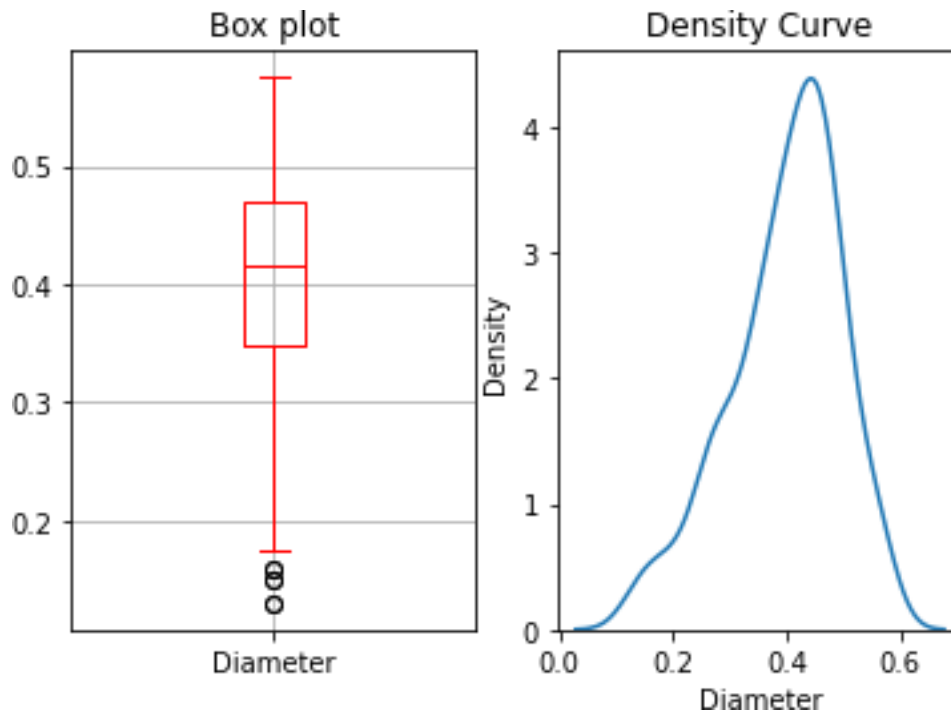
```
7.5      5
21.5     4
5.5      4
20.5     3
19.5     3
22.5     2
18.5     1
Name: Age, dtype: int64
```

Mean, Median, std

```
1-mean of age = 12.235
2-mean of height = 0.13482500000000003
3-median value of length = 0.53
4-standard deviation of whole weight = 0.48292555269001314
5-frequency table for rings =
 10    32
 9     28
 7     20
 8     18
12     17
11     16
13     13
14     11
15     10
16      7
 5      6
 6      5
20      4
 4      4
19      3
18      3
21      2
17      1
Name: Rings, dtype: int64
```

Chart

6-boxplot of Diameter



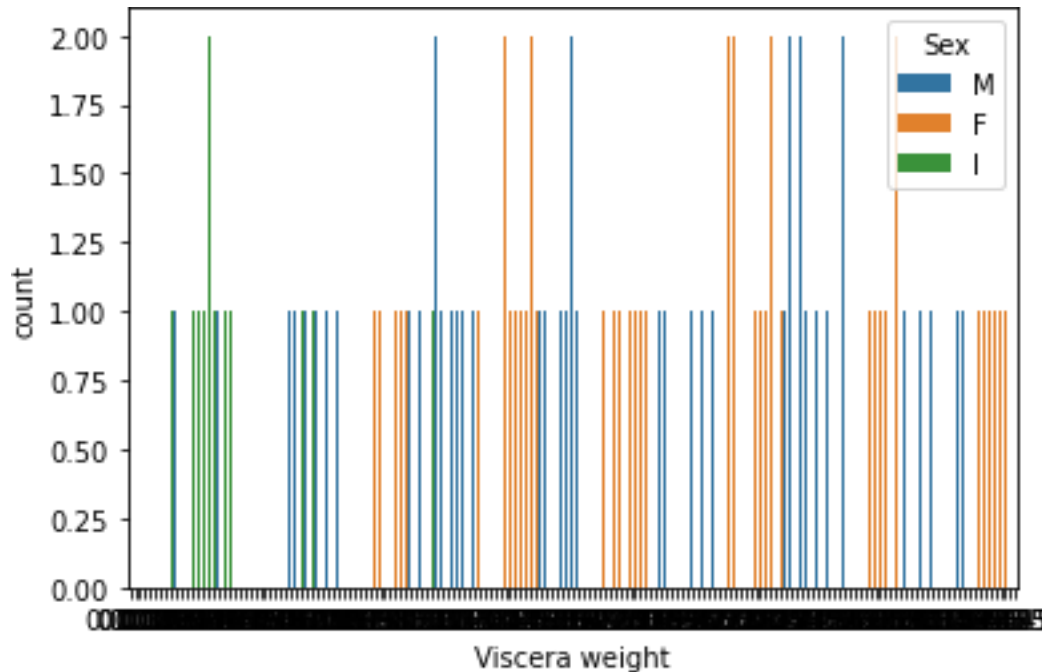
```
#multi-varient analysis
```

```
import matplotlib.pyplot as plt
import seaborn as sns
```

```
ds1=ds.head(200)
df=sns.countplot(x="Viscera weight",hue='Sex',data=ds1)
```

```
print(df)
```

```
AxesSubplot(0.125,0.125;0.775x0.755)
```



#### 4. Perform descriptive statistics on the dataset.

```
ds.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	Age
count	4177.000000	4177.000000	4177.000000	4177.000000
mean	0.180594	0.238831	9.933684	11.433684
std	0.109614	0.139203	3.224169	3.224169
min	0.000500	0.001500	1.000000	2.500000
25%	0.093500	0.130000	8.000000	9.500000
50%	0.171000	0.234000	9.000000	10.500000



4176	True	True	True	True	True	True
	Viscera weight	Shell weight	Rings	Age		
0	True	True	True	True		
1	True	True	True	True		
2	True	True	True	True		
3	True	True	True	True		
4	True	True	True	True		
...	...	...	...	...		
4172	True	True	True	True		
4173	True	True	True	True		
4174	True	True	True	True		
4175	True	True	True	True		
4176	True	True	True	True		

[4177 rows x 10 columns]

## 6. Find the outliers and replace them outliers

*#occurence of outliers*

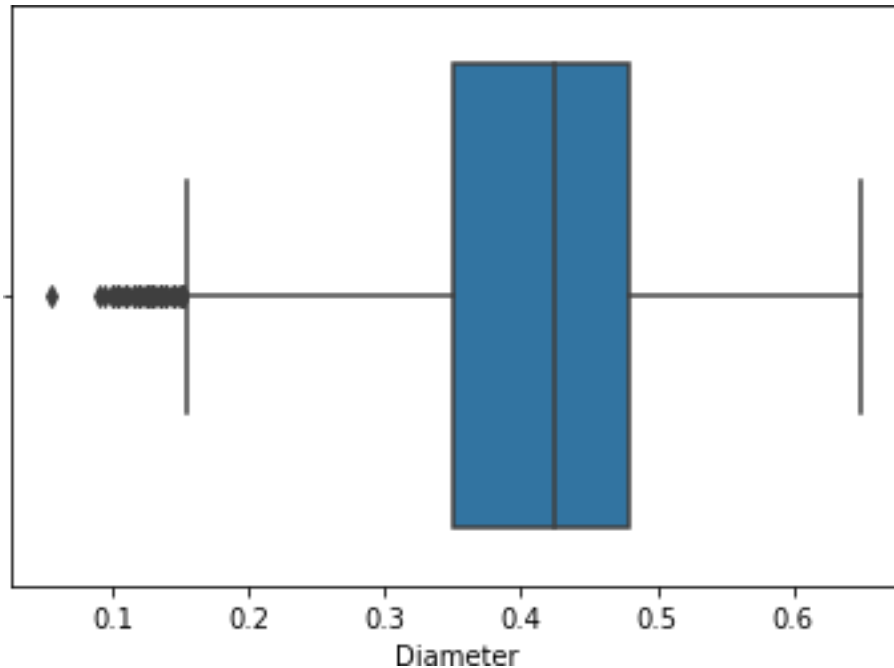
*#a data point in a data set that is distant from all other observations*

```
sns.boxplot(ds.Diameter)
```

```
/home/lokes/anaconda3/lib/python3.9/site-packages/seaborn/_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. 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.
```

```
warnings.warn(
```

```
<AxesSubplot:xlabel='Diameter'>
```



```
Q1= ds.Diameter.quantile(0.25)
```

```
Q3=ds.Diameter.quantile(0.75)
```

```
IQR=Q3-Q1    #spread the middle values are
```

```
upper_limit =Q3 + 1.5*IQR
```

```
lower_limit =Q1 - 1.5*IQR
```

```
ds['Diameter'] =
```

```
np.where(ds['Diameter']>upper_limit,30,ds['Diameter'])
```

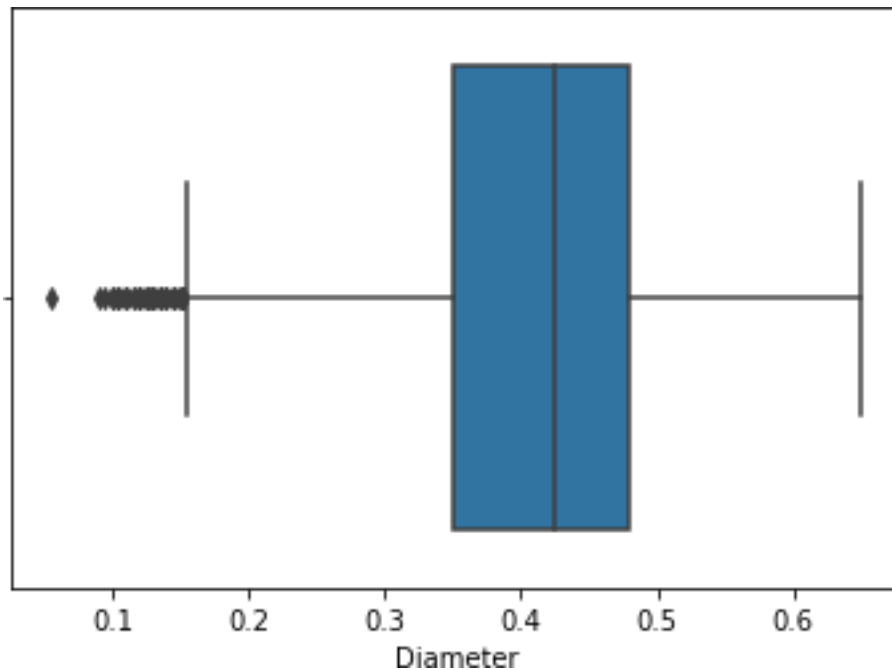
```
sns.boxplot(ds.Diameter)
```

```
/home/lokes/anaconda3/lib/python3.9/site-packages/seaborn/
_decorators.py:36: FutureWarning: Pass the following variable as a
keyword arg: x. 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.
```

```
warnings.warn(
```

```
<AxesSubplot:xlabel='Diameter'>
```





## 7. Check for Categorical columns and perform encoding.

```
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
```

```
ds1['Sex'] = le.fit_transform(ds1['Sex'])
ds1
```

*# 0 = female, 1 = infant, 2 = male*

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	\
0	2	0.455	0.365	0.095	0.5140	0.2245	
1	2	0.350	0.265	0.090	0.2255	0.0995	
2	0	0.530	0.420	0.135	0.6770	0.2565	
3	2	0.440	0.365	0.125	0.5160	0.2155	
4	1	0.330	0.255	0.080	0.2050	0.0895	
..	...	...	...	...	...	...	
195	2	0.500	0.405	0.155	0.7720	0.3460	
196	0	0.505	0.410	0.150	0.6440	0.2850	
197	2	0.640	0.500	0.185	1.3035	0.4445	
198	2	0.560	0.450	0.160	0.9220	0.4320	
199	2	0.585	0.460	0.185	0.9220	0.3635	

	Viscera weight	Shell weight	Rings	Age
0	0.1010	0.150	15	16.5
1	0.0485	0.070	7	8.5
2	0.1415	0.210	9	10.5
3	0.1140	0.155	10	11.5
4	0.0395	0.055	7	8.5

```

..      ...      ...      ...      ...
195      0.1535      0.245      12      13.5
196      0.1450      0.210      11      12.5
197      0.2635      0.465      16      17.5
198      0.1780      0.260      15      16.5
199      0.2130      0.285      10      11.5

```

[200 rows x 10 columns]

## 8. Split the data into dependent and independent variables.

*#Splitting the Dataset into the Independent Feature Matrix*

```
x = ds1.iloc[:, 0:9]
```

```
x
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	\
0	2	0.455	0.365	0.095	0.5140	0.2245	
1	2	0.350	0.265	0.090	0.2255	0.0995	
2	0	0.530	0.420	0.135	0.6770	0.2565	
3	2	0.440	0.365	0.125	0.5160	0.2155	
4	1	0.330	0.255	0.080	0.2050	0.0895	
..	...	...	...	...	...	...	
195	2	0.500	0.405	0.155	0.7720	0.3460	
196	0	0.505	0.410	0.150	0.6440	0.2850	
197	2	0.640	0.500	0.185	1.3035	0.4445	
198	2	0.560	0.450	0.160	0.9220	0.4320	
199	2	0.585	0.460	0.185	0.9220	0.3635	

	Viscera weight	Shell weight	Rings
0	0.1010	0.150	15
1	0.0485	0.070	7
2	0.1415	0.210	9
3	0.1140	0.155	10
4	0.0395	0.055	7
..	...	...	...
195	0.1535	0.245	12
196	0.1450	0.210	11
197	0.2635	0.465	16
198	0.1780	0.260	15
199	0.2130	0.285	10

[200 rows x 9 columns]

*#Extracting the Dataset to Get the Dependent Vector*

```
y = ds1.iloc[:,9:10]
```

```
print(y)
```

	Age
0	16.5

```

1      8.5
2     10.5
3     11.5
4      8.5
..     ...
195   13.5
196   12.5
197   17.5
198   16.5
199   11.5

```

```
[200 rows x 1 columns]
```

## 9. Scale the independent variables

*#scaling the independent variables using scale and MinMaxScaler*

```

from sklearn.preprocessing import scale
from sklearn.preprocessing import MinMaxScaler

```

```
mm = MinMaxScaler()
```

```

x_scaled = mm.fit_transform(x)
y_scaled = mm.fit_transform(y)

```

```
x_scaled
```

```

array([[1.          , 0.51351351, 0.52808989, ..., 0.17680075,
0.14070352,
        0.64705882],
       [1.          , 0.32432432, 0.30337079, ..., 0.07857811,
0.06030151,
        0.17647059],
       [0.          , 0.64864865, 0.65168539, ..., 0.2525725 ,
0.20100503,
        0.29411765],
       ...,
       [1.          , 0.84684685, 0.83146067, ..., 0.4808232 ,
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        0.70588235],
       [1.          , 0.7027027 , 0.71910112, ..., 0.32086062,
0.25125628,
        0.64705882],
       [1.          , 0.74774775, 0.74157303, ..., 0.38634238,
0.27638191,
        0.35294118]])

```

```
y_scaled
```

```

array([[0.64705882],
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```

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```

## 10. Split the data into training and testing

```
from sklearn.model_selection import train_test_split # library for
split the data into training and testing
```

```
x_train,x_test,y_train,y_test =
train_test_split(x_scaled,y_scaled,train_size=0.80,test_size =
0.20,random_state=0)
```

```
x_train
```

```
array([[0.5          , 0.17117117, 0.15730337, ..., 0.0261927 ,
0.01809045,
        0.17647059],
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        0.47058824],
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0.27638191,
        0.41176471],
 ...,
 [1.          , 0.48648649, 0.47191011, ..., 0.16651076,
0.15577889,
        0.35294118],
 [0.          , 0.52252252, 0.5505618 , ..., 0.19363891,
0.14070352,
        0.17647059],
 [1.          , 0.63963964, 0.68539326, ..., 0.42376052,
0.27638191,
        0.23529412]])
```

```
y_train
```

```
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[0.35294118],
[0.17647059],
[0.23529412]])

```

x\_test

```

array([[1.      , 0.35135135, 0.37078652, 0.21052632, 0.08948413,
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       [1.      , 0.94594595, 0.94382022, 0.92105263, 0.76448413,
        0.66226415, 1.      , 0.58291457, 0.58823529],
       [0.      , 0.59459459, 0.60674157, 0.44736842, 0.25297619,

```

0.23632075, 0.23386342, 0.21105528, 0.35294118],  
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```

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[0.          , 0.67567568, 0.6741573 , 0.65789474, 0.30634921,
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```

y\_test

```

array([[0.17647059],
       [0.58823529],
       [0.35294118],
       [0.17647059],
       [0.23529412],
       [0.35294118],
       [0.23529412],
       [0.35294118],
       [0.41176471],
       [0.35294118],
       [0.29411765],
       [0.05882353],
       [0.58823529],
       [0.47058824],
       [0.29411765],
       [0.70588235],
       [0.88235294],
       [0.76470588],
       [0.23529412],
       [0.52941176],
       [0.35294118],
       [0.35294118],
       [0.17647059],

```

```

[0.52941176],
[0.17647059],
[0.11764706],
[0.41176471],
[0.52941176],
[0.58823529],
[0.      ],
[0.17647059],
[0.23529412],
[0.64705882],
[0.29411765],
[0.47058824],
[0.29411765],
[0.82352941],
[0.17647059],
[1.      ],
[0.41176471]])

print(x_scaled.shape)
print(y_scaled.shape)
print(x_train.shape)
print(y_train.shape)
print(x_test.shape)
print(y_test.shape)

```

```

(200, 9)
(200, 1)
(160, 9)
(160, 1)
(40, 9)
(40, 1)

```

## 11. Build the Model

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

```
mlr = LinearRegression()
```

```
mlr.fit(x_train,y_train)
```

```
LinearRegression()
```

## 12. Train the Model

## 13. Test the Model

```
prediction = mlr.predict(x_test)
```

```
prediction
```

```

array([[1.76470588e-01],
       [5.88235294e-01],
       [3.52941176e-01],

```

[1.76470588e-01],  
[2.35294118e-01],  
[3.52941176e-01],  
[2.35294118e-01],  
[3.52941176e-01],  
[4.11764706e-01],  
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[5.88235294e-01],  
[4.70588235e-01],  
[2.94117647e-01],  
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[8.82352941e-01],  
[7.64705882e-01],  
[2.35294118e-01],  
[5.29411765e-01],  
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[1.17647059e-01],  
[4.11764706e-01],  
[5.29411765e-01],  
[5.88235294e-01],  
[2.20691474e-16],  
[1.76470588e-01],  
[2.35294118e-01],  
[6.47058824e-01],  
[2.94117647e-01],  
[4.70588235e-01],  
[2.94117647e-01],  
[8.23529412e-01],  
[1.76470588e-01],  
[1.00000000e+00],  
[4.11764706e-01]]

```
prediction.astype(int)
```

[illegible]

[illegible]

```
y_test.astype(int)
```

[illegible]





## Abalone Age Prediction

### 1. LinearRegression

```
from sklearn.linear_model import LinearRegression
lr = LinearRegression()
lr.fit(x_poly,y)

LinearRegression()

lr.predict(plr.transform([[1,0.350,0.410,0.185,1.3035,0.3635,0.1010,0.
285,16]]))

/home/lokes/anaconda3/lib/python3.9/site-packages/sklearn/
base.py:450: UserWarning: X does not have valid feature names, but
PolynomialFeatures was fitted with feature names
  warnings.warn(

array([[17.5]])
```

### 2. Ridge

```
from sklearn.linear_model import Ridge
r = Ridge()
r.fit(x,y)

Ridge()

r.predict([[1,0.350,0.410,0.185,1.3035,0.3635,0.1010,0.285,16]])

/home/lokes/anaconda3/lib/python3.9/site-packages/sklearn/
base.py:450: UserWarning: X does not have valid feature names, but
Ridge was fitted with feature names
  warnings.warn(

array([[17.49624459]])
```

### 3. Lasso

```
from sklearn.linear_model import Lasso
l = Lasso()
l.fit(x,y)

Lasso()

l.predict([[1,0.350,0.410,0.185,1.3035,0.3635,0.1010,0.285,16]])

/home/lokes/anaconda3/lib/python3.9/site-packages/sklearn/
base.py:450: UserWarning: X does not have valid feature names, but
Lasso was fitted with feature names
  warnings.warn(

array([17.08721342])
```