```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
```

```
data = pd.read_csv("housing.csv")
```

```
data
```

	CRIM	ZN	INDUS	CHAS	NOX	RM	AGE	DIS	RAD	TAX	PTRATIO	B	LSTAT	MEDV
0	0.00632	18.0	2.31	0.0	0.538	6.575	65.2	4.0900	1	296	15.3	396.90	4.98	24.0
1	0.02731	0.0	7.07	0.0	0.469	6.421	78.9	4.9671	2	242	17.8	396.90	9.14	21.6
2	0.02729	0.0	7.07	0.0	0.469	7.185	61.1	4.9671	2	242	17.8	392.83	4.03	34.7
3	0.03237	0.0	2.18	0.0	0.458	6.998	45.8	6.0622	3	222	18.7	394.63	2.94	33.4
4	0.06905	0.0	2.18	0.0	0.458	7.147	54.2	6.0622	3	222	18.7	396.90	NaN	36.2
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
501	0.06263	0.0	11.93	0.0	0.573	6.593	69.1	2.4786	1	273	21.0	391.99	NaN	22.4
502	0.04527	0.0	11.93	0.0	0.573	6.120	76.7	2.2875	1	273	21.0	396.90	9.08	20.6
503	0.06076	0.0	11.93	0.0	0.573	6.976	91.0	2.1675	1	273	21.0	396.90	5.64	23.9
504	0.10959	0.0	11.93	0.0	0.573	6.794	89.3	2.3889	1	273	21.0	393.45	6.48	22.0
505	0.04741	0.0	11.93	0.0	0.573	6.030	NaN	2.5050	1	273	21.0	396.90	7.88	11.9

506 rows × 14 columns

```
X=data.iloc[:,:-1].values
Y=data.iloc[:,-1].values
```

```
data.head()
```

	CRIM	ZN	INDUS	CHAS	NOX	RM	AGE	DIS	RAD	TAX	PTRATIO	B	LSTAT	MEDV
0	0.00632	18.0	2.31	0.0	0.538	6.575	65.2	4.0900	1	296	15.3	396.90	4.98	24.0
1	0.02731	0.0	7.07	0.0	0.469	6.421	78.9	4.9671	2	242	17.8	396.90	9.14	21.6
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4	0.06905	0.0	2.18	0.0	0.458	7.147	54.2	6.0622	3	222	18.7	396.90	NaN	36.2

```
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     486 non-null    float64
 1   ZN       486 non-null    float64
 2   INDUS    486 non-null    float64
 3   CHAS     486 non-null    float64
 4   NOX      506 non-null    float64
 5   RM       506 non-null    float64
 6   AGE      486 non-null    float64
 7   DIS      506 non-null    float64
```

```
      8   RAD      506 non-null    int64
      9   TAX      506 non-null    int64
      10  PTRATIO  506 non-null    float64
      11  B        506 non-null    float64
      12  LSTAT    486 non-null    float64
      13  MEDV     506 non-null    float64
     dtypes: float64(12), int64(2)
     memory usage: 55.5 KB
```

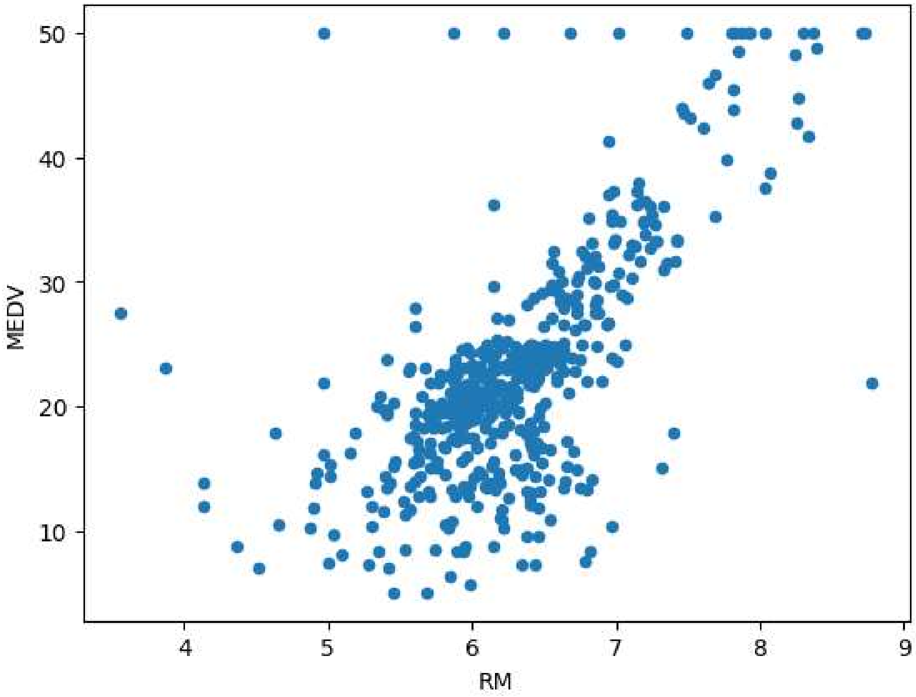
```
data['CRIM'].fillna(data['CRIM'].mean() , inplace = True)
data['ZN'].fillna(data['ZN'].mean() , inplace = True)
data['INDUS'].fillna(data['INDUS'].mean() , inplace = True)
data['CHAS'].fillna(data['CHAS'].mean() , inplace = True)
data['AGE'].fillna(data['AGE'].mean() , inplace = True)
data['LSTAT'].fillna(data['LSTAT'].mean() , inplace = True)
```

```
data.isnull().sum()
```

```
     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
```

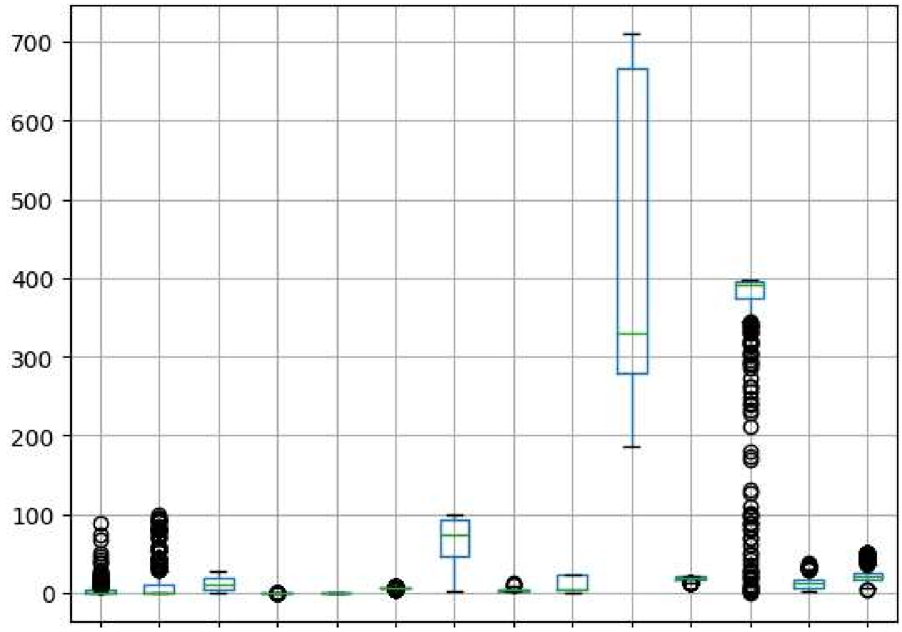
```
data.plot.scatter('RM', 'MEDV')
```

```
     <Axes: xlabel='RM', ylabel='MEDV'>
```



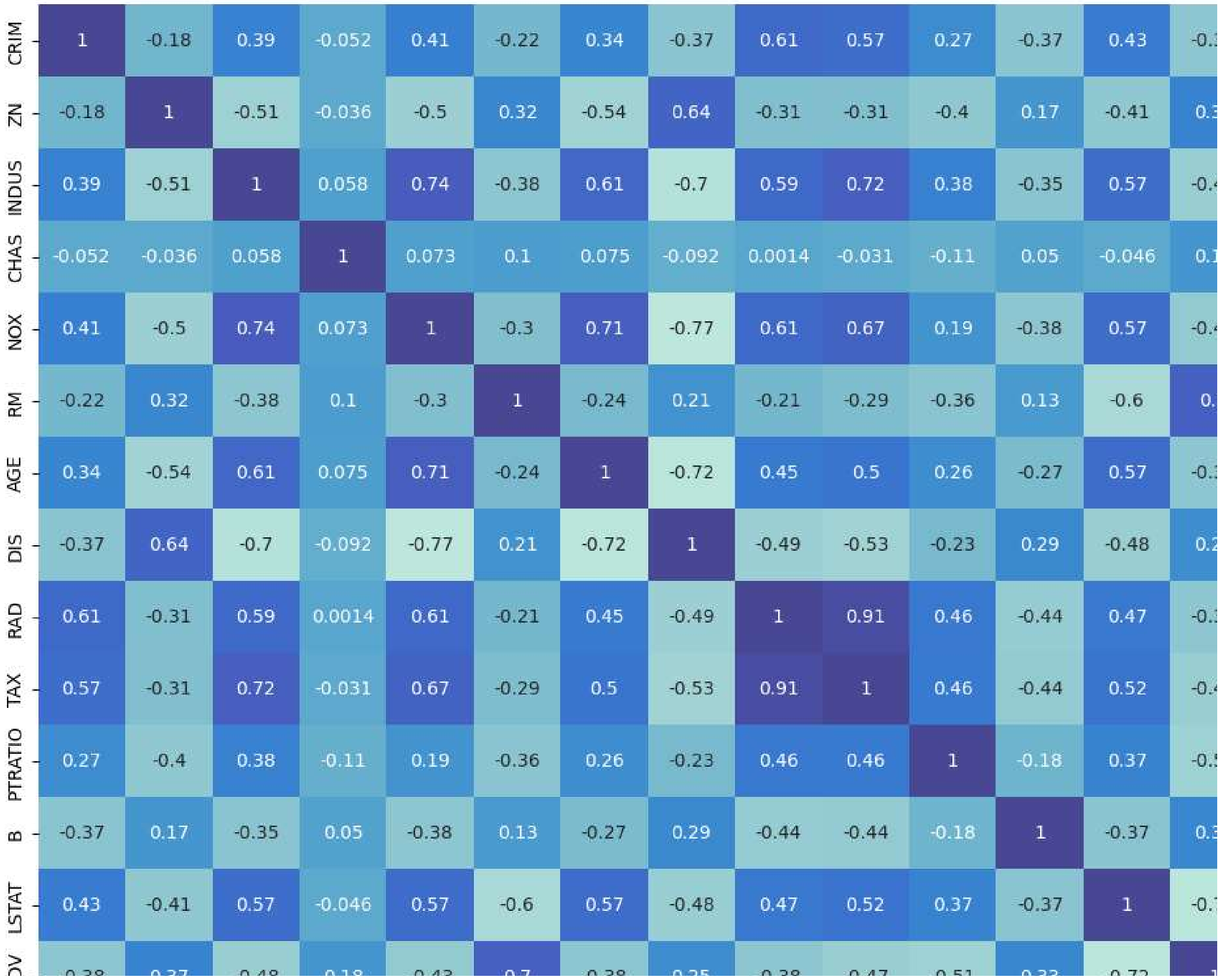
```
data.boxplot(column_names, rot=15)
```

```
<Axes: >
```



```
x=data.iloc[:,:-1].values
y=data.iloc[:,-1].values
```

```
plt.figure(figsize=(15,10))
sns.heatmap(data.select_dtypes(include=['int','float']).corr(),annot=True,center = 2)
plt.show()
```



```
from sklearn.model_selection import train_test_split

X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.2,random_state=1)
```

```
print(X_train.shape)
print(X_test.shape)
print(y_train.shape)
print(y_test.shape)

     (404, 13)
     (102, 13)
     (404,)
     (102,)
```

```
X = data[['LSTAT', 'RM', 'PTRATIO', 'INDUS', 'TAX', 'NOX' , 'RAD' ,
'AGE' , 'CRIM' , 'ZN']]
Y = data['MEDV']
seed= 1
X_train , X_test, Y_train , Y_test = train_test_split(X, Y,
test_size=0.20, random_state=seed)
```

```
X.shape

     (506, 10)
```

```
Y.shape

     (506,)
```

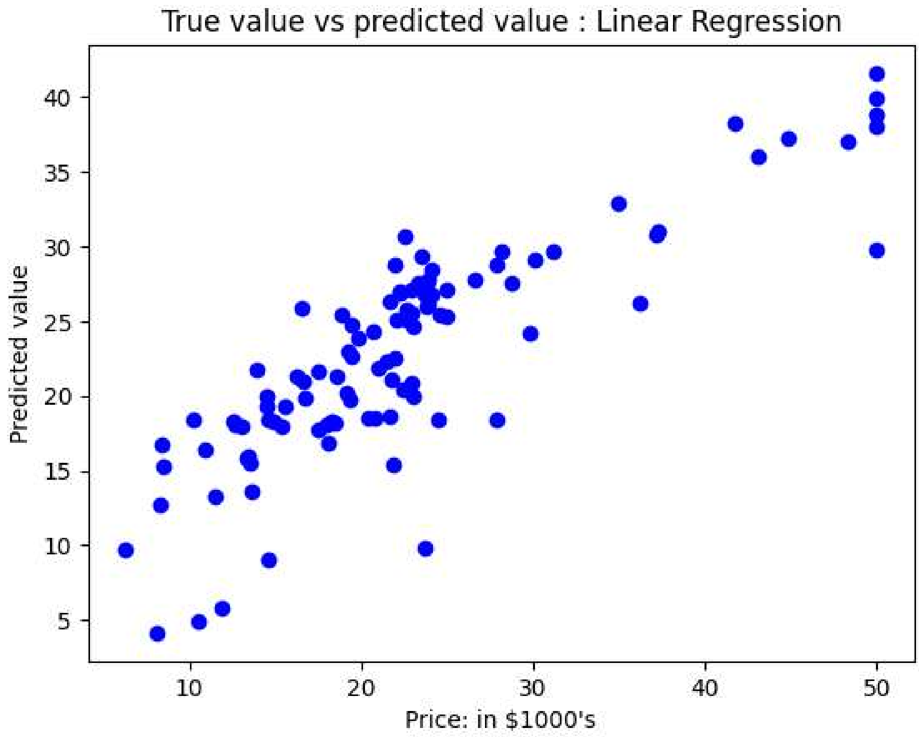
```
from sklearn.linear_model import LinearRegression
LR=LinearRegression()
LR.fit(X_train , Y_train)
LinearRegression()

     ▾ LinearRegression
     LinearRegression()
```

```
y_pred= LR.predict(X_test)
```

```
from sklearn import metrics
import numpy as np

print("Mean Absolute Error:",metrics.mean_absolute_error(y_test,y_pred))
print("Mean Squred Error:",metrics.mean_squared_error(y_test,y_pred))
print("Root Mean Squred Error:",metrics.mean_squared_error(y_test,y_pred))

     Mean Absolute Error: 4.311333848096257
     Mean Squred Error: 29.58597268132346
     Root Mean Squred Error: 29.58597268132346
```

```
print("Mean Absolute Error:",metrics.mean_absolute_error(y_test,y_pred))

     Mean Absolute Error: 4.311333848096257
```

```
plt.scatter(y_test, y_pred, c = 'Blue')
plt.xlabel("Price: in $1000's")
plt.ylabel("Predicted value")
plt.ylabel("Predicted value")
plt.title("True value vs predicted value : Linear Regression")
plt.show()
```


True value vs predicted value : Linear Regression
Predicted value
Price: in $1000's