In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import r2_score,accuracy_score,mean_squared_error,mean_absolut
```

In [3]:

```
df=pd.read_csv("HousingData.csv")
```

In [4]:

```
df.head()
```

Out[4]:

	CRIM	ZN	INDUS	CHAS	NOX	RM	AGE	DIS	RAD	TAX	PTRATIO	B
0	0.00632	18.0	2.31	0.0	0.538	6.575	65.2	4.0900	1	296	15.3	396.90
1	0.02731	0.0	7.07	0.0	0.469	6.421	78.9	4.9671	2	242	17.8	396.90
2	0.02729	0.0	7.07	0.0	0.469	7.185	61.1	4.9671	2	242	17.8	392.83
3	0.03237	0.0	2.18	0.0	0.458	6.998	45.8	6.0622	3	222	18.7	394.63
4	0.06905	0.0	2.18	0.0	0.458	7.147	54.2	6.0622	3	222	18.7	396.90

In [6]:

```
df.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
```

In [7]:

```
df.shape
```

Out[7]:

```
(506, 14)
```

In [8]:

```
df.isnull().sum()
```

Out[8]:

```
CRIM       20
ZN         20
INDUS      20
CHAS       20
NOX         0
RM          0
AGE        20
DIS         0
RAD         0
TAX         0
PTRATIO     0
B           0
LSTAT      20
MEDV        0
dtype: int64
```

In [9]:

```
df=df.dropna()
```

In [10]:

```
df.isnull().sum()
```

Out[10]:

```
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 [12]:

```
df.shape
```

Out[12]:

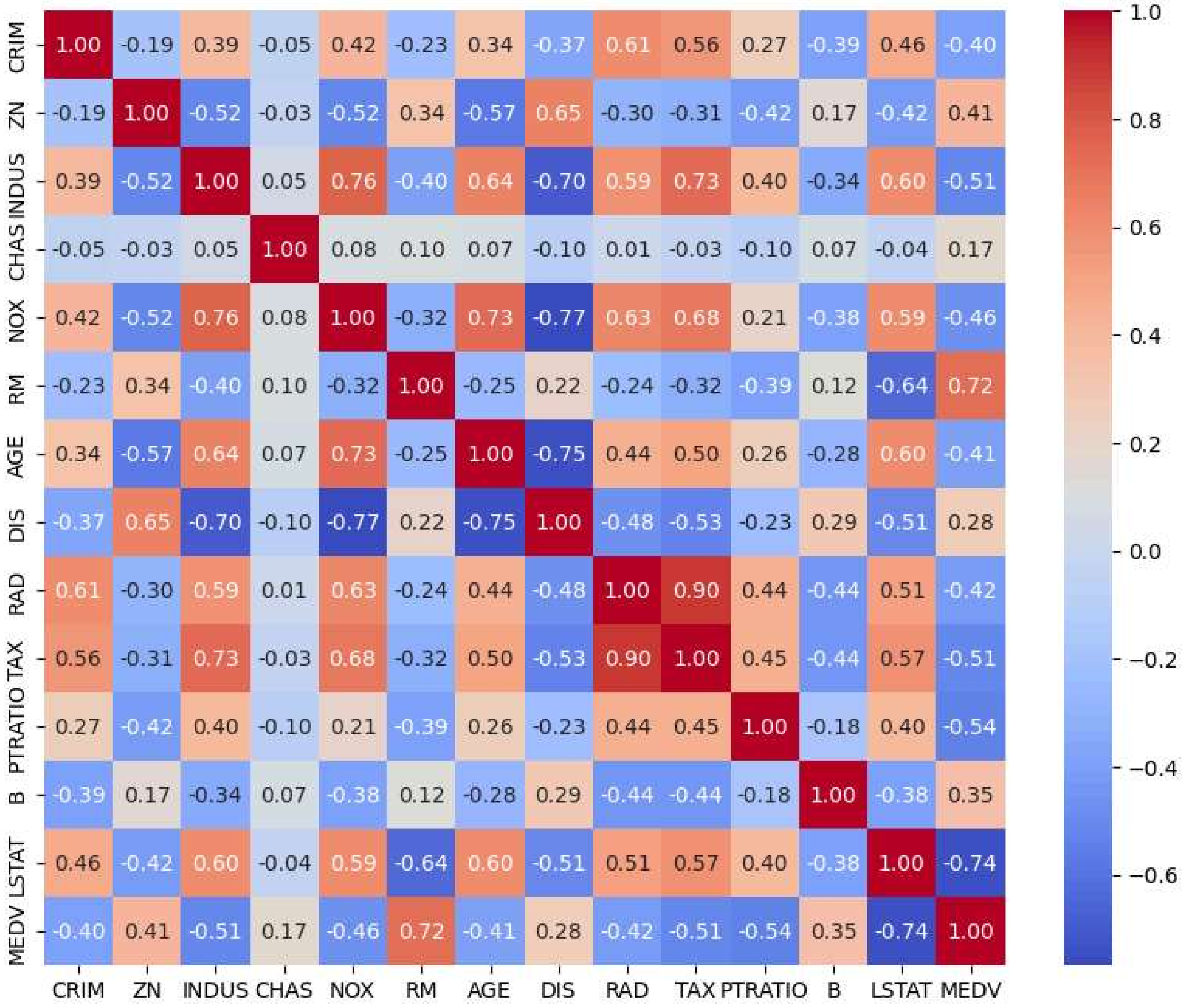
```
(394, 14)
```

In [13]:

```
corr=df.corr()
```

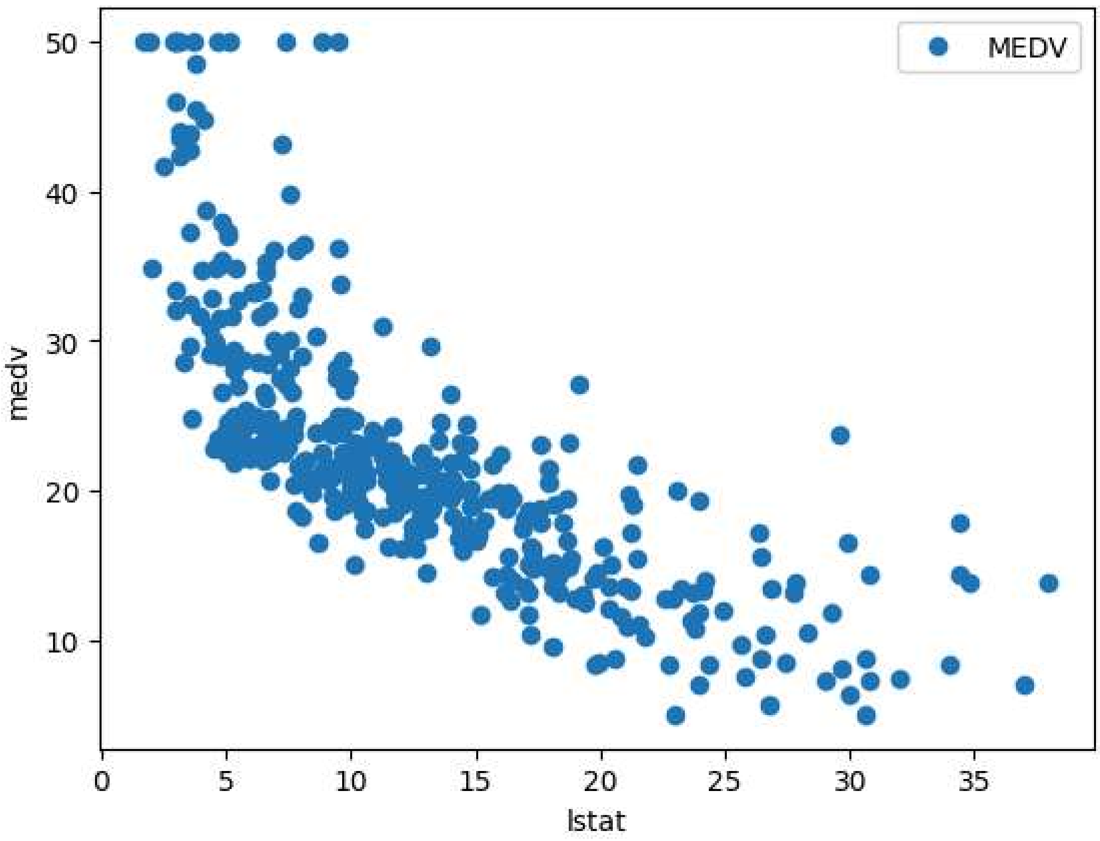
In [15]:

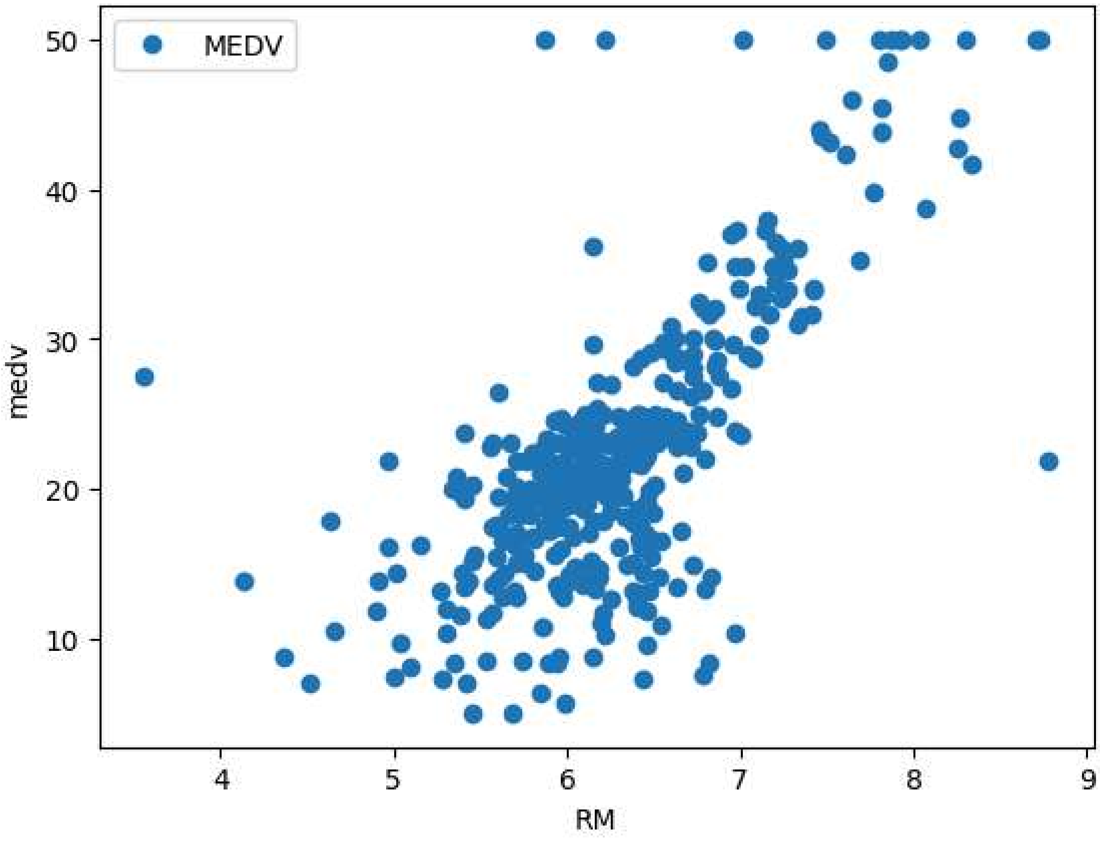
```
plt.figure(figsize=(10, 8))
sns.heatmap(corr, annot=True, cmap="coolwarm", fmt=".2f")
plt.show()
```



In [17]:

```
df.plot(x='LSTAT',y='MEDV',style='o')
plt.xlabel('lstat')
plt.ylabel('medv')
plt.show()
df.plot(x='RM',y='MEDV',style='o')
plt.xlabel('RM')
plt.ylabel('medv')
plt.show()
```





In [24]:

```
df1=df.loc[:,['RM','MEDV']]
df1.head()
```

Out[24]:

	RM	MEDV
0	6.575	24.0
1	6.421	21.6
2	7.185	34.7
3	6.998	33.4
5	6.430	28.7

In [33]:
```
x=pd.DataFrame(df1['RM'])
y=pd.DataFrame(df1['MEDV'])
```

In [34]:
```
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3,random_state=2)
```

In [35]:
```
lr=LinearRegression()
lr.fit(x_train,y_train)
```

Out[35]:
```
▾ LinearRegression
LinearRegression()
```

In [43]:
```
y_pred=lr.predict(x_test)
```

In [44]:
```
lr.intercept_
```

Out[44]:
```
array([-36.46388815])
```

In [45]:
```
lr.coef_
```

Out[45]:
```
array([[9.3646384]])
```

In [46]:
```
y_pred.shape
```

Out[46]:
```
(119, 1)
```

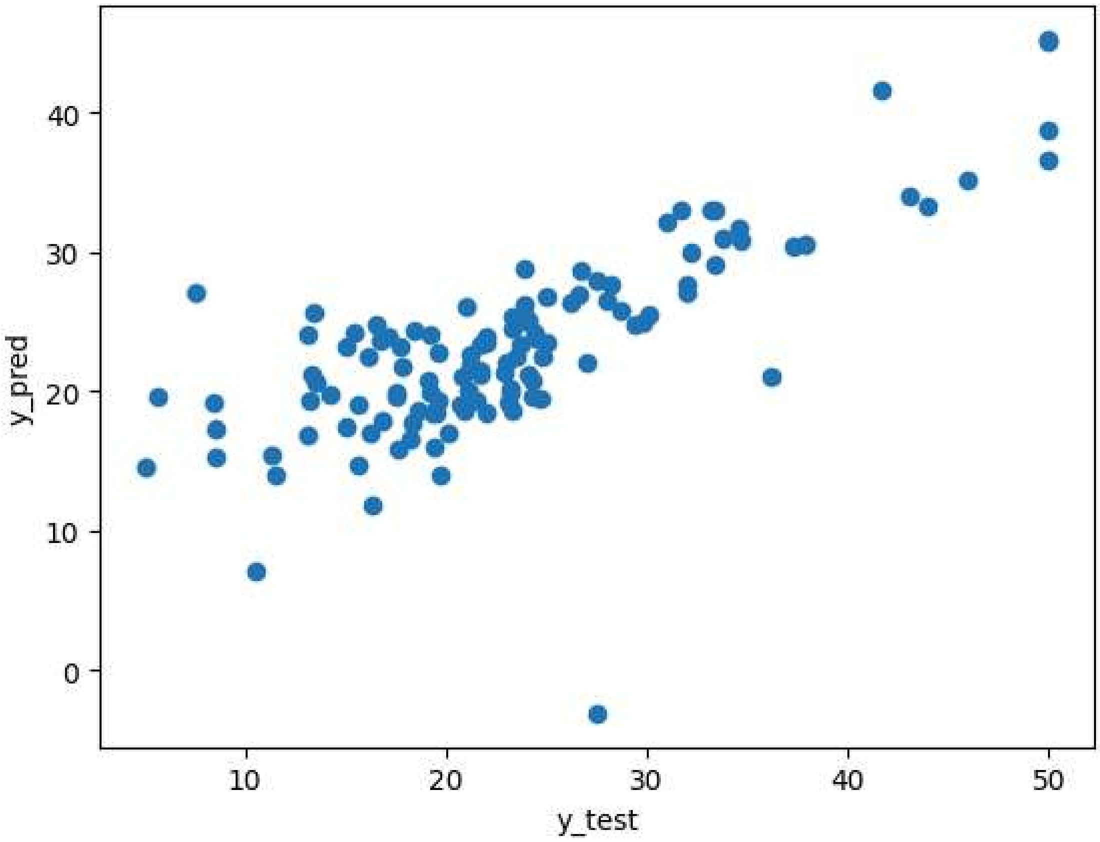
In [47]:
```
y_test.shape
```

Out[47]:
```
(119, 1)
```

In [48]:
```
print("Mean Absolute Error :" ,mean_absolute_error(y_test,y_pred))
print("Meas Squared Error :" , mean_squared_error(y_test,y_pred))
print("Root Mean Squared Error :" , mean_squared_error(y_test,y_pred))
```

```
Mean Absolute Error : 4.21025512996237
Meas Squared Error : 36.841866268951804
Root Mean Squared Error : 36.841866268951804
```

In [52]:
```
plt.scatter(y_test,y_pred)
plt.xlabel('y_test')
plt.ylabel('y_pred')
plt.show()
```



In [56]:

```
from sklearn.preprocessing import StandardScaler
```

In [63]:

```
sc=StandardScaler()
x_sc=sc.fit_transform(x)
x_train, x_test, y_train, y_test = train_test_split(x_sc, y, test_size=0.2, random_
```

In [64]:

```
lr_scaled = LinearRegression()
lr_scaled.fit(x_train, y_train)
y_pred_scaled = lr_scaled.predict(x_test)

print("Scaled R²:", r2_score(y_test, y_pred_scaled))
```

```
Scaled R²: 0.4786797724382229
```

In [67]:

```
from sklearn.preprocessing import PolynomialFeatures
pf=PolynomialFeatures()
x_poly=pf.fit_transform(x_sc)
plm=LinearRegression()
x_train, x_test, y_train, y_test = train_test_split(x_poly, y, test_size=0.2, rando
plm.fit(x_train, y_train)
y_pred_scaled = plm.predict(x_test)
```

In [68]:

```
print("Scaled R²:", r2_score(y_test, y_pred_scaled))
```

```
Scaled R²: 0.5134161272669115
```

In [72]:

```
input=[[8.95]]
i=sc.transform(input)
predict=lr_scaled.predict(i)
predict
```

```
C:\Users\nitin\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\bas
e.py:465: UserWarning: X does not have valid feature names, but StandardScaler was f
itted with feature names
  warnings.warn(
```

Out[72]:

```
array([[47.17608766]])
```

In [ ]: