Linear Regression

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importing libraries

In [1]:

```
import numpy as np
import pandas as pd
%pylab inline
import matplotlib.pyplot as plt
import sklearn
import os

# !pip install numpy pandas matplotlib xlrd
```

```
Populating the interactive namespace from numpy and matplotlib
```

loading the dataset

In [16]:

```
def create_dataset() :

    dataset_path = None
    for root, dirs, files in os.walk(".", topdown=False) :
        for name in files:
            if name.endswith('Real_estate_valuation.xlsx') :
                dataset_path = os.path.join(root, name)
                break
        if dataset_path != None :
            break

    dataset = pd.read_excel(dataset_path)
    dataset = dataset.dropna()
    dataset = pd.concat([pd.Series(1, index=dataset.index, name='ones'), dataset], axis=1)
    print("\nhead of dataset")
    dataset.head()
    return dataset
```

taking dependent and independent variables

In [3]:

```
# features = ['ones', 'X1 transaction date', 'X2 house age', 'X3 distance to the nearest MR
# #features = ['X2 house age']
def X_y_regresssion(dataset, features):
    X = dataset[features].values
    y = dataset['Y house price of unit area'].values
    m, n = X.shape
    print("\ndependent and independent variables")
    print(X)
    print(y)
    print("{} {}".format(m, n))
    return X, y, m, n
```

normalizing training set

In [4]:

```
def normalized_X(X) :
    for i in range(1, X.shape[1]):
        X[i-1] = X[i-1]/np.max(X[i-1])
        print("\nnormalized independent matrix")
        print(X)
        return X
```

splitting into training and testing dataset

In [5]:

```
from sklearn.model_selection import train_test_split

def split_train_test(X, y) :
    X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.4)

    print("\nsplit training and test sets")

    print(X_train.shape)
    print(X_test.shape)
    print(y_train.shape)
    print(y_test.shape)

    m_train = X_train.shape[0]
    m_test = X_test.shape[0]

    return X_train, X_test, y_train, y_test, m_train, m_test
```

calculating parameters for regression

In [6]:

```
def regression_parameter_B(X, y) :
    B = np.dot(np.dot(np.linalg.inv(np.dot(X.T, X)), X.T), y)
    print("\nregression parameter")
    print(B)
    return B
```

predicting values for test dataset

In [7]:

```
def predictions(X, B) :
    y_pred = np.dot(X, B)
    print("\npredicted values on test set")
    print(y_pred)
    return y_pred
```

calculating RMSE

In [8]:

```
def root_mean_squared_error(y, y_pred, m) :
    RMSE = np.sqrt(np.sum((y - y_pred) ** 2) / m)
    print("\nroot mean squared error")
    print(RMSE)
    return RMSE
```

scatter plot actual vs predicted values

In [9]:

```
def plot_actual_vs_pred_scatter(y, y_pred, m) :
    print("\nplotting actual vs predicted scatter")
    plt.figure()
    plt.scatter(x = list(range(0, m)),y = y, color='blue')
    plt.scatter(x = list(range(0, m)), y = y_pred, color='black')
    plt.show()
```

plotting actual vs predicted

In [10]:

```
def plot_actual_vs_pred(y, y_pred, m) :
    print("\nplotting actual vs predicted")
    plt.figure()
    plt.plot(list(range(0, m)),y, color='green')
    plt.plot(list(range(0, m)), y_pred, color='red')
    plt.show()
```

function for regression

In [11]:

```
def linear_regression(features) :
    dataset = create_dataset()

    X, y, m, n = X_y_regresssion(dataset, features)

    X = normalized_X(X)

    X_train, X_test, y_train, y_test, m_train, m_test = split_train_test(X, y)

    B = regression_parameter_B(X_train, y_train)

    y_test_pred = predictions(X_test, B)

    RMSE = root_mean_squared_error(y_test, y_test_pred, m_test)

    return y_test, y_test_pred, m_test
```

single linear regression

In [12]:

```
y_test, y_test_pred, m_test = linear_regression(features = ['ones', 'X2 house age'])
```

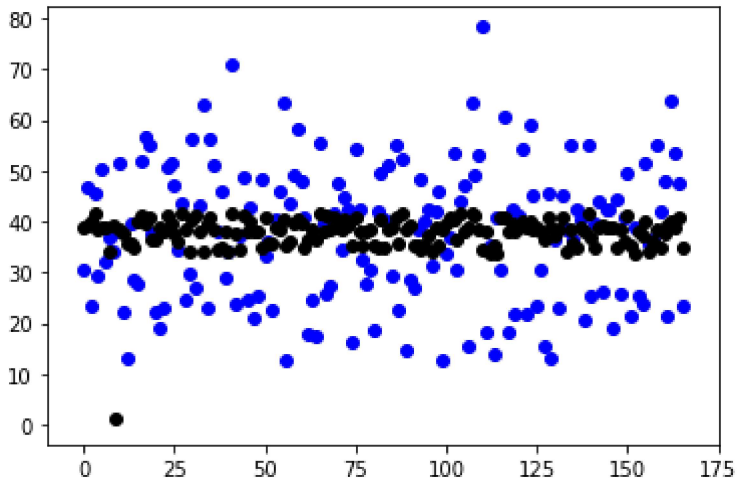
```
head of dataset

dependent and independent variables
[[ 1.  32. ]
 [ 1.  19.5]
 [ 1.  13.3]
 [ 1.  13.3]
 [ 1.   5. ]
 [ 1.   7.1]
 [ 1.  34.5]
 [ 1.  20.3]
 [ 1.  31.7]
 [ 1.  17.9]
 [ 1.  34.8]
 [ 1.   6.3]
 [ 1.  13. ]
 [ 1.  20.4]
 [ 1.  13.2]
```

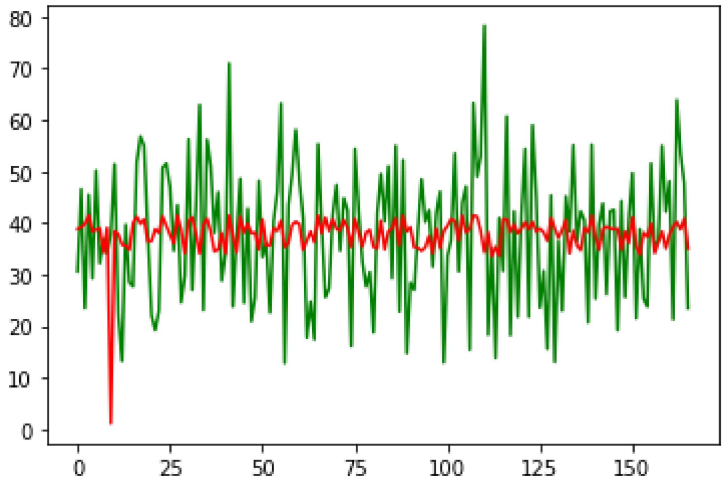
In [13]:

```
plot_actual_vs_pred_scatter(y_test, y_test_pred, m_test)
plot_actual_vs_pred(y_test, y_test_pred, m_test)
```

```
plotting actual vs predicted scatter
```




```
plotting actual vs predicted
```



multiple linear regression

In [14]:

```
y_test, y_test_pred, m_test = linear_regression(features = ['ones', 'X1 transaction date',
```

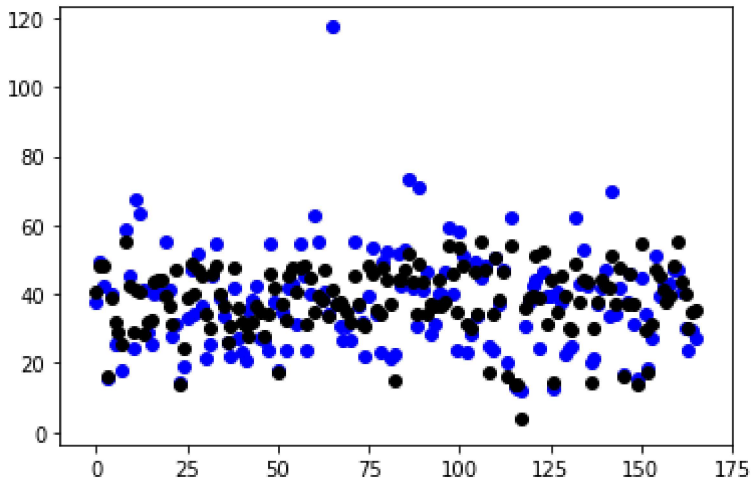
```
head of dataset

dependent and independent variables
[[1.00000000e+00 2.01291667e+03 3.20000000e+01 ... 1.00000000e+01
  2.49829800e+01 1.21540240e+02]
 [1.00000000e+00 2.01291667e+03 1.95000000e+01 ... 9.00000000e+00
  2.49803400e+01 1.21539510e+02]
 [1.00000000e+00 2.01358333e+03 1.33000000e+01 ... 5.00000000e+00
  2.49874600e+01 1.21543910e+02]
 ...
 [1.00000000e+00 2.01325000e+03 1.88000000e+01 ... 7.00000000e+00
  2.49792300e+01 1.21539860e+02]
 [1.00000000e+00 2.01300000e+03 8.10000000e+00 ... 5.00000000e+00
  2.49667400e+01 1.21540670e+02]
 [1.00000000e+00 2.01350000e+03 6.50000000e+00 ... 9.00000000e+00
  2.49743300e+01 1.21543100e+02]]
[ 37.9  42.2  47.3  54.8  43.1  32.1  40.3  46.7  18.8  22.1  41.4  58.1
  39.3  23.8  34.3  50.5  70.1  37.4  42.3  47.7  29.3  51.6  24.6  47.9
```

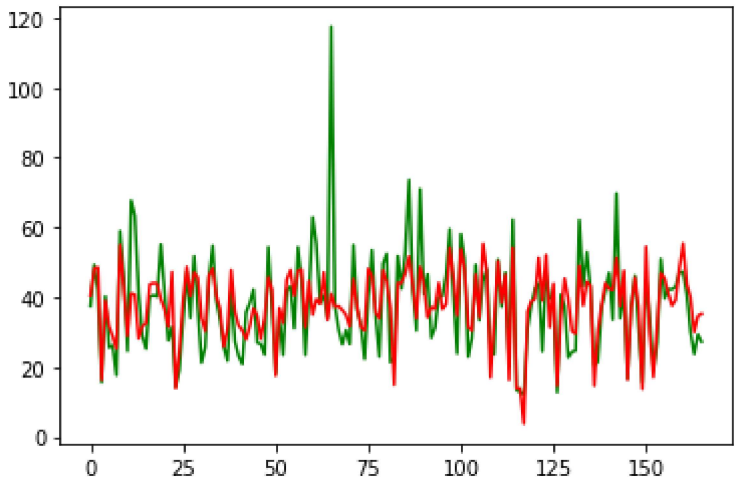
In [15]:

```
plot_actual_vs_pred_scatter(y_test, y_test_pred, m_test)
plot_actual_vs_pred(y_test, y_test_pred, m_test)
```

```
plotting actual vs predicted scatter
```




```
plotting actual vs predicted
```



In [ ]:

```

```