

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

LOADING OF DATA

```
In [2]: df=pd.read_csv("C:/Users/NAVEEN/Downloads/housing.csv",header=None)
df
```

Out[2]:

| | 0 |
|-----|---|
| 0 | 0.00632 18.00 2.310 0 0.5380 6.5750 65... |
| 1 | 0.02731 0.00 7.070 0 0.4690 6.4210 78... |
| 2 | 0.02729 0.00 7.070 0 0.4690 7.1850 61... |
| 3 | 0.03237 0.00 2.180 0 0.4580 6.9980 45... |
| 4 | 0.06905 0.00 2.180 0 0.4580 7.1470 54... |
| ... | ... |
| 501 | 0.06263 0.00 11.930 0 0.5730 6.5930 69... |
| 502 | 0.04527 0.00 11.930 0 0.5730 6.1200 76... |
| 503 | 0.06076 0.00 11.930 0 0.5730 6.9760 91... |
| 504 | 0.10959 0.00 11.930 0 0.5730 6.7940 89... |
| 505 | 0.04741 0.00 11.930 0 0.5730 6.0300 80... |

506 rows × 1 columns

```
In [3]: data=pd.read_csv("C:/Users/NAVEEN/Downloads/housing.csv",sep="\s+",names=[ 'CRIM', 'ZN', 'INDUS', 'CHAS', 'NOX', 'RM', 'AGE', 'DIS', 'RAD', 'TAX', 'PTRATIO', 'B', 'LSTAT'])
```

Out[3]:

| | CRIM | ZN | INDUS | CHAS | NOX | RM | AGE | DIS | RAD | TAX | PTRATIO | B | LSTAT |
|-----|---------|------|-------|------|-------|-------|------|--------|-----|-------|---------|--------|-------|
| 0 | 0.00632 | 18.0 | 2.31 | 0 | 0.538 | 6.575 | 65.2 | 4.0900 | 1 | 296.0 | 15.3 | 396.90 | ... |
| 1 | 0.02731 | 0.0 | 7.07 | 0 | 0.469 | 6.421 | 78.9 | 4.9671 | 2 | 242.0 | 17.8 | 396.90 | ... |
| 2 | 0.02729 | 0.0 | 7.07 | 0 | 0.469 | 7.185 | 61.1 | 4.9671 | 2 | 242.0 | 17.8 | 392.83 | ... |
| 3 | 0.03237 | 0.0 | 2.18 | 0 | 0.458 | 6.998 | 45.8 | 6.0622 | 3 | 222.0 | 18.7 | 394.63 | ... |
| 4 | 0.06905 | 0.0 | 2.18 | 0 | 0.458 | 7.147 | 54.2 | 6.0622 | 3 | 222.0 | 18.7 | 396.90 | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 501 | 0.06263 | 0.0 | 11.93 | 0 | 0.573 | 6.593 | 69.1 | 2.4786 | 1 | 273.0 | 21.0 | 391.99 | ... |
| 502 | 0.04527 | 0.0 | 11.93 | 0 | 0.573 | 6.120 | 76.7 | 2.2875 | 1 | 273.0 | 21.0 | 396.90 | ... |
| 503 | 0.06076 | 0.0 | 11.93 | 0 | 0.573 | 6.976 | 91.0 | 2.1675 | 1 | 273.0 | 21.0 | 396.90 | ... |
| 504 | 0.10959 | 0.0 | 11.93 | 0 | 0.573 | 6.794 | 89.3 | 2.3889 | 1 | 273.0 | 21.0 | 393.45 | ... |
| 505 | 0.04741 | 0.0 | 11.93 | 0 | 0.573 | 6.030 | 80.8 | 2.5050 | 1 | 273.0 | 21.0 | 396.90 | ... |

506 rows × 14 columns

BASIC EXPLORATRY ANALYSIS

```
In [4]: data.isnull().sum()
```

```
Out[4]: CRIM      0
ZN          0
INDUS       0
CHAS        0
NOX         0
RM          0
AGE         0
DIS         0
RAD         0
TAX         0
PTRATIO     0
B           0
LSTAT       0
MEDV        0
dtype: int64
```

```
In [5]: data.dropna()
```

Out[5]:

| | CRIM | ZN | INDUS | CHAS | NOX | RM | AGE | DIS | RAD | TAX | PTRATIO | B | LS |
|-----|---------|------|-------|------|-------|-------|------|--------|-----|-------|---------|--------|-----|
| 0 | 0.00632 | 18.0 | 2.31 | 0 | 0.538 | 6.575 | 65.2 | 4.0900 | 1 | 296.0 | 15.3 | 396.90 | |
| 1 | 0.02731 | 0.0 | 7.07 | 0 | 0.469 | 6.421 | 78.9 | 4.9671 | 2 | 242.0 | 17.8 | 396.90 | |
| 2 | 0.02729 | 0.0 | 7.07 | 0 | 0.469 | 7.185 | 61.1 | 4.9671 | 2 | 242.0 | 17.8 | 392.83 | |
| 3 | 0.03237 | 0.0 | 2.18 | 0 | 0.458 | 6.998 | 45.8 | 6.0622 | 3 | 222.0 | 18.7 | 394.63 | |
| 4 | 0.06905 | 0.0 | 2.18 | 0 | 0.458 | 7.147 | 54.2 | 6.0622 | 3 | 222.0 | 18.7 | 396.90 | |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 501 | 0.06263 | 0.0 | 11.93 | 0 | 0.573 | 6.593 | 69.1 | 2.4786 | 1 | 273.0 | 21.0 | 391.99 | |
| 502 | 0.04527 | 0.0 | 11.93 | 0 | 0.573 | 6.120 | 76.7 | 2.2875 | 1 | 273.0 | 21.0 | 396.90 | |
| 503 | 0.06076 | 0.0 | 11.93 | 0 | 0.573 | 6.976 | 91.0 | 2.1675 | 1 | 273.0 | 21.0 | 396.90 | |
| 504 | 0.10959 | 0.0 | 11.93 | 0 | 0.573 | 6.794 | 89.3 | 2.3889 | 1 | 273.0 | 21.0 | 393.45 | |
| 505 | 0.04741 | 0.0 | 11.93 | 0 | 0.573 | 6.030 | 80.8 | 2.5050 | 1 | 273.0 | 21.0 | 396.90 | |

506 rows × 14 columns



```
In [6]: data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 506 entries, 0 to 505
Data columns (total 14 columns):
#   Column      Non-Null Count  Dtype
---  -
0   CRIM        506 non-null    float64
1   ZN          506 non-null    float64
2   INDUS       506 non-null    float64
3   CHAS        506 non-null    int64
4   NOX         506 non-null    float64
5   RM          506 non-null    float64
6   AGE         506 non-null    float64
7   DIS         506 non-null    float64
8   RAD         506 non-null    int64
9   TAX         506 non-null    float64
10  PTRATIO     506 non-null    float64
11  B           506 non-null    float64
12  LSTAT       506 non-null    float64
13  MEDV       506 non-null    float64
dtypes: float64(12), int64(2)
memory usage: 55.5 KB
```

```
In [7]: data.dtypes
```

```
Out[7]: CRIM      float64
        ZN        float64
        INDUS     float64
        CHAS      int64
        NOX       float64
        RM        float64
        AGE       float64
        DIS       float64
        RAD       int64
        TAX       float64
        PTRATIO   float64
        B         float64
        LSTAT     float64
        MEDV     float64
        dtype: object
```


```
In [8]: data.columns
```

```
Out[8]: Index(['CRIM', 'ZN', 'INDUS', 'CHAS', 'NOX', 'RM', 'AGE', 'DIS', 'RAD', 'TAX', 'PTRATIO', 'B', 'LSTAT', 'MEDV'],
              dtype='object')
```

```
In [9]: data.head(5)
```

Out[9]:

| | CRIM | ZN | INDUS | CHAS | NOX | RM | AGE | DIS | RAD | TAX | PTRATIO | B | LSTAT |
|---|---------|------|-------|------|-------|-------|------|--------|-----|-------|---------|--------|-------|
| 0 | 0.00632 | 18.0 | 2.31 | 0 | 0.538 | 6.575 | 65.2 | 4.0900 | 1 | 296.0 | 15.3 | 396.90 | 4.97 |
| 1 | 0.02731 | 0.0 | 7.07 | 0 | 0.469 | 6.421 | 78.9 | 4.9671 | 2 | 242.0 | 17.8 | 396.90 | 9.14 |
| 2 | 0.02729 | 0.0 | 7.07 | 0 | 0.469 | 7.185 | 61.1 | 4.9671 | 2 | 242.0 | 17.8 | 392.83 | 4.03 |
| 3 | 0.03237 | 0.0 | 2.18 | 0 | 0.458 | 6.998 | 45.8 | 6.0622 | 3 | 222.0 | 18.7 | 394.63 | 2.93 |
| 4 | 0.06905 | 0.0 | 2.18 | 0 | 0.458 | 7.147 | 54.2 | 6.0622 | 3 | 222.0 | 18.7 | 396.90 | 5.33 |




```
In [10]: data.columns
```

```
Out[10]: Index(['CRIM', 'ZN', 'INDUS', 'CHAS', 'NOX', 'RM', 'AGE', 'DIS', 'RAD', 'TAX', 'PTRATIO', 'B', 'LSTAT', 'MEDV'],
              dtype='object')
```

```
In [11]: data.describe()
```

```
Out[11]:
```

| | CRIM | ZN | INDUS | CHAS | NOX | RM | AGE | |
|--------------|------------|------------|------------|------------|------------|------------|------------|------|
| count | 506.000000 | 506.000000 | 506.000000 | 506.000000 | 506.000000 | 506.000000 | 506.000000 | 506. |
| mean | 3.613524 | 11.363636 | 11.136779 | 0.069170 | 0.554695 | 6.284634 | 68.574901 | 3. |
| std | 8.601545 | 23.322453 | 6.860353 | 0.253994 | 0.115878 | 0.702617 | 28.148861 | 2. |
| min | 0.006320 | 0.000000 | 0.460000 | 0.000000 | 0.385000 | 3.561000 | 2.900000 | 1. |
| 25% | 0.082045 | 0.000000 | 5.190000 | 0.000000 | 0.449000 | 5.885500 | 45.025000 | 2. |
| 50% | 0.256510 | 0.000000 | 9.690000 | 0.000000 | 0.538000 | 6.208500 | 77.500000 | 3. |
| 75% | 3.677083 | 12.500000 | 18.100000 | 0.000000 | 0.624000 | 6.623500 | 94.075000 | 5. |
| max | 88.976200 | 100.000000 | 27.740000 | 1.000000 | 0.871000 | 8.780000 | 100.000000 | 12. |



```
In [12]: data.columns
```

```
Out[12]: Index(['CRIM', 'ZN', 'INDUS', 'CHAS', 'NOX', 'RM', 'AGE', 'DIS', 'RAD', 'TA  
X',  
               'PTRATIO', 'B', 'LSTAT', 'MEDV'],  
              dtype='object')
```

```
In [13]: data.shape
```

```
Out[13]: (506, 14)
```

```
In [14]: data.index
```

```
Out[14]: RangeIndex(start=0, stop=506, step=1)
```

DATA MANUPULATION

Replace the 'chas' column (Charles River dummy variable) with 'Yes' if chas = 1 and 'No' if chas = 0.

```
In [15]: data["CHAS"]=data["CHAS"].replace({1:"yes",0:"no"})
data
```

Out[15]:

| | CRIM | ZN | INDUS | CHAS | NOX | RM | AGE | DIS | RAD | TAX | PTRATIO | B | LS |
|-----|---------|------|-------|------|-------|-------|------|--------|-----|-------|---------|--------|-----|
| 0 | 0.00632 | 18.0 | 2.31 | no | 0.538 | 6.575 | 65.2 | 4.0900 | 1 | 296.0 | 15.3 | 396.90 | |
| 1 | 0.02731 | 0.0 | 7.07 | no | 0.469 | 6.421 | 78.9 | 4.9671 | 2 | 242.0 | 17.8 | 396.90 | |
| 2 | 0.02729 | 0.0 | 7.07 | no | 0.469 | 7.185 | 61.1 | 4.9671 | 2 | 242.0 | 17.8 | 392.83 | |
| 3 | 0.03237 | 0.0 | 2.18 | no | 0.458 | 6.998 | 45.8 | 6.0622 | 3 | 222.0 | 18.7 | 394.63 | |
| 4 | 0.06905 | 0.0 | 2.18 | no | 0.458 | 7.147 | 54.2 | 6.0622 | 3 | 222.0 | 18.7 | 396.90 | |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 501 | 0.06263 | 0.0 | 11.93 | no | 0.573 | 6.593 | 69.1 | 2.4786 | 1 | 273.0 | 21.0 | 391.99 | |
| 502 | 0.04527 | 0.0 | 11.93 | no | 0.573 | 6.120 | 76.7 | 2.2875 | 1 | 273.0 | 21.0 | 396.90 | |
| 503 | 0.06076 | 0.0 | 11.93 | no | 0.573 | 6.976 | 91.0 | 2.1675 | 1 | 273.0 | 21.0 | 396.90 | |
| 504 | 0.10959 | 0.0 | 11.93 | no | 0.573 | 6.794 | 89.3 | 2.3889 | 1 | 273.0 | 21.0 | 393.45 | |
| 505 | 0.04741 | 0.0 | 11.93 | no | 0.573 | 6.030 | 80.8 | 2.5050 | 1 | 273.0 | 21.0 | 396.90 | |

506 rows × 14 columns



Rename the column 'rm' to 'rooms'

```
In [16]: data=data.rename({"RM":"rooms"},axis=1)
data
```

Out[16]:

| | CRIM | ZN | INDUS | CHAS | NOX | rooms | AGE | DIS | RAD | TAX | PTRATIO | B | L |
|-----|---------|------|-------|------|-------|-------|------|--------|-----|-------|---------|--------|-----|
| 0 | 0.00632 | 18.0 | 2.31 | no | 0.538 | 6.575 | 65.2 | 4.0900 | 1 | 296.0 | 15.3 | 396.90 | |
| 1 | 0.02731 | 0.0 | 7.07 | no | 0.469 | 6.421 | 78.9 | 4.9671 | 2 | 242.0 | 17.8 | 396.90 | |
| 2 | 0.02729 | 0.0 | 7.07 | no | 0.469 | 7.185 | 61.1 | 4.9671 | 2 | 242.0 | 17.8 | 392.83 | |
| 3 | 0.03237 | 0.0 | 2.18 | no | 0.458 | 6.998 | 45.8 | 6.0622 | 3 | 222.0 | 18.7 | 394.63 | |
| 4 | 0.06905 | 0.0 | 2.18 | no | 0.458 | 7.147 | 54.2 | 6.0622 | 3 | 222.0 | 18.7 | 396.90 | |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 501 | 0.06263 | 0.0 | 11.93 | no | 0.573 | 6.593 | 69.1 | 2.4786 | 1 | 273.0 | 21.0 | 391.99 | |
| 502 | 0.04527 | 0.0 | 11.93 | no | 0.573 | 6.120 | 76.7 | 2.2875 | 1 | 273.0 | 21.0 | 396.90 | |
| 503 | 0.06076 | 0.0 | 11.93 | no | 0.573 | 6.976 | 91.0 | 2.1675 | 1 | 273.0 | 21.0 | 396.90 | |
| 504 | 0.10959 | 0.0 | 11.93 | no | 0.573 | 6.794 | 89.3 | 2.3889 | 1 | 273.0 | 21.0 | 393.45 | |
| 505 | 0.04741 | 0.0 | 11.93 | no | 0.573 | 6.030 | 80.8 | 2.5050 | 1 | 273.0 | 21.0 | 396.90 | |

506 rows × 14 columns



Add a new column to the DataFrame that categorizes the 'medv' (median value of owner-occupied homes) column into 'Low', 'Medium', and 'High'

```
In [17]: cat=[]
for i in data["MEDV"]:
    if i<20.0:
        cat.append("low")
    elif i>=20.0 and i<=30.0:
        cat.append("medium")
    else:
        cat.append("high")
cat
df2=pd.DataFrame(cat)
df2
```

Out[17]:

| | 0 |
|-----|--------|
| 0 | medium |
| 1 | medium |
| 2 | high |
| 3 | high |
| 4 | high |
| ... | ... |
| 501 | medium |
| 502 | medium |
| 503 | medium |
| 504 | medium |
| 505 | low |

506 rows × 1 columns

```
In [18]: data=pd.concat([data,df2],axis=1)
data
```

Out[18]:

| | CRIM | ZN | INDUS | CHAS | NOX | rooms | AGE | DIS | RAD | TAX | PTRATIO | B | L |
|-----|---------|------|-------|------|-------|-------|------|--------|-----|-------|---------|--------|-----|
| 0 | 0.00632 | 18.0 | 2.31 | no | 0.538 | 6.575 | 65.2 | 4.0900 | 1 | 296.0 | 15.3 | 396.90 | |
| 1 | 0.02731 | 0.0 | 7.07 | no | 0.469 | 6.421 | 78.9 | 4.9671 | 2 | 242.0 | 17.8 | 396.90 | |
| 2 | 0.02729 | 0.0 | 7.07 | no | 0.469 | 7.185 | 61.1 | 4.9671 | 2 | 242.0 | 17.8 | 392.83 | |
| 3 | 0.03237 | 0.0 | 2.18 | no | 0.458 | 6.998 | 45.8 | 6.0622 | 3 | 222.0 | 18.7 | 394.63 | |
| 4 | 0.06905 | 0.0 | 2.18 | no | 0.458 | 7.147 | 54.2 | 6.0622 | 3 | 222.0 | 18.7 | 396.90 | |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 501 | 0.06263 | 0.0 | 11.93 | no | 0.573 | 6.593 | 69.1 | 2.4786 | 1 | 273.0 | 21.0 | 391.99 | |
| 502 | 0.04527 | 0.0 | 11.93 | no | 0.573 | 6.120 | 76.7 | 2.2875 | 1 | 273.0 | 21.0 | 396.90 | |
| 503 | 0.06076 | 0.0 | 11.93 | no | 0.573 | 6.976 | 91.0 | 2.1675 | 1 | 273.0 | 21.0 | 396.90 | |
| 504 | 0.10959 | 0.0 | 11.93 | no | 0.573 | 6.794 | 89.3 | 2.3889 | 1 | 273.0 | 21.0 | 393.45 | |
| 505 | 0.04741 | 0.0 | 11.93 | no | 0.573 | 6.030 | 80.8 | 2.5050 | 1 | 273.0 | 21.0 | 396.90 | |

506 rows × 15 columns



```
In [19]: data=data.rename(columns={0:"new_medv"})
data
```

Out[19]:

| | CRIM | ZN | INDUS | CHAS | NOX | rooms | AGE | DIS | RAD | TAX | PTRATIO | B | L |
|-----|---------|------|-------|------|-------|-------|------|--------|-----|-------|---------|--------|-----|
| 0 | 0.00632 | 18.0 | 2.31 | no | 0.538 | 6.575 | 65.2 | 4.0900 | 1 | 296.0 | 15.3 | 396.90 | |
| 1 | 0.02731 | 0.0 | 7.07 | no | 0.469 | 6.421 | 78.9 | 4.9671 | 2 | 242.0 | 17.8 | 396.90 | |
| 2 | 0.02729 | 0.0 | 7.07 | no | 0.469 | 7.185 | 61.1 | 4.9671 | 2 | 242.0 | 17.8 | 392.83 | |
| 3 | 0.03237 | 0.0 | 2.18 | no | 0.458 | 6.998 | 45.8 | 6.0622 | 3 | 222.0 | 18.7 | 394.63 | |
| 4 | 0.06905 | 0.0 | 2.18 | no | 0.458 | 7.147 | 54.2 | 6.0622 | 3 | 222.0 | 18.7 | 396.90 | |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 501 | 0.06263 | 0.0 | 11.93 | no | 0.573 | 6.593 | 69.1 | 2.4786 | 1 | 273.0 | 21.0 | 391.99 | |
| 502 | 0.04527 | 0.0 | 11.93 | no | 0.573 | 6.120 | 76.7 | 2.2875 | 1 | 273.0 | 21.0 | 396.90 | |
| 503 | 0.06076 | 0.0 | 11.93 | no | 0.573 | 6.976 | 91.0 | 2.1675 | 1 | 273.0 | 21.0 | 396.90 | |
| 504 | 0.10959 | 0.0 | 11.93 | no | 0.573 | 6.794 | 89.3 | 2.3889 | 1 | 273.0 | 21.0 | 393.45 | |
| 505 | 0.04741 | 0.0 | 11.93 | no | 0.573 | 6.030 | 80.8 | 2.5050 | 1 | 273.0 | 21.0 | 396.90 | |

506 rows × 15 columns



DATA ANALYSIS

Find out the average number of rooms ('rooms' column) per dwelling for each category of 'medv' (Low, Medium, High)

```
In [20]: array_of_age=data["AGE"].values  
array_of_age
```

```
Out[20]: array([ 65.2,  78.9,  61.1,  45.8,  54.2,  58.7,  66.6,  96.1, 100. ,
  85.9,  94.3,  82.9,  39. ,  61.8,  84.5,  56.5,  29.3,  81.7,
  36.6,  69.5,  98.1,  89.2,  91.7, 100. ,  94.1,  85.7,  90.3,
  88.8,  94.4,  87.3,  94.1, 100. ,  82. ,  95. ,  96.9,  68.2,
  61.4,  41.5,  30.2,  21.8,  15.8,   2.9,   6.6,   6.5,  40. ,
  33.8,  33.3,  85.5,  95.3,  62. ,  45.7,  63. ,  21.1,  21.4,
  47.6,  21.9,  35.7,  40.5,  29.2,  47.2,  66.2,  93.4,  67.8,
  43.4,  59.5,  17.8,  31.1,  21.4,  36.8,  33. ,   6.6,  17.5,
   7.8,   6.2,   6. ,  45. ,  74.5,  45.8,  53.7,  36.6,  33.5,
  70.4,  32.2,  46.7,  48. ,  56.1,  45.1,  56.8,  86.3,  63.1,
  66.1,  73.9,  53.6,  28.9,  77.3,  57.8,  69.6,  76. ,  36.9,
  62.5,  79.9,  71.3,  85.4,  87.4,  90. ,  96.7,  91.9,  85.2,
  97.1,  91.2,  54.4,  81.6,  92.9,  95.4,  84.2,  88.2,  72.5,
  82.6,  73.1,  65.2,  69.7,  84.1,  92.9,  97. ,  95.8,  88.4,
  95.6,  96. ,  98.8,  94.7,  98.9,  97.7,  97.9,  95.4,  98.4,
  98.2,  93.5,  98.4,  98.2,  97.9,  93.6, 100. , 100. , 100. ,
  97.8, 100. , 100. ,  95.7,  93.8,  94.9,  97.3, 100. ,  88. ,
  98.5,  96. ,  82.6,  94. ,  97.4, 100. , 100. ,  92.6,  90.8,
  98.2,  93.9,  91.8,  93. ,  96.2,  79.2,  96.1,  95.2,  94.6,
  97.3,  88.5,  84.1,  68.7,  33.1,  47.2,  73.4,  74.4,  58.4,
  83.3,  62.2,  92.2,  95.6,  89.8,  68.8,  53.6,  41.1,  29.1,
  38.9,  21.5,  30.8,  26.3,   9.9,  18.8,  32. ,  34.1,  36.6,
  38.3,  15.3,  13.9,  38.4,  15.7,  33.2,  31.9,  22.3,  52.5,
  72.7,  59.1, 100. ,  92.1,  88.6,  53.8,  32.3,   9.8,  42.4,
  56. ,  85.1,  93.8,  92.4,  88.5,  91.3,  77.7,  80.8,  78.3,
  83. ,  86.5,  79.9,  17. ,  21.4,  68.1,  76.9,  73.3,  70.4,
  66.5,  61.5,  76.5,  71.6,  18.5,  42.2,  54.3,  65.1,  52.9,
   7.8,  76.5,  70.2,  34.9,  79.2,  49.1,  17.5,  13. ,   8.9,
   6.8,   8.4,  32. ,  19.1,  34.2,  86.9, 100. , 100. ,  81.8,
  89.4,  91.5,  94.5,  91.6,  62.8,  84.6,  67. ,  52.6,  61.5,
  42.1,  16.3,  58.7,  51.8,  32.9,  42.8,  49. ,  27.6,  32.1,
  32.2,  64.5,  37.2,  49.7,  24.8,  20.8,  31.9,  31.5,  31.3,
  45.6,  22.9,  27.9,  27.7,  23.4,  18.4,  42.3,  31.1,  51. ,
  58. ,  20.1,  10. ,  47.4,  40.4,  18.4,  17.7,  41.1,  58.1,
  71.9,  70.3,  82.5,  76.7,  37.8,  52.8,  90.4,  82.8,  87.3,
  77.7,  83.2,  71.7,  67.2,  58.8,  52.3,  54.3,  49.9,  74.3,
  40.1,  14.7,  28.9,  43.7,  25.8,  17.2,  32.2,  28.4,  23.3,
  38.1,  38.5,  34.5,  46.3,  59.6,  37.3,  45.4,  58.5,  49.3,
  59.7,  56.4,  28.1,  48.5,  52.3,  27.7,  29.7,  34.5,  44.4,
  35.9,  18.5,  36.1,  21.9,  19.5,  97.4,  91. ,  83.4,  81.3,
  88. ,  91.1,  96.2,  89. ,  82.9,  87.9,  91.4, 100. , 100. ,
  96.8,  97.5, 100. ,  89.6, 100. , 100. ,  97.9,  93.3,  98.8,
  96.2, 100. ,  91.9,  99.1, 100. , 100. ,  91.2,  98.1, 100. ,
  89.5, 100. ,  98.9,  97. ,  82.5,  97. ,  92.6,  94.7,  98.8,
  96. ,  98.9, 100. ,  77.8, 100. , 100. , 100. ,  96. ,  85.4,
 100. , 100. , 100. ,  97.9, 100. , 100. , 100. , 100. , 100. ,
 100. , 100. ,  90.8,  89.1, 100. ,  76.5, 100. ,  95.3,  87.6,
  85.1,  70.6,  95.4,  59.7,  78.7,  78.1,  95.6,  86.1,  94.3,
  74.8,  87.9,  95. ,  94.6,  93.3, 100. ,  87.9,  93.9,  92.4,
  97.2, 100. , 100. ,  96.6,  94.8,  96.4,  96.6,  98.7,  98.3,
  92.6,  98.2,  91.8,  99.3,  94.1,  86.5,  87.9,  80.3,  83.7,
  84.4,  90. ,  88.4,  83. ,  89.9,  65.4,  48.2,  84.7,  94.5,
  71. ,  56.7,  84. ,  90.7,  75. ,  67.6,  95.4,  97.4,  93.6,
  97.3,  96.7,  88. ,  64.7,  74.9,  77. ,  40.3,  41.9,  51.9,
  79.8,  53.2,  92.7,  98.3,  98. ,  98.8,  83.5,  54. ,  42.6,
```

```
28.8, 72.9, 70.6, 65.3, 73.5, 79.7, 69.1, 76.7, 91. ,  
89.3, 80.8])
```

NUMPY OPERATION

MEAN OF AGE

```
In [21]: np.mean(array_of_age)
```

```
Out[21]: 68.57490118577076
```

STANDARD DEVIATION OF AGE

```
In [22]: np.std(array_of_age)
```

```
Out[22]: 28.121032570236867
```

```
In [23]: average_of_rooms=data.groupby(["new_medv"])  
average_of_rooms=average_of_rooms["rooms"].mean()  
average_of_rooms
```

```
Out[23]: new_medv  
high      7.293524  
low       5.915876  
medium    6.250165  
Name: rooms, dtype: float64
```