assignment_25.1

January 20, 2019

```
In [1]: import numpy as np
        import pandas as pd
        import matplotlib.pyplot as plt
        import seaborn as sns
        from sklearn.model_selection import train_test_split
        from sklearn.preprocessing import StandardScaler
        from sklearn import datasets

        # this allows plots to appear directly in the notebook
        %matplotlib inline
```

0.1 Load Boston Dataset

```
In [2]: boston = datasets.load_boston()
        bos = pd.DataFrame(boston.data)

In [3]: boston.keys()

Out[3]: dict_keys(['data', 'target', 'feature_names', 'DESCR'])

In [4]: boston.data.shape

Out[4]: (506, 13)

In [5]: print( boston.feature_names )

['CRIM' 'ZN' 'INDUS' 'CHAS' 'NOX' 'RM' 'AGE' 'DIS' 'RAD' 'TAX' 'PTRATIO'
 'B' 'LSTAT']


In [6]: bos.head()

Out[6]:          0     1     2    3      4      5     6       7    8      9    10  \
        0  0.00632  18.0  2.31  0.0  0.538  6.575  65.2  4.0900  1.0  296.0  15.3
        1  0.02731   0.0  7.07  0.0  0.469  6.421  78.9  4.9671  2.0  242.0  17.8
        2  0.02729   0.0  7.07  0.0  0.469  7.185  61.1  4.9671  2.0  242.0  17.8
        3  0.03237   0.0  2.18  0.0  0.458  6.998  45.8  6.0622  3.0  222.0  18.7
        4  0.06905   0.0  2.18  0.0  0.458  7.147  54.2  6.0622  3.0  222.0  18.7
```

```
        11    12
0  396.90  4.98
1  396.90  9.14
2  392.83  4.03
3  394.63  2.94
4  396.90  5.33
```

0.2 Add columns as feature names and PRICE from target

In [7]:
```
bos.columns = boston.feature_names
```

In [8]:
```
bos['PRICE']= boston.target
bos.head()
```

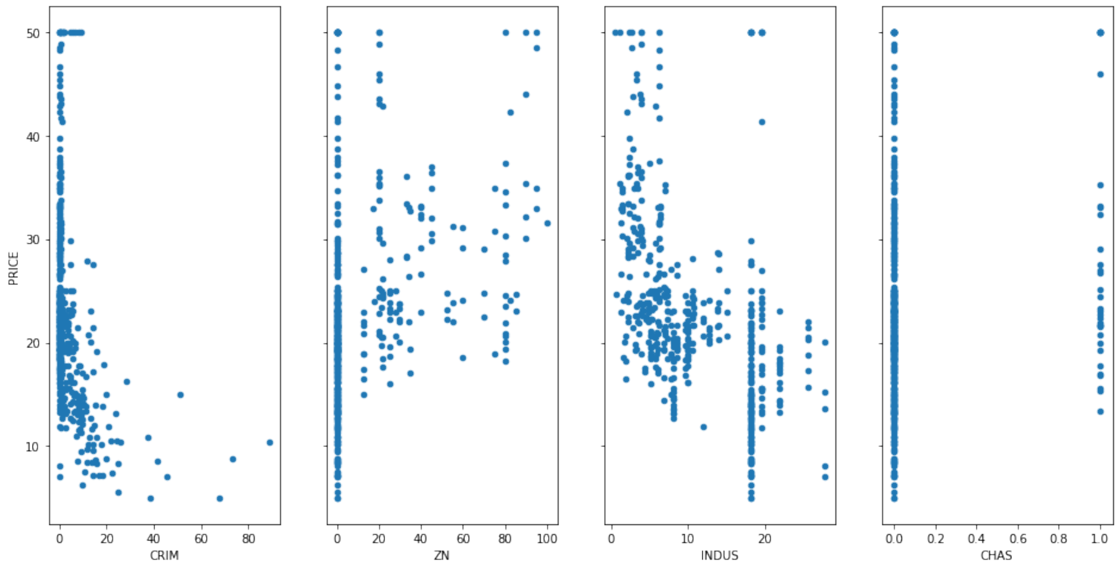
Out[8]:
```
      CRIM    ZN  INDUS  CHAS    NOX     RM   AGE     DIS  RAD    TAX  \
0  0.00632  18.0   2.31   0.0  0.538  6.575  65.2  4.0900  1.0  296.0
1  0.02731   0.0   7.07   0.0  0.469  6.421  78.9  4.9671  2.0  242.0
2  0.02729   0.0   7.07   0.0  0.469  7.185  61.1  4.9671  2.0  242.0
3  0.03237   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  PRICE
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
```

0.3 Display scatter plots betweebn features

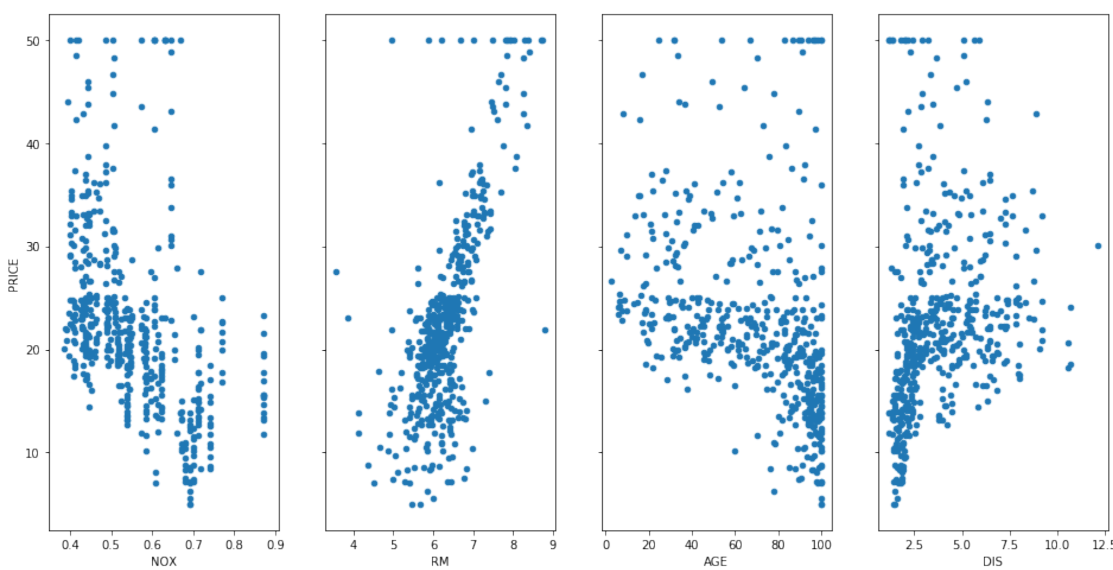
In [9]:
```
fig, axs = plt.subplots(1, 4, sharey=True)
bos.plot(kind='scatter', x='CRIM', y='PRICE', ax=axs[0], figsize=(16, 8))
bos.plot(kind='scatter', x='ZN', y='PRICE', ax=axs[1])
bos.plot(kind='scatter', x='INDUS', y='PRICE', ax=axs[2])
bos.plot(kind='scatter', x='CHAS', y='PRICE', ax=axs[3])
```

Out[9]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x297bc54d9b0>
```



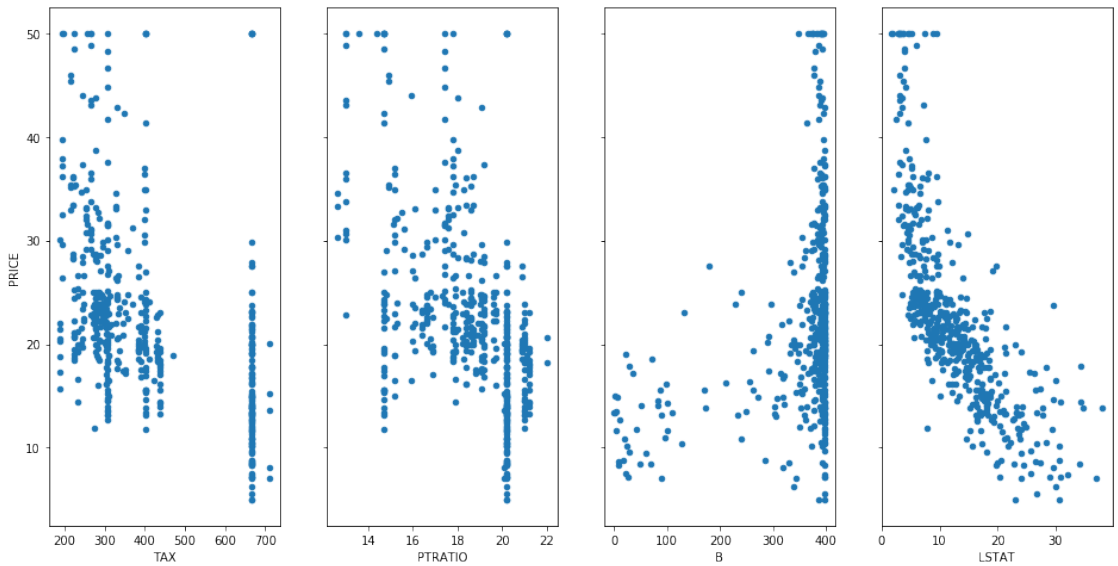

```
In [10]: fig, axs = plt.subplots(1, 4, sharey=True)
         bos.plot(kind='scatter', x='NOX', y='PRICE', ax=axs[0],  figsize=(16, 8))
         bos.plot(kind='scatter', x='RM', y='PRICE', ax=axs[1])
         bos.plot(kind='scatter', x='AGE', y='PRICE', ax=axs[2])
         bos.plot(kind='scatter', x='DIS', y='PRICE', ax=axs[3])
```

```
Out[10]: <matplotlib.axes._subplots.AxesSubplot at 0x297bc6e2860>
```



In [11]:
```
fig, axs = plt.subplots(1, 4, sharey=True)
bos.plot(kind='scatter', x='TAX', y='PRICE', ax=axs[0],  figsize=(16, 8))
bos.plot(kind='scatter', x='PTRATIO', y='PRICE', ax=axs[1])
bos.plot(kind='scatter', x='B', y='PRICE', ax=axs[2])
bos.plot(kind='scatter', x='LSTAT', y='PRICE', ax=axs[3])
```

Out[11]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x297bc86ab00>
```



0.4 Split dataset into train and test

In [12]:
```
from sklearn.model_selection import train_test_split
import numpy as np
```

In [13]:
```
# create X and y
feature_cols = [ 'CRIM', 'ZN', 'CHAS', 'NOX', 'RM', 'DIS', 'RAD', 'TAX', 'PTRATIO', 'I
X_Train,X_Test,y_Train,y_Test = train_test_split(bos[feature_cols ],bos['PRICE'],test_
```

In [14]:
```
## Use RandomForestRegressor to fit the model and calculate accuracy
```

In [15]:
```
from sklearn.ensemble import RandomForestRegressor
model = RandomForestRegressor()

# Fitting to the model
model.fit(X_Train, y_Train)
y_predict = model.predict(X_Test)
print("Prediction values: ", y_predict)
```

```
Prediction values:  [24.1  26.03 22.74 13.23 20.49 20.72 21.11 20.23 18.69 19.06 10.03 15.32
 15.58  8.71 47.62 33.95 20.35 34.12 25.54 20.31 23.83 22.77 20.15 23.66
```

```
 20.69 18.49 18.66 16.9  45.74 19.17 14.64 19.32 21.18 21.36 23.06 18.32
  8.25 24.23 14.44 14.54 22.56 21.34 21.85 14.75 23.17 23.08 18.94 17.69
 14.8  24.15 16.51 18.18 19.28 40.12 14.34 19.6  20.93 18.67 20.21 20.6
 21.88 19.55 33.76 28.88 19.05 30.09 17.25 19.01 17.58 20.08 19.91 22.96
 27.27 31.61 26.75  8.86 45.13 21.3  23.13 19.6  26.04 19.28 19.45 42.68
 41.4  24.56 21.95 14.54 24.23 15.88 18.86 13.71 23.28 31.67 21.25 22.24
 14.29 23.26 14.7  19.82 24.07 20.79 28.33 20.42 28.94 20.04  8.73 18.42
 21.01 22.54 35.32 12.09 19.68 18.62 17.   20.73  9.8  18.67  9.94 48.33
 31.31  9.62 18.3  20.05 20.94 18.48 34.04 17.93 21.35 35.15 12.94  9.89
 14.   21.16 13.06 34.21 19.91 15.14 25.28  9.01 10.71 19.74 32.29 23.99
 24.32 17.32 34.61 33.35 11.79  8.33 29.82 24.58]
```

```
In [16]: print("Accuracy of RandomForestRegressor is: ",model.score(X_Test,y_Test))
```

```
Accuracy of RandomForestRegressor is:  0.7847288235111113
```