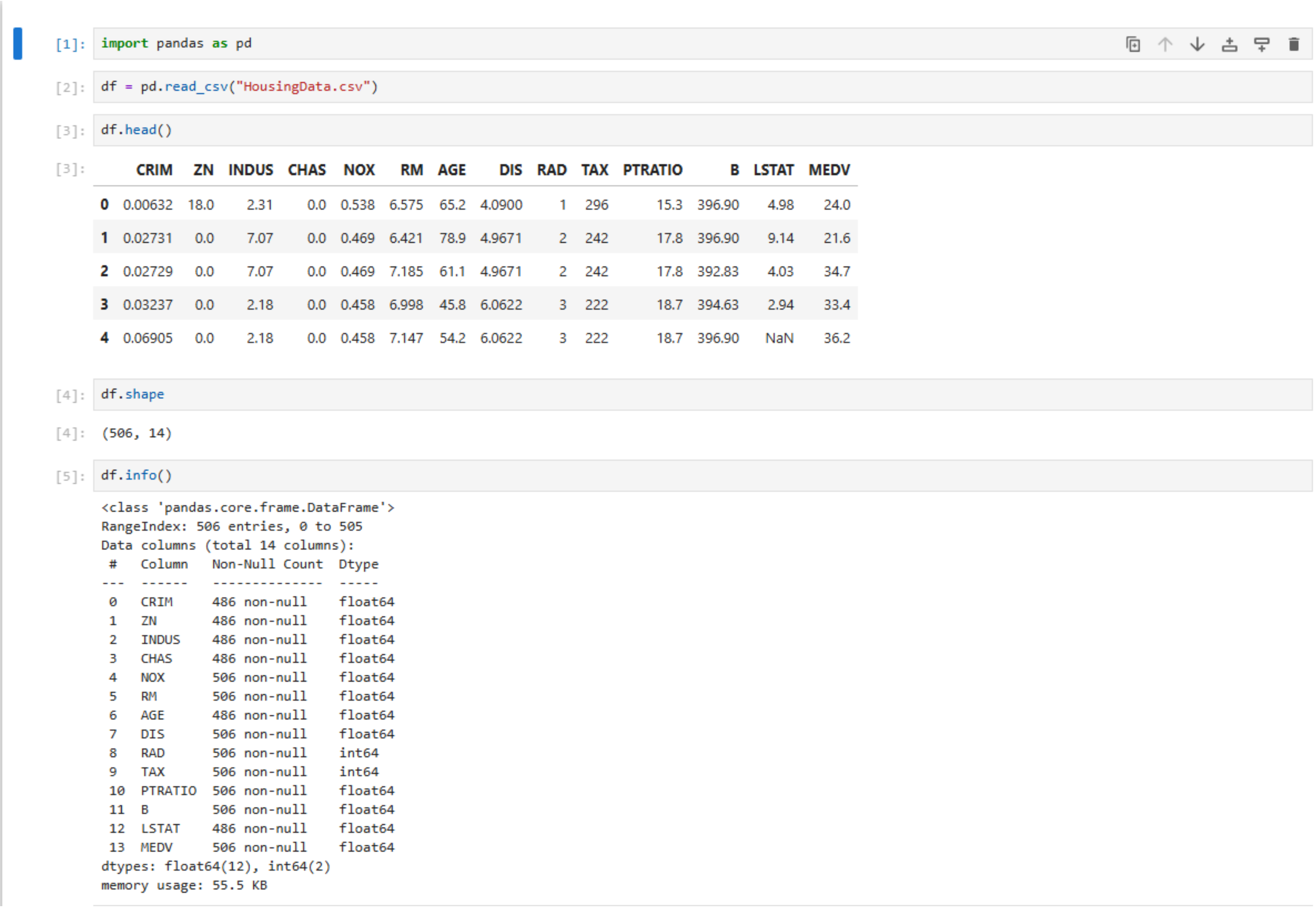


[1]:
```
import pandas as pd
```

[2]:
```
df = pd.read_csv("HousingData.csv")
```

[3]:
```
df.head()
```

[3]:

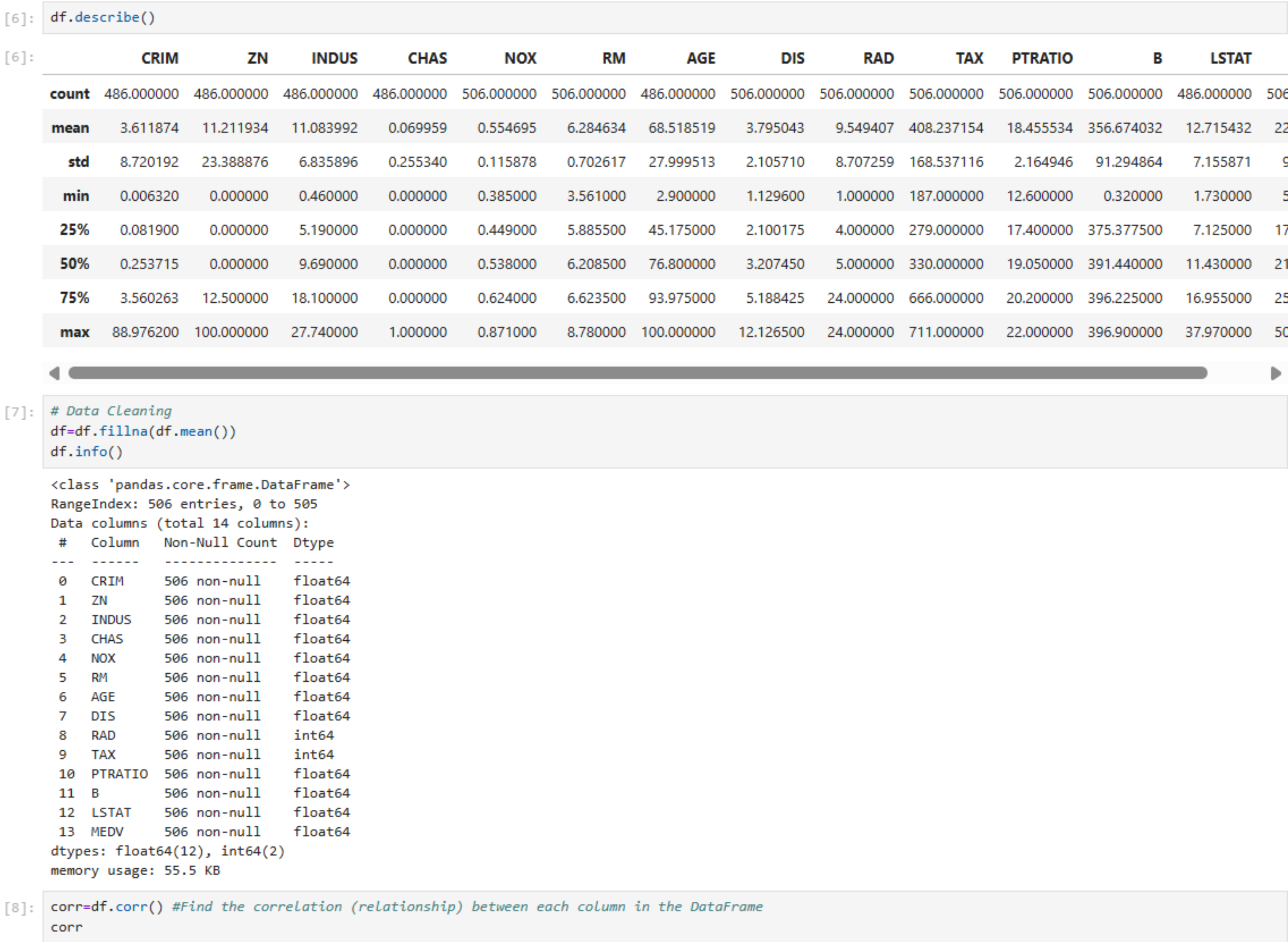
	CRIM	ZN	INDUS	CHAS	NOX	RM	AGE	DIS	RAD	TAX	PTRATIO	B	LSTAT	MEDV
0	0.00632	18.0	2.31	0.0	0.538	6.575	65.2	4.0900	1	296	15.3	396.90	4.98	24.0
1	0.02731	0.0	7.07	0.0	0.469	6.421	78.9	4.9671	2	242	17.8	396.90	9.14	21.6
2	0.02729	0.0	7.07	0.0	0.469	7.185	61.1	4.9671	2	242	17.8	392.83	4.03	34.7
3	0.03237	0.0	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

[4]:
```
df.shape
```

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

[5]:
```
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
```



[6]:
```
df.describe()
```

[6]:

	CRIM	ZN	INDUS	CHAS	NOX	RM	AGE	DIS	RAD	TAX	PTRATIO	B	LSTAT	
count	486.000000	486.000000	486.000000	486.000000	506.000000	506.000000	486.000000	506.000000	506.000000	506.000000	506.000000	506.000000	486.000000	506
mean	3.611874	11.211934	11.083992	0.069959	0.554695	6.284634	68.518519	3.795043	9.549407	408.237154	18.455534	356.674032	12.715432	22
std	8.720192	23.388876	6.835896	0.255340	0.115878	0.702617	27.999513	2.105710	8.707259	168.537116	2.164946	91.294864	7.155871	9
min	0.006320	0.000000	0.460000	0.000000	0.385000	3.561000	2.900000	1.129600	1.000000	187.000000	12.600000	0.320000	1.730000	5
25%	0.081900	0.000000	5.190000	0.000000	0.449000	5.885500	45.175000	2.100175	4.000000	279.000000	17.400000	375.377500	7.125000	17
50%	0.253715	0.000000	9.690000	0.000000	0.538000	6.208500	76.800000	3.207450	5.000000	330.000000	19.050000	391.440000	11.430000	21
75%	3.560263	12.500000	18.100000	0.000000	0.624000	6.623500	93.975000	5.188425	24.000000	666.000000	20.200000	396.225000	16.955000	25
max	88.976200	100.000000	27.740000	1.000000	0.871000	8.780000	100.000000	12.126500	24.000000	711.000000	22.000000	396.900000	37.970000	50

[7]:
```
# Data Cleaning
df=df.fillna(df.mean())
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     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    int64  
 9   TAX      506 non-null    int64  
 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(12), int64(2)
memory usage: 55.5 KB
```

[8]:
```
corr=df.corr() #Find the correlation (relationship) between each column in the DataFrame
corr
```

[8]:

	CRIM	ZN	INDUS	CHAS	NOX	RM	AGE	DIS	RAD	TAX	PTRATIO	B	LSTAT	MEDV
CRIM	1.000000	-0.182930	0.391161	-0.052223	0.410377	-0.215434	0.344934	-0.366523	0.608886	0.566528	0.273384	-0.370163	0.434044	-0.379695
ZN	-0.182930	1.000000	-0.513336	-0.036147	-0.502287	0.316550	-0.541274	0.638388	-0.306316	-0.308334	-0.403085	0.167431	-0.407549	0.365943
INDUS	0.391161	-0.513336	1.000000	0.058035	0.740965	-0.381457	0.614592	-0.699639	0.593176	0.716062	0.384806	-0.354597	0.567354	-0.478657
CHAS	-0.052223	-0.036147	0.058035	1.000000	0.073286	0.102284	0.075206	-0.091680	0.001425	-0.031483	-0.109310	0.050055	-0.046166	0.179882
NOX	0.410377	-0.502287	0.740965	0.073286	1.000000	-0.302188	0.711461	-0.769230	0.611441	0.668023	0.188933	-0.380051	0.572379	-0.427321
RM	-0.215434	0.316550	-0.381457	0.102284	-0.302188	1.000000	-0.241351	0.205246	-0.209847	-0.292048	-0.355501	0.128069	-0.602962	0.695360
AGE	0.344934	-0.541274	0.614592	0.075206	0.711461	-0.241351	1.000000	-0.724353	0.449989	0.500589	0.262723	-0.265282	0.574893	-0.380223
DIS	-0.366523	0.638388	-0.699639	-0.091680	-0.769230	0.205246	-0.724353	1.000000	-0.494588	-0.534432	-0.232471	0.291512	-0.483429	0.249929
RAD	0.608886	-0.306316	0.593176	0.001425	0.611441	-0.209847	0.449989	-0.494588	1.000000	0.910228	0.464741	-0.444413	0.468440	-0.381626
TAX	0.566528	-0.308334	0.716062	-0.031483	0.668023	-0.292048	0.500589	-0.534432	0.910228	1.000000	0.460853	-0.441808	0.524545	-0.468536
PTRATIO	0.273384	-0.403085	0.384806	-0.109310	0.188933	-0.355501	0.262723	-0.232471	0.464741	0.460853	1.000000	-0.177383	0.373343	-0.507787
B	-0.370163	0.167431	-0.354597	0.050055	-0.380051	0.128069	-0.265282	0.291512	-0.444413	-0.441808	-0.177383	1.000000	-0.368886	0.333461
LSTAT	0.434044	-0.407549	0.567354	-0.046166	0.572379	-0.602962	0.574893	-0.483429	0.468440	0.524545	0.373343	-0.368886	1.000000	-0.721975
MEDV	-0.379695	0.365943	-0.478657	0.179882	-0.427321	0.695360	-0.380223	0.249929	-0.381626	-0.468536	-0.507787	0.333461	-0.721975	1.000000

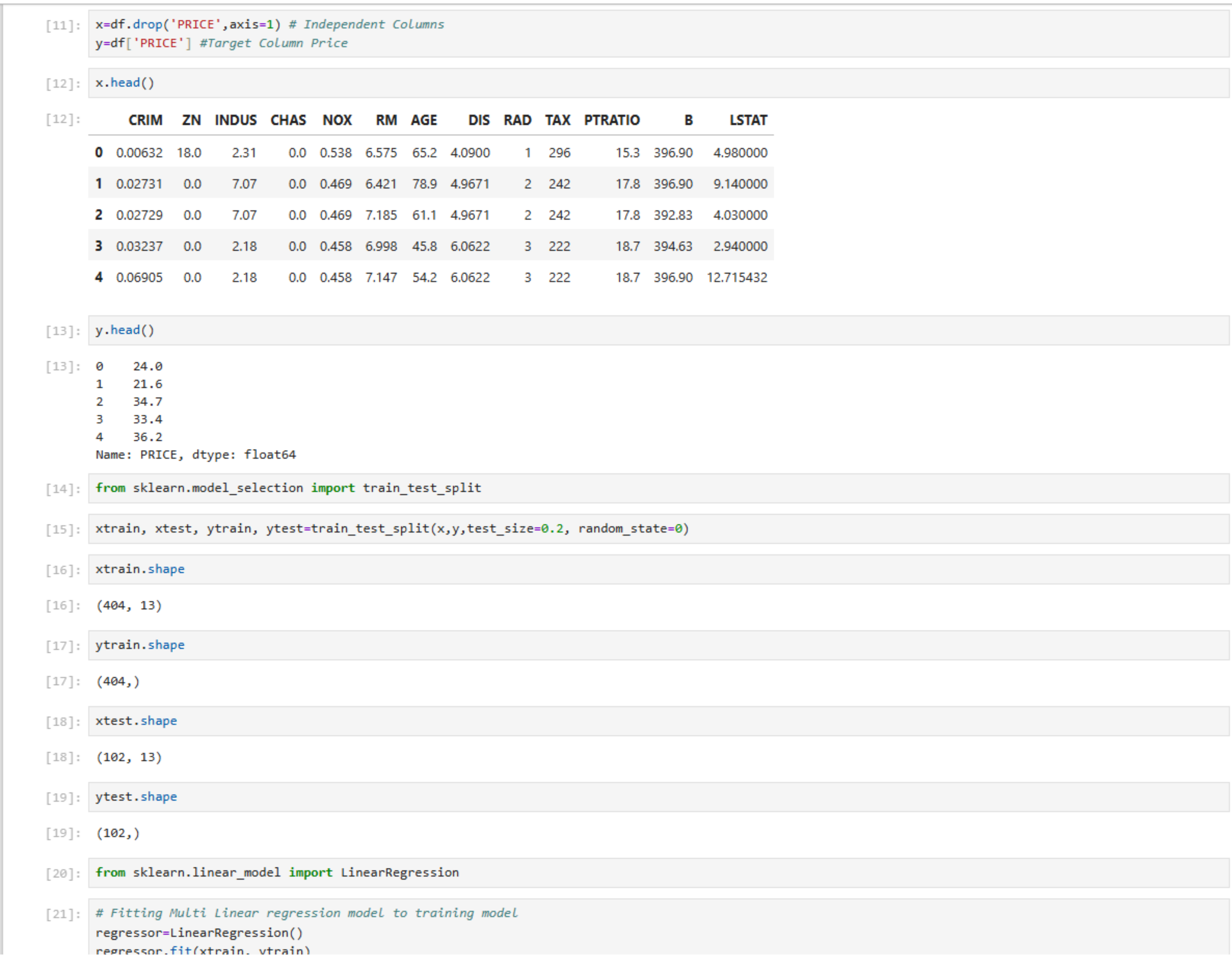
[9]:

```
df.rename(columns={'MEDV':'PRICE'}, inplace=True)
```

[10]:

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



[11]:

```
x=df.drop('PRICE',axis=1) # Independent Columns
y=df['PRICE'] #Target Column Price
```

[12]:

```
x.head()
```

[12]:

	CRIM	ZN	INDUS	CHAS	NOX	RM	AGE	DIS	RAD	TAX	PTRATIO	B	LSTAT
0	0.00632	18.0	2.31	0.0	0.538	6.575	65.2	4.0900	1	296	15.3	396.90	4.980000
1	0.02731	0.0	7.07	0.0	0.469	6.421	78.9	4.9671	2	242	17.8	396.90	9.140000
2	0.02729	0.0	7.07	0.0	0.469	7.185	61.1	4.9671	2	242	17.8	392.83	4.030000
3	0.03237	0.0	2.18	0.0	0.458	6.998	45.8	6.0622	3	222	18.7	394.63	2.940000
4	0.06905	0.0	2.18	0.0	0.458	7.147	54.2	6.0622	3	222	18.7	396.90	12.715432

[13]:

```
y.head()
```

[13]:

```
0    24.0
1    21.6
2    34.7
3    33.4
4    36.2
Name: PRICE, dtype: float64
```

[14]:

```
from sklearn.model_selection import train_test_split
```

[15]:

```
xtrain, xtest, ytrain, ytest=train_test_split(x,y,test_size=0.2, random_state=0)
```

[16]:

```
xtrain.shape
```

[16]:

```
(404, 13)
```

[17]:

```
ytrain.shape
```

[17]:

```
(404,)
```

[18]:

```
xtest.shape
```

[18]:

```
(102, 13)
```

[19]:

```
ytest.shape
```

[19]:

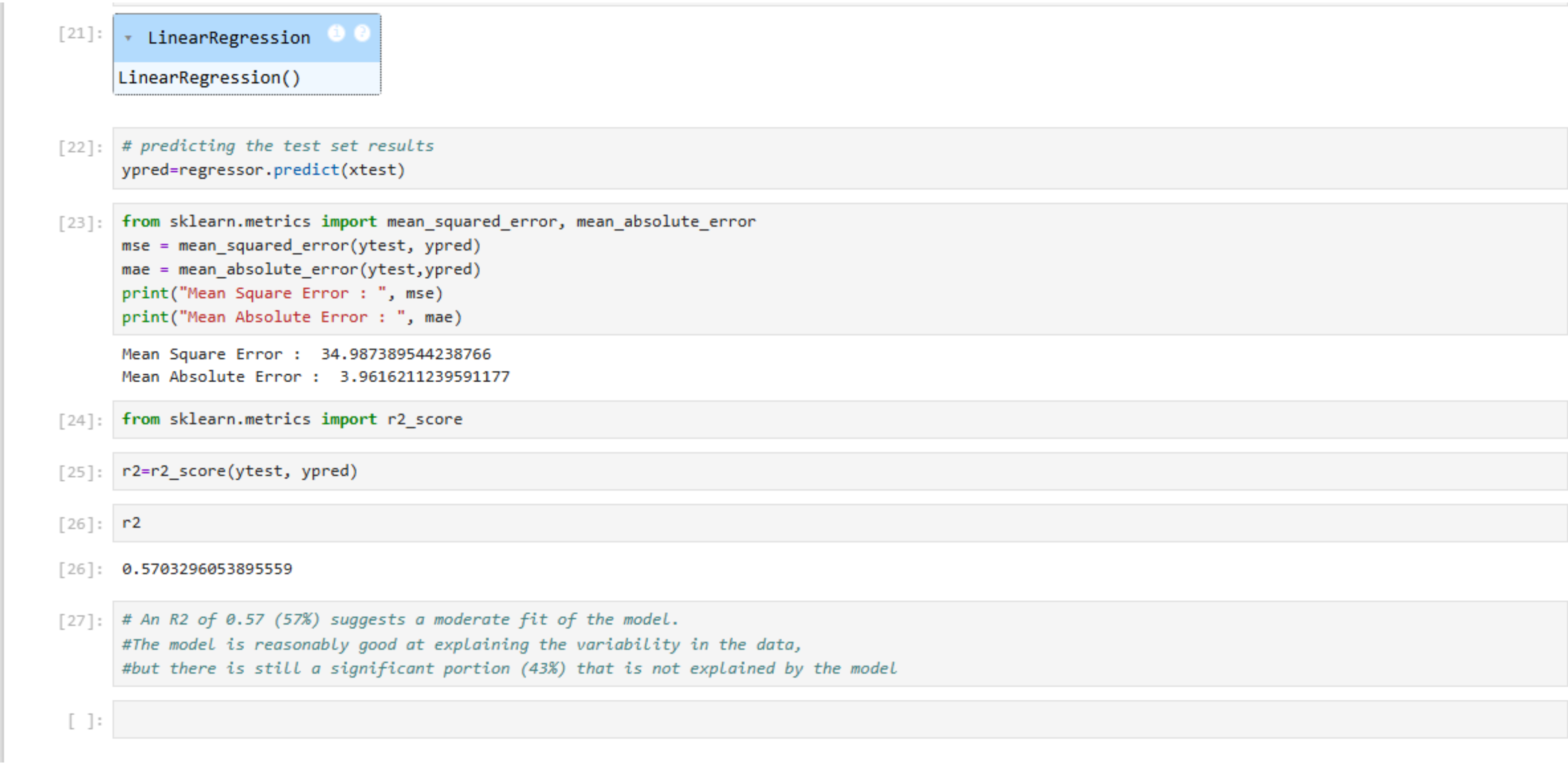
```
(102,)
```

[20]:

```
from sklearn.linear_model import LinearRegression
```

[21]:

```
# Fitting Multi Linear regression model to training model
regressor=LinearRegression()
regressor.fit(xtrain, ytrain)
```



```
[21]:  ▾ LinearRegression
       LinearRegression()
```

```
[22]:  # predicting the test set results
       ypred=regressor.predict(xtest)
```

```
[23]:  from sklearn.metrics import mean_squared_error, mean_absolute_error
       mse = mean_squared_error(ytest, ypred)
       mae = mean_absolute_error(ytest,ypred)
       print("Mean Square Error : ", mse)
       print("Mean Absolute Error : ", mae)

       Mean Square Error :  34.987389544238766
       Mean Absolute Error :  3.9616211239591177
```

```
[24]:  from sklearn.metrics import r2_score
```

```
[25]:  r2=r2_score(ytest, ypred)
```

```
[26]:  r2

[26]:  0.5703296053895559
```

```
[27]:  # An R2 of 0.57 (57%) suggests a moderate fit of the model.
       #The model is reasonably good at explaining the variability in the data,
       #but there is still a significant portion (43%) that is not explained by the model
```

```
[ ]:
```