1 Import libraries

[3]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.datasets import load_boston
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error, mean_absolute_error
from sklearn.preprocessing import StandardScaler
import warnings
warnings.filterwarnings("ignore")
%matplotlib inline
```

[4]:
```
boston = load_boston()
boston.keys()
```

[4]:
```
dict_keys(['data', 'target', 'feature_names', 'DESCR', 'filename',
'data_module'])
```

[5]:
```
x = pd.DataFrame(boston.data, columns=boston.feature_names)
y = pd.DataFrame(boston.target, columns=['MEDV'])
```

[6]:
```
x.head()
```

[6]:

	CRIM	ZN	INDUS	CHAS	NOX	RM	AGE	DIS	RAD	TAX	\
0	0.00632	18.0	2.31	0.0	0.538	6.575	65.2	4.0900	1.0	296.0	
1	0.02731	0.0	7.07	0.0	0.469	6.421	78.9	4.9671	2.0	242.0	
2	0.02729	0.0	7.07	0.0	0.469	7.185	61.1	4.9671	2.0	242.0	
3	0.03237	0.0	2.18	0.0	0.458	6.998	45.8	6.0622	3.0	222.0	
4	0.06905	0.0	2.18	0.0	0.458	7.147	54.2	6.0622	3.0	222.0	

	PTRATIO	B	LSTAT
0	15.3	396.90	4.98
1	17.8	396.90	9.14
2	17.8	392.83	4.03

```
3     18.7  394.63   2.94
4     18.7  396.90   5.33
```

[7]:
```
x.shape, y.shape
```

[7]:
```
((506, 13), (506, 1))
```

2 Basic stats

[8]:
```
x.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 506 entries, 0 to 505
Data columns (total 13 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    float64
 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    float64
 9   TAX      506 non-null    float64
 10  PTRATIO  506 non-null    float64
 11  B        506 non-null    float64
 12  LSTAT    506 non-null    float64
dtypes: float64(13)
memory usage: 51.5 KB
```

[9]:
```
x.describe()
```

[9]:

	CRIM	ZN	INDUS	CHAS	NOX	RM	\
count	506.000000	506.000000	506.000000	506.000000	506.000000	506.000000	
mean	3.613524	11.363636	11.136779	0.069170	0.554695	6.284634	
std	8.601545	23.322453	6.860353	0.253994	0.115878	0.702617	
min	0.006320	0.000000	0.460000	0.000000	0.385000	3.561000	
25%	0.082045	0.000000	5.190000	0.000000	0.449000	5.885500	
50%	0.256510	0.000000	9.690000	0.000000	0.538000	6.208500	
75%	3.677083	12.500000	18.100000	0.000000	0.624000	6.623500	
max	88.976200	100.000000	27.740000	1.000000	0.871000	8.780000	

	AGE	DIS	RAD	TAX	PTRATIO	B	\
count	506.000000	506.000000	506.000000	506.000000	506.000000	506.000000	

```
mean    68.574901    3.795043    9.549407  408.237154   18.455534  356.674032
std     28.148861    2.105710    8.707259  168.537116    2.164946   91.294864
min      2.900000    1.129600    1.000000  187.000000   12.600000    0.320000
25%     45.025000    2.100175    4.000000  279.000000   17.400000  375.377500
50%     77.500000    3.207450    5.000000  330.000000   19.050000  391.440000
75%     94.075000    5.188425   24.000000  666.000000   20.200000  396.225000
max    100.000000   12.126500   24.000000  711.000000   22.000000  396.900000

            LSTAT
count  506.000000
mean    12.653063
std      7.141062
min      1.730000
25%      6.950000
50%     11.360000
75%     16.955000
max     37.970000
```

[10]:
```
y.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 506 entries, 0 to 505
Data columns (total 1 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   MEDV    506 non-null    float64
dtypes: float64(1)
memory usage: 4.1 KB
```

[11]:
```
y.describe()
```

[11]:
```
             MEDV
count  506.000000
mean    22.532806
std      9.197104
min      5.000000
25%     17.025000
50%     21.200000
75%     25.000000
max     50.000000
```

[12]:
```
x.isnull().sum()
```

[12]:
```
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
dtype: int64
```

[13]:
```
y.isnull().sum()
```

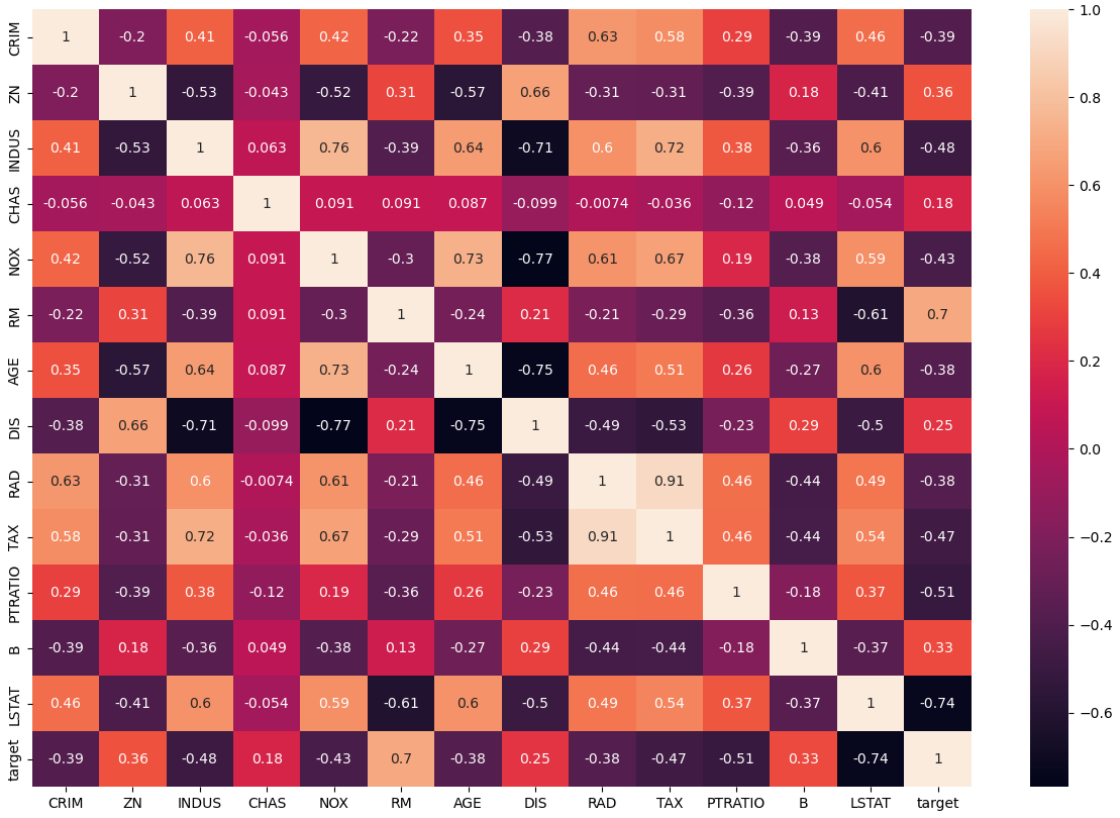
[13]:
```
MEDV    0
dtype: int64
```

[14]:
```
df = x
df["target"] = y
df.head()
```

[14]:

	CRIM	ZN	INDUS	CHAS	NOX	RM	AGE	DIS	RAD	TAX	PTRATIO	B	LSTAT	target
0	0.00632	18.0	2.31	0.0	0.538	6.575	65.2	4.0900	1.0	296.0	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	2.0	242.0	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	2.0	242.0	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	3.0	222.0	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	3.0	222.0	18.7	396.90	5.33	36.2

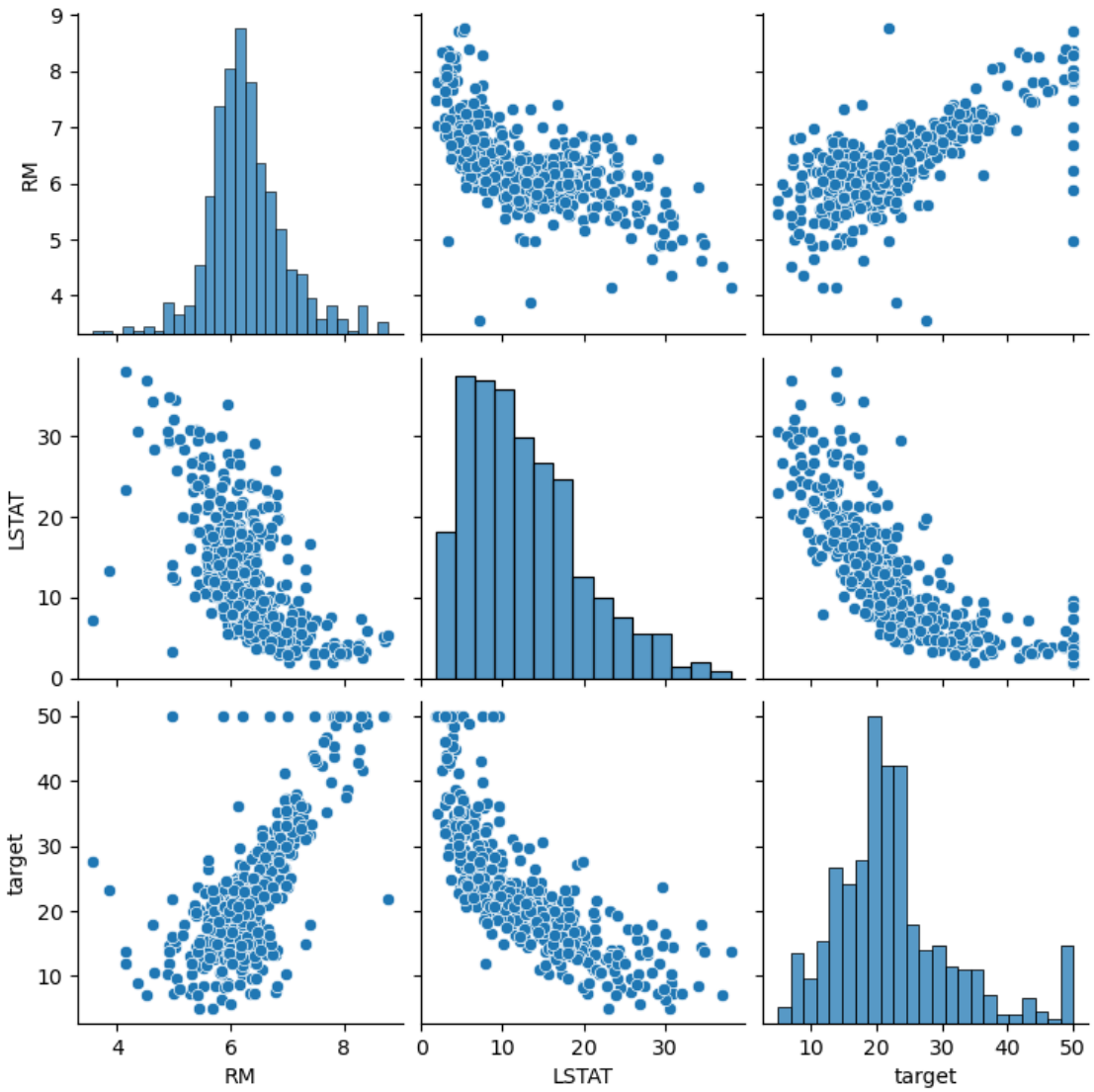
[15]:
```
plt.figure(figsize=(15,10))
sns.heatmap(df.corr(), annot=True)
plt.show()
```



2.0.1 Considering only 'RM' and 'LSTAT' by considering correlation and multicollinearity of other features

[51]:
```
df = df[['RM', 'LSTAT', 'target']]
```

[52]:
```
sns.pairplot(df)
plt.show()
```



[63]:
```
x = df[['RM', 'LSTAT']]
y = df['target']
```

3 Scale the data

[64]:
```
scaler = StandardScaler()
```

[65]:
```
x = scaler.fit_transform(x)
```

4 Split the data

[67]:
```
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.3,␣
↪shuffle=True)
```

[68]:
```
x_train.shape, x_test.shape, y_train.shape, y_test.shape
```

[68]:
```
((354, 2), (152, 2), (354,), (152,))
```

5 Linear Regression Modelling

[69]:
```
model = LinearRegression(n_jobs=-1)
```

[70]:
```
model.fit(x_train, y_train)
```

[70]:
```
LinearRegression(n_jobs=-1)
```

6 Make predictions

[71]:
```
y_pred = model.predict(x_test)
```

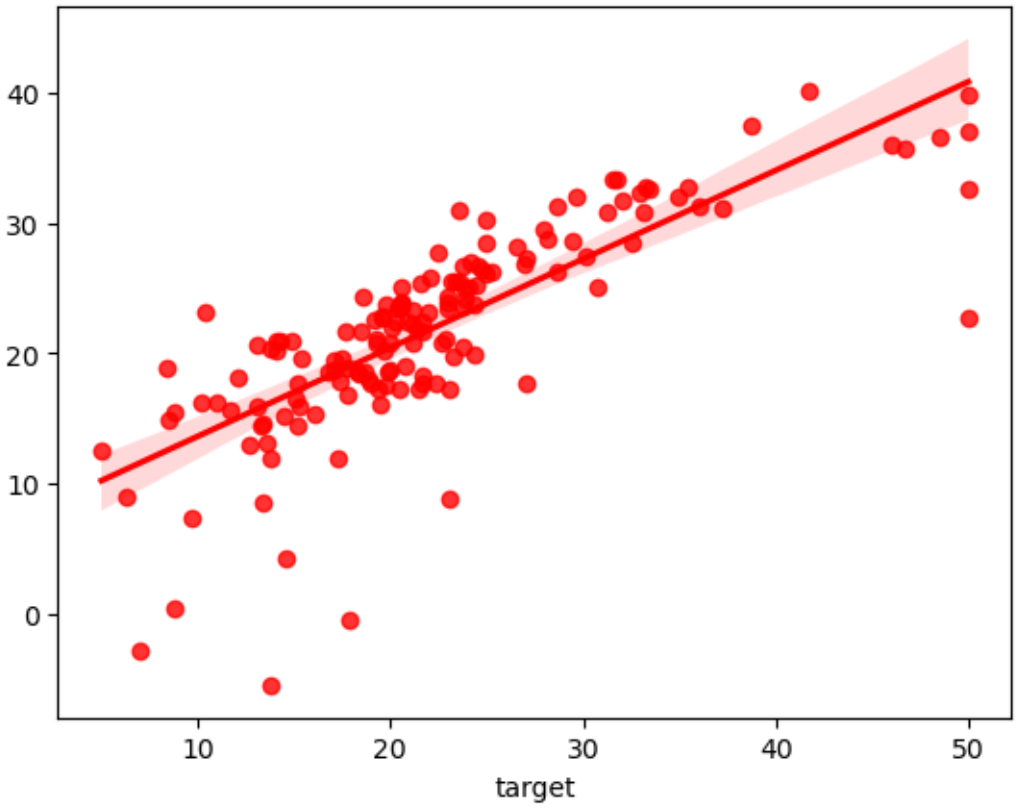
[72]:
```
mean_absolute_error(y_test, y_pred)
```

[72]:
```
3.701010266760501
```

[73]:
```
mean_squared_error(y_test, y_pred)
```

[73]:
```
30.5001478179898
```

[74]:
```
sns.regplot(y_test, y_pred, color='red')
plt.show()
```


40
30
20
10
0
10
20
30
40
50
target