```
import pandas as pd
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.tree import DecisionTreeRegressor as dt
from sklearn.ensemble import RandomForestRegressor as rf
from sklearn.metrics import r2_score
import warnings
warnings.filterwarnings("ignore")
import matplotlib.pyplot as plt
import numpy as np

z = pd.read_csv(r"C:\Users\skj_h\OneDrive\Desktop\dataset\
boston_housing.csv")
z

        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
..       ...   ...    ...   ...    ...    ...   ...     ...  ...    ..
.
501  0.06263   0.0  11.93   0.0  0.573  6.593  69.1  2.4786  1.0
273.0
502  0.04527   0.0  11.93   0.0  0.573  6.120  76.7  2.2875  1.0
273.0
503  0.06076   0.0  11.93   0.0  0.573  6.976  91.0  2.1675  1.0
273.0
504  0.10959   0.0  11.93   0.0  0.573  6.794  89.3  2.3889  1.0
273.0
505  0.04741   0.0  11.93   0.0  0.573  6.030  80.8  2.5050  1.0
273.0

     PTRATIO       B  LSTAT  MEDV
0       15.3  396.90   4.98  24.0
1       17.8  396.90   9.14  21.6
2       17.8  392.83   4.03  34.7
3       18.7  394.63   2.94  33.4
4       18.7  396.90   5.33  36.2
..       ...     ...    ...   ...
501     21.0  391.99   9.67  22.4
502     21.0  396.90   9.08  20.6
```

```
503     21.0  396.90   5.64  23.9
504     21.0  393.45   6.48  22.0
505     21.0  396.90   7.88  11.9

[506 rows x 14 columns]
```

```
z.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
```

```
z.shape
```

```
(506, 14)
```

```
z.size
```

```
7084
```

```
z.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    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
 13  MEDV     506 non-null    float64
dtypes: float64(14)
memory usage: 55.5 KB
```

```
z.ndim
```

```
2
```

```
z.dtypes
```

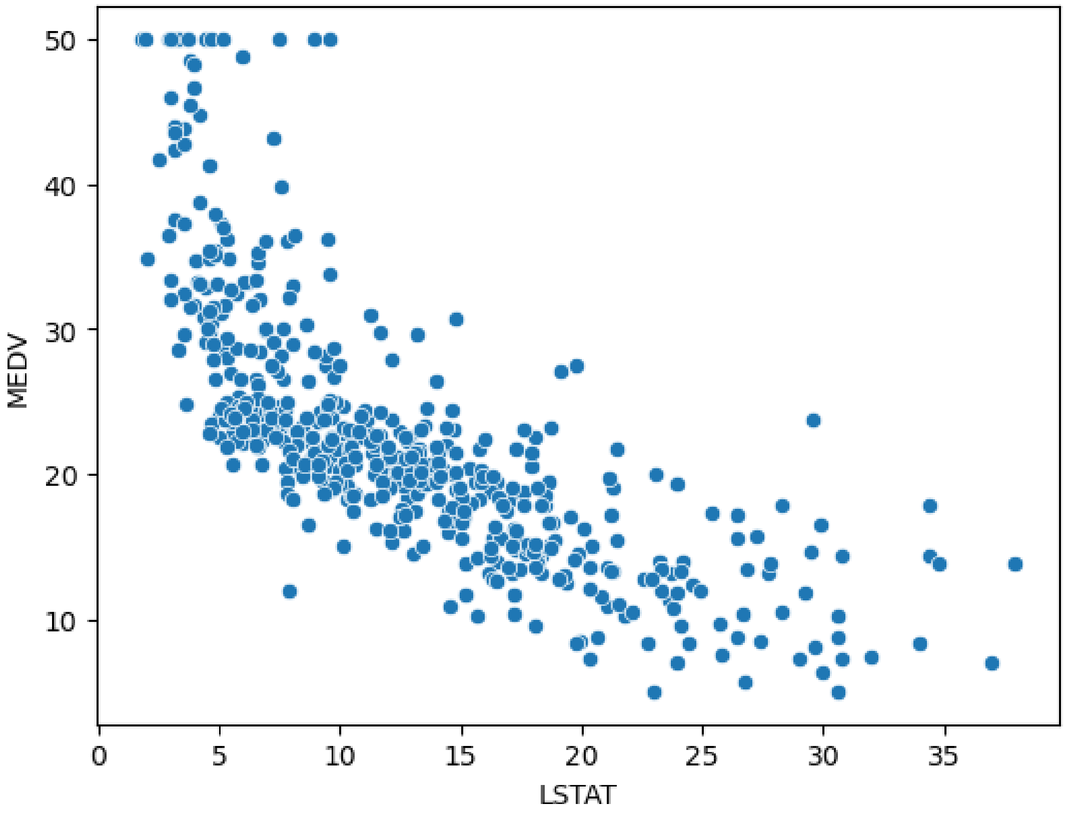
```
CRIM       float64
ZN         float64
INDUS      float64
CHAS       float64
NOX        float64
RM         float64
AGE        float64
DIS        float64
RAD        float64
TAX        float64
PTRATIO    float64
B          float64
LSTAT      float64
MEDV       float64
dtype: object
```

```
abs(z.corr()["MEDV"]).sort_values(ascending = False)
```

```
MEDV       1.000000
LSTAT      0.737663
RM         0.695360
PTRATIO    0.507787
INDUS      0.483725
TAX        0.468536
NOX        0.427321
CRIM       0.388305
RAD        0.381626
AGE        0.376955
ZN         0.360445
B          0.333461
DIS        0.249929
CHAS       0.175260
Name: MEDV, dtype: float64
```

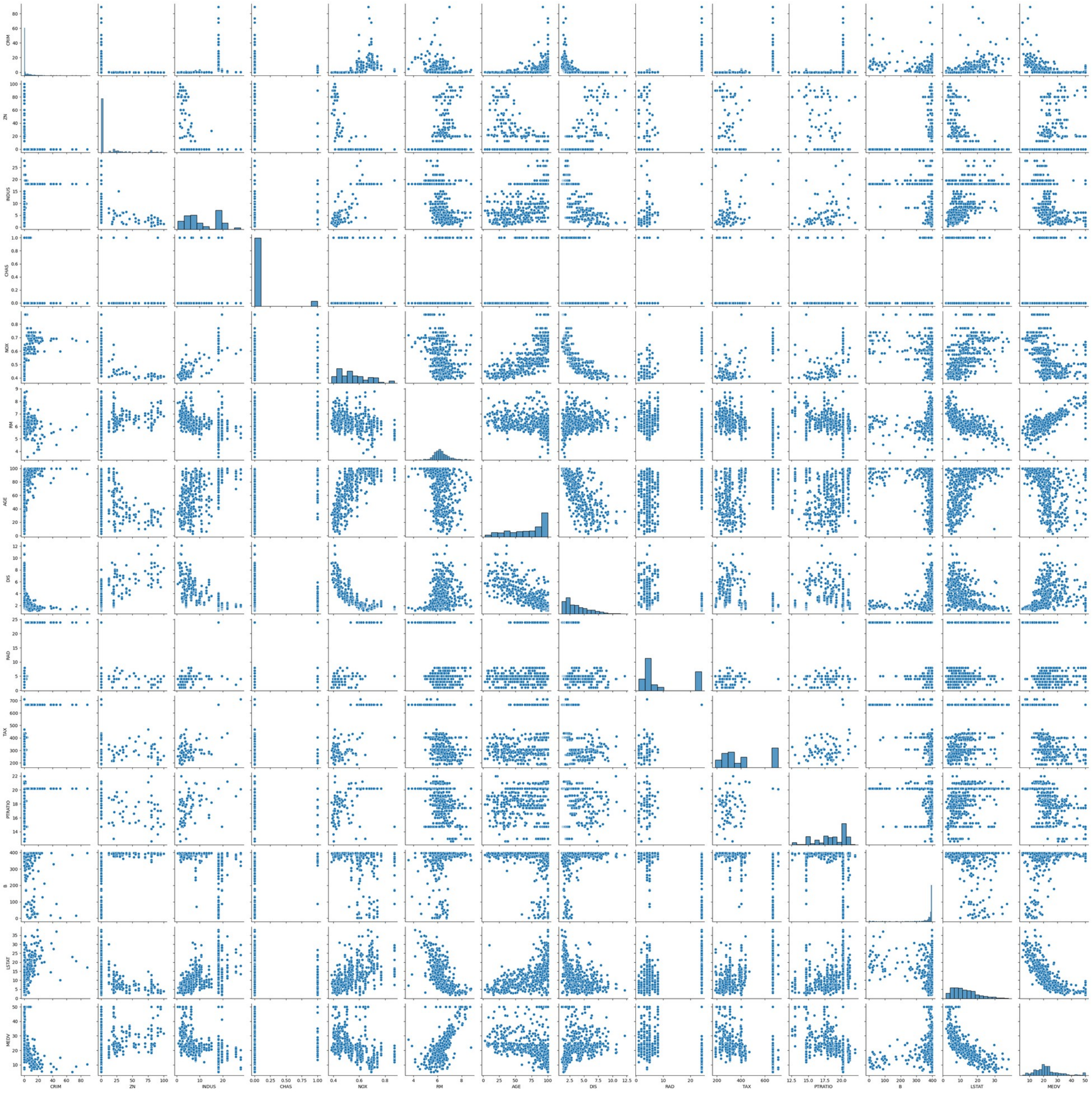
```
sns.scatterplot(x = z["LSTAT"], y = z["MEDV"], data = z)
```

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



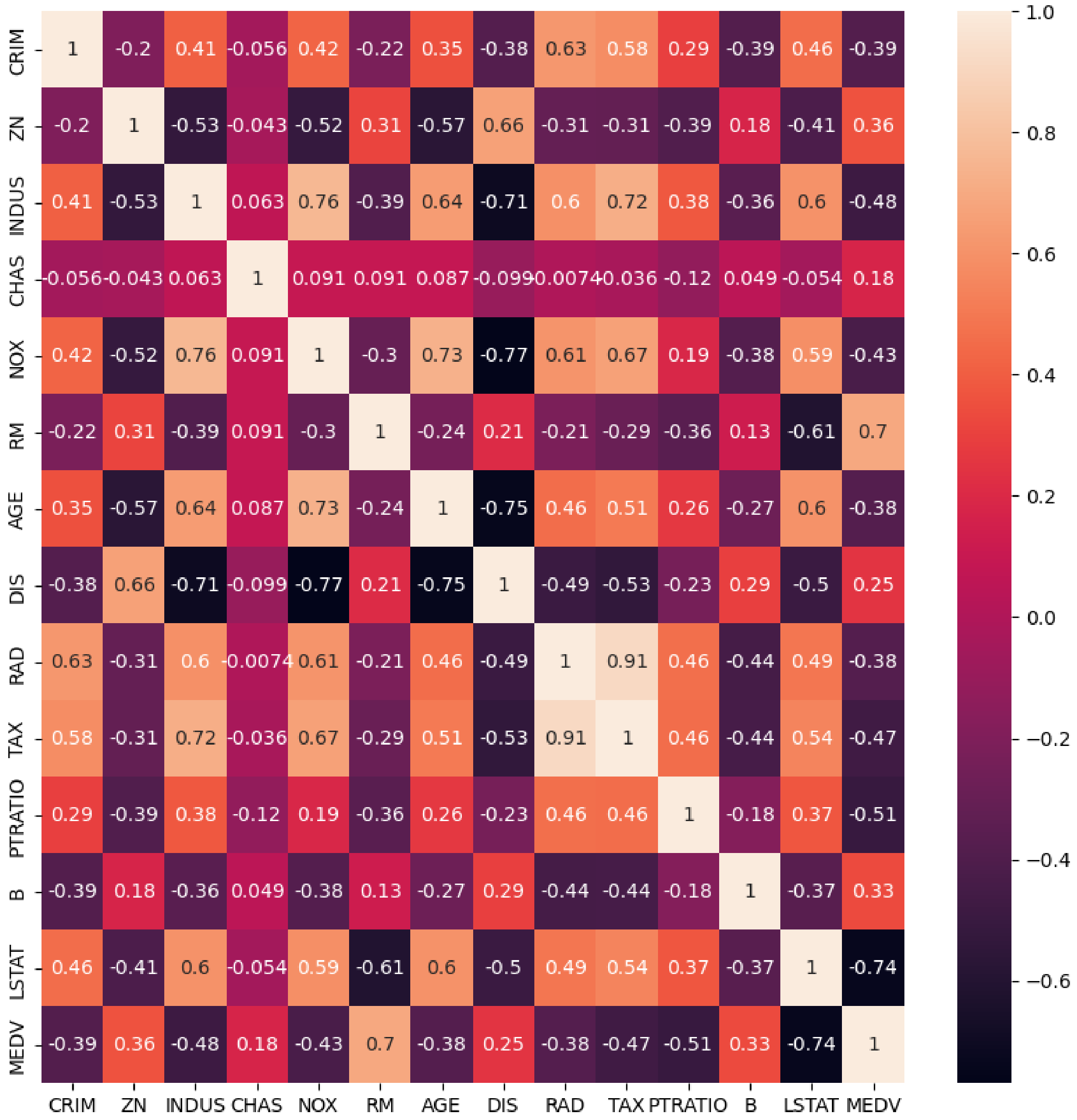
```
sns.pairplot(z)
```

```
<seaborn.axisgrid.PairGrid at 0x26bb980fc80>
```



```
plt.figure(figsize = (10, 10))
sns.heatmap(z.corr(), annot = True, alpha = 1)
```

```
<Axes: >
```

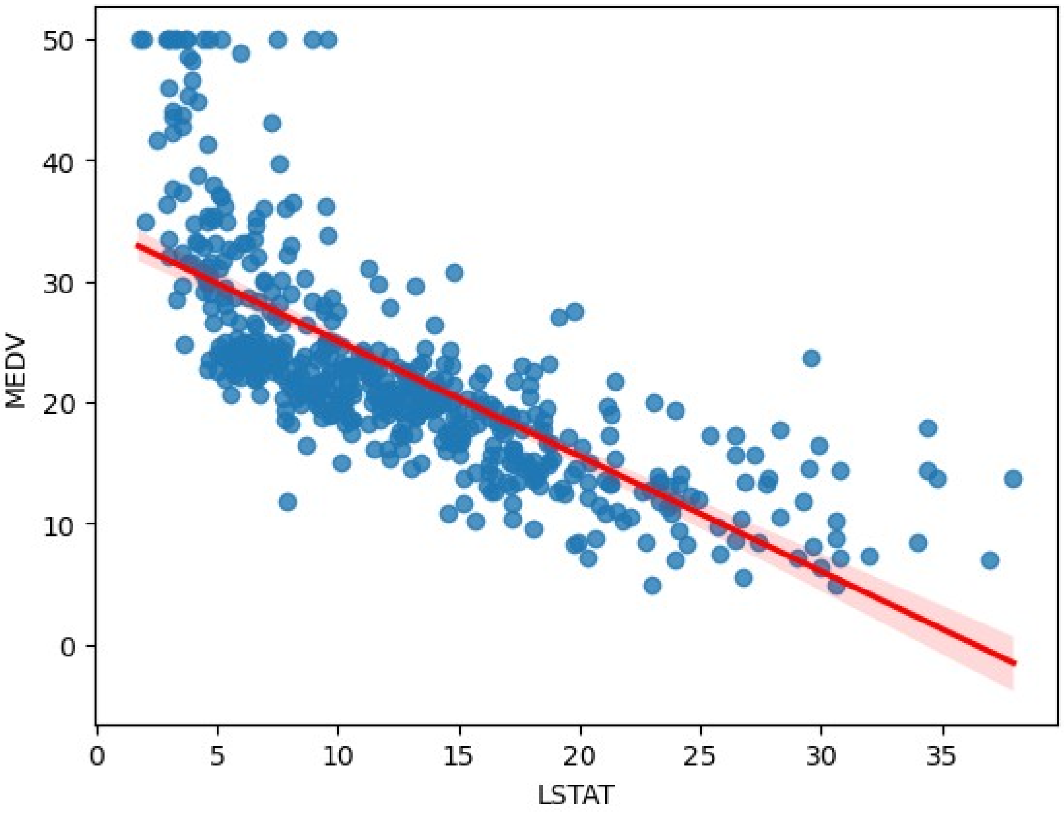


```
z.columns
```

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

```
sns.regplot(x = z["LSTAT"], y = z["MEDV"], data = z, line_kws =
{"color" : "red"})
```

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



```
z.columns

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

x = z[["LSTAT", "MEDV"]]

X = x
Y = x["MEDV"]

x_train, x_test, y_train, y_test = train_test_split(X, Y, train_size =
0.7, test_size = 0.3, random_state = 100)

x_train.shape

(354, 2)

x_train = x_train.drop(["MEDV"], axis = 1)
x_test = x_test .drop(["MEDV"], axis = 1)

y_train = np.array(y_train).reshape(-1, 1)
y_test = np.array(y_test).reshape(-1, 1)
```

```
n = LinearRegression()
n.fit(x_train, y_train)

LinearRegression()

y_predict_train = n.predict(x_train)
r2_train__LinearRegression = r2_score(y_true = y_train, y_pred =
y_predict_train)

y_predict_test = n.predict(x_test)
r2_test__LinearRegression = r2_score(y_true = y_test, y_pred =
y_predict_test)

a = dt()
a.fit(x_train, y_train)

DecisionTreeRegressor()

y_predict_train1 = a.predict(x_train)
r2_train__DecisionTree = r2_score(y_true = y_train, y_pred =
y_predict_train1)

y_predict_test1 = a.predict(x_test)
r2_test__DecisionTree = r2_score(y_true = y_test, y_pred =
y_predict_test1)

b = rf()
b.fit(x_train, y_train)

RandomForestRegressor()

y_predict_train2 = b.predict(x_train)
r2_train__RandomForest = r2_score(y_true = y_train, y_pred =
y_predict_train2)

y_predict_test2 = b.predict(x_test)
r2_test__RandomForest = r2_score(y_true = y_test, y_pred =
y_predict_test2)

z5 = {"Model name" : ["LinearRegression", "Decision Tree Regression",
"Random Forest Regression"],
      "Evaluation on training dataset" : [r2_train__LinearRegression,
r2_train__DecisionTree,
                                          r2_train__RandomForest],
      "Evaluation on testing dataset" : [r2_test__LinearRegression,
r2_test__DecisionTree,
                                          r2_test__RandomForest]
     }


List_model_with_r2_score = pd.DataFrame(z5)
List_model_with_r2_score
```

```
                 Model name  Evaluation on training dataset  \
0          LinearRegression                        0.546342
1  Decision Tree Regression                        0.960354
2  Random Forest Regression                        0.910186

   Evaluation on testing dataset
0                       0.532230
1                       0.471643
2                       0.565357
```