Assignment:Implementing SGDClassifiers

In [1]:
```
import warnings
warnings.filterwarnings('ignore')
from sklearn.datasets import load_boston
from random import seed
from random import randrange
from csv import reader
from math import sqrt
from sklearn import preprocessing
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.linear_model import SGDRegressor
from sklearn import preprocessing
from sklearn.metrics import mean_squared_error
```

In [2]:
```
import warnings
warnings.filterwarnings('ignore')
```

In [3]:
```
X = load_boston().data
Y = load_boston().target
```

In [4]:
```
from sklearn.model_selection import train_test_split
X_tra, X_tes, Y_tra, Y_tes = train_test_split(X, Y, test_size = 0.33, r
andom_state = 5)
print(X_tra.shape)
print(X_tes.shape)
print(Y_tra.shape)
print(Y_tes.shape)
```

```
(339, 13)
(167, 13)
```

```
(339,)
(167,)
```

In [5]:
```
scaler= preprocessing.StandardScaler().fit(X_tra)
X_train=scaler.transform(X_tra)
X_test=scaler.transform(X_tes)
```

In [7]:
```
custom=pd.DataFrame(data=X_train)
custom['price']=Y_tra
```

In [8]:
```
def sgd(alpha, lrr_var, eta=0.01, pow_t=0.25,n_iter=1):
    clf=SGDRegressor(alpha=alpha,  learning_rate=lrr_var, eta0=eta, pow
er_t=pow_t, n_iter=n_iter)
    clf.fit(X_train,Y_tra)
    y_pred=clf.predict(X_test)

    #scatter plot
    plt.scatter(Y_tes,y_pred)
    plt.title('Actual Values VS Predicted Values')
    plt.xlabel('Actual Values')
    plt.ylabel('Predicted Values')
    plt.grid(b=True, linewidth=0.5)
    plt.show()
    print('**************************************')
    sgd_error=mean_squared_error(Y_tes,y_pred)
    print('mean square error=', sgd_error)

    return clf.coef_, clf.intercept_, sgd_error
```

In [9]:
```
def custom_model(X, lr_rate_variation, alpha=0.0001, lr_rate=0.01, powe
r_t=0.25, n_iter=1):
    w_new=np.zeros(shape=(1,13))
    b_new=0
    t=1
    r=lr_rate

    while(t<=n_iter):
        w_old=w_new
```

```
        b_old=b_new
        w_=np.zeros(shape=(1,13))
        b_=0
        x_data=X.sample(10)
        x=np.array(x_data.drop('price',axis=1))
        y=np.array(x_data['price'])


        for i in range(10):  # for getting the derivatives using sgd wi
th k=10
            y_curr=np.dot(w_old,x[i])+b_old
            w_+=x[i] * (y[i] - y_curr)
            b_+=(y[i]-y_curr)


        w_*=(-2/x.shape[0])
        b_*=(-2/x.shape[0])

        #updating the parameters
        w_new=(w_old-r*w_)
        b_new=(b_old-r*b_)


        if(lr_rate_variation=='invscaling'):
            r = lr_rate / pow(t, power_t)
        t+=1

    return w_new, b_new
```

In [10]:
```
def predict(x,w, b):
    y_pred=[]
    for i in range(len(x)):
        y=np.asscalar(np.dot(w,x[i])+b)
        y_pred.append(y)
    return np.array(y_pred)
```

In [11]:
```
def ploting(X_test,y_pred):
    #scatter plot
```

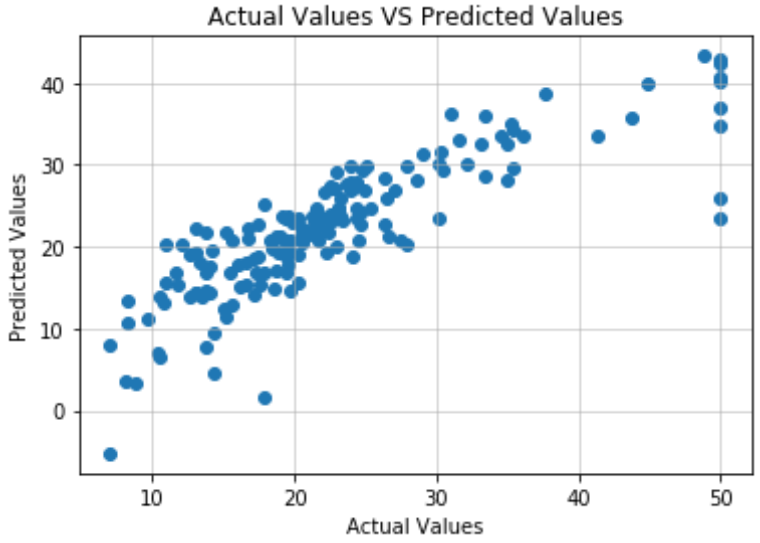
```
    plt.scatter(Y_tes,y_pred)
    plt.grid(b=True, linewidth=0.3)
    plt.title('Actual Values VS Predicted Values')
    plt.xlabel('Actual Values')
    plt.ylabel('Predicted Values')
    plt.show()
    print('************************************')


    manual_error=mean_squared_error(Y_tes,y_pred)
    print('mean square error=',manual_error)

    return manual_error
```

Skearn SGDRegressor

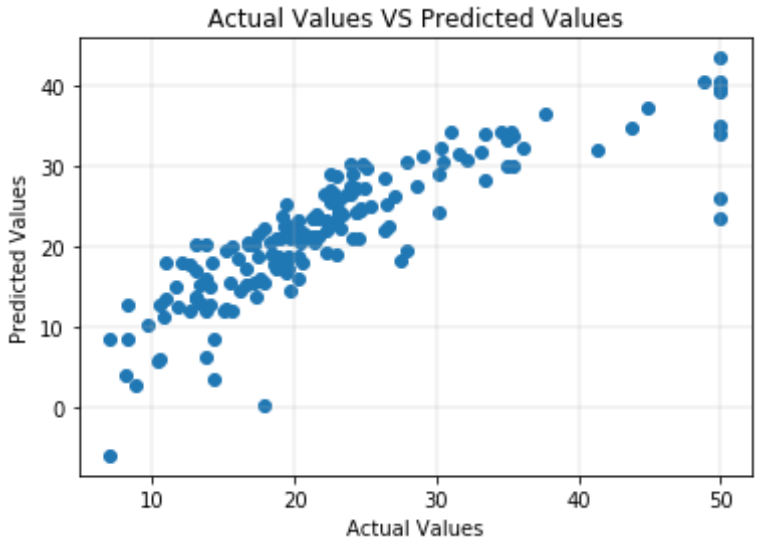
In [19]:
```
w_sgd, b_sgd, error_sgd=sgd(alpha=0.0001, lrr_var='constant', eta=0.01,
 n_iter=1000)
```




```
************************************
mean square error= 27.458390584964505
```

Custom implementation of SGDRegressor

In [20]:
```
w, b=custom_model(X=custom, lr_rate_variation='constant' , n_iter=1000)
y_pred=predict(X_test, w=w, b=b)
manual_error=ploting(X_test,y_pred)
```




```
**************************************
mean square error= 27.401949693132224
```

In [21]:
```
b=w.reshape(13,1)
```

In [22]:
```
from prettytable import PrettyTable

numbering = [1,2,3,4,5,6,7,8,9,10,11,12,13]
# Initializing prettytable
ptable = PrettyTable()

# Adding columns
ptable.add_column("S.NO.",numbering)
ptable.add_column("Weights of Sklearn's SGD",w_sgd)
ptable.add_column("Weights of manual SGD",b)
```

```
# Printing the Table
print(ptable)
```

```
+-------+--------------------------+-----------------------+
| S.NO. | Weights of Sklearn's SGD | Weights of manual SGD |
+-------+--------------------------+-----------------------+
|   1   |   -1.3812233430359353    |     [-1.18969291]     |
|   2   |    0.6342440751923348    |      [0.76183188]     |
|   3   |   -0.11820806673036802   |      [-0.527319]      |
|   4   |    0.4512447404217142    |      [0.69989891]     |
|   5   |    -1.354866106534257    |     [-1.41940834]     |
|   6   |    3.1880799640744666    |      [2.47851379]     |
|   7   |  -0.016879860138361562   |     [-0.30013524]     |
|   8   |   -3.0270354416702983    |     [-2.78326128]     |
|   9   |     3.22408253504173     |      [2.20547065]     |
|   10  |    -2.17961223091745     |     [-1.07909456]     |
|   11  |    -2.156591952719235    |     [-2.12206703]     |
|   12  |    0.9947252014489741    |      [1.10438779]     |
|   13  |    -3.219698660547973    |     [-3.61071477]     |
+-------+--------------------------+-----------------------+
```

Conclusion

In [23]:
```
models = pd.DataFrame({'Vectorizer': ['SGD Regressor','Custom SGD Regressor'],'Mean_Sqaure_Error(MSE)':[27,27]}, columns = ["Vectorizer", "Mean_Sqaure_Error(MSE)"])
models
```

Out[23]:

	Vectorizer	Mean_Sqaure_Error(MSE)
0	SGD Regressor	27
1	Custom SGD Regressor	27