boston-house-prediction

October 10, 2024

[1]:

```
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
```

[2]:

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

[2]:

```
        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]
```

```
[3]: z.isnull().sum()
```

```
[3]: 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
```

```
[4]: z.shape
```

```
[4]: (506, 14)
```

```
[5]: z.size
```

```
[5]: 7084
```

```
[6]: 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
```

```
[7]: z.ndim
```

```
[7]: 2
```

```
[8]: z.dtypes
```

```
[8]: 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
```

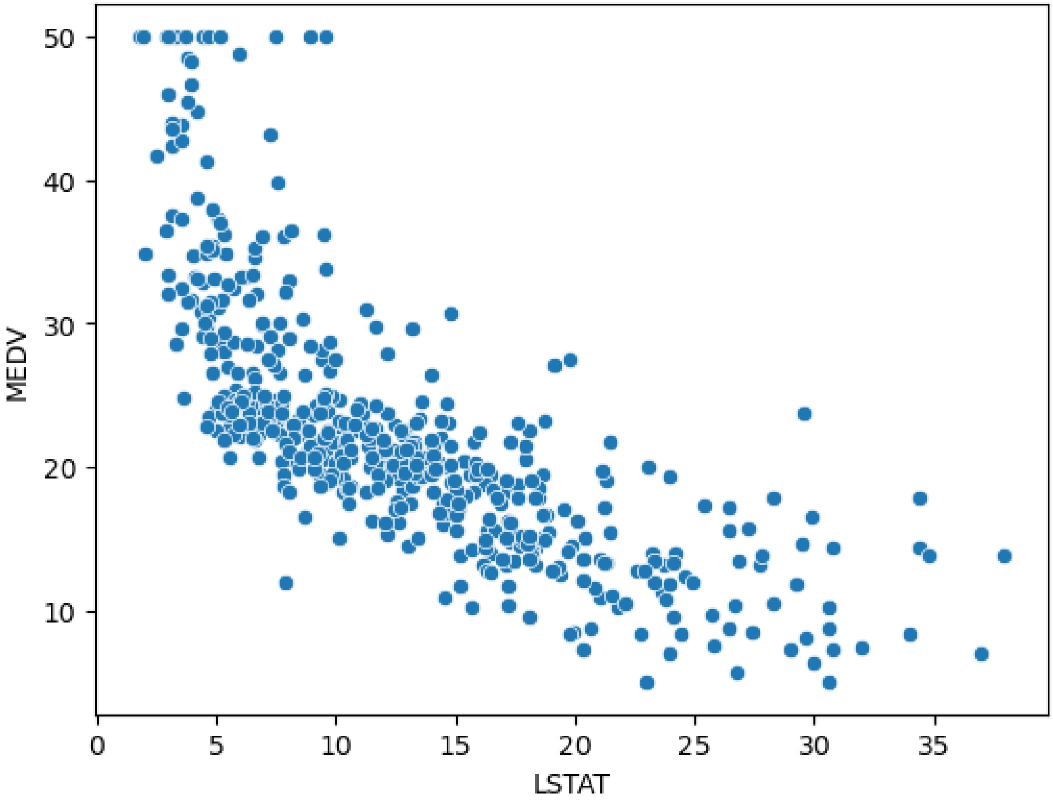
```
[9]: abs(z.corr()["MEDV"]).sort_values(ascending = False)
```

```
[9]: 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
```

[10]:
```
sns.scatterplot(x = z["LSTAT"], y = z["MEDV"], data = z)
```

[10]:
```
<Axes: xlabel='LSTAT', ylabel='MEDV'>
```



[ ]:
```
sns.pairplot(z)
```

[ ]:
```
<seaborn.axisgrid.PairGrid at 0x1826b7bdf70>
```

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

[ ]:
```
z.columns
```

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

[ ]:
```
z.columns
```

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

[ ]:
```python
X = x
Y = x["MEDV"]
```

[ ]:
```python
x_train, x_test, y_train, y_test = train_test_split(X, Y, train_size = 0.7, test_size = 0.3, random_state = 100)
```

[ ]:
```python
x_train.shape
```

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

[ ]:
```python
y_train = np.array(y_train).reshape(-1, 1)
y_test = np.array(y_test).reshape(-1, 1)
```

[ ]:
```python
n = LinearRegression()
n.fit(x_train, y_train)
```

[ ]:
```python
y_predict_train = n.predict(x_train)
r2_train__LinearRegression = r2_score(y_true = y_train, y_pred = y_predict_train)
```

[ ]:
```python
n = LinearRegression()
n.fit(x_test, y_test)
```

[ ]:
```python
y_predict_test = n.predict(x_test)
r2_test__LinearRegression = r2_score(y_true = y_test, y_pred = y_predict_test)
```

[ ]:
```python
a = dt()
a.fit(x_train, y_train)
```

[ ]:
```python
y_predict_train1 = a.predict(x_train)
r2_train__DecisionTree = r2_score(y_true = y_train, y_pred = y_predict_train1)
```

[ ]:
```python
a = dt()
a.fit(x_test, y_test)
```

[ ]:
```python
y_predict_test1 = a.predict(x_test)
r2_test__DecisionTree = r2_score(y_true = y_test, y_pred = y_predict_test1)
```

[ ]:
```python
b = rf(n_estimators = 100)
b.fit(x_train, y_train)
```

[ ]:
```python
y_predict_train2 = b.predict(x_train)
r2_train__RandomForest = r2_score(y_true = y_train, y_pred = y_predict_train2)
```

[ ]:
```python
b = rf(n_estimators = 100)
b.fit(x_test, y_test)
```

[ ]:

```
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
```

[ ]:

```

```