In [0]:

```
import warnings
warnings.filterwarnings("ignore")
from sklearn.datasets import load_boston
from random import seed
import seaborn as sns
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 prettytable import PrettyTable
from sklearn.linear_model import SGDRegressor
from sklearn import preprocessing
from sklearn.metrics import mean_squared_error
```

In [0]:

```
X = load_boston().data
Y = load_boston().target
```

In [0]:

```
scaler = preprocessing.MinMaxScaler().fit(X)
X = scaler.transform(X)
```

In [166]:

```
clf = SGDRegressor(average=True)
clf.fit(X, Y)
print(mean_squared_error(Y, clf.predict(X)))
```

```
25.578652465650105
```

In [0]:

```
def cost_funct(y,y_cap):
  a=np.mean(np.square(np.subtract(y_cap,y)))
  return a/2
```

In [0]:

```
def cost_dev(loss,xi=1):   #1 because i will also calculate for bias term
  a=(-2)*(loss)*(xi)
  return a
```

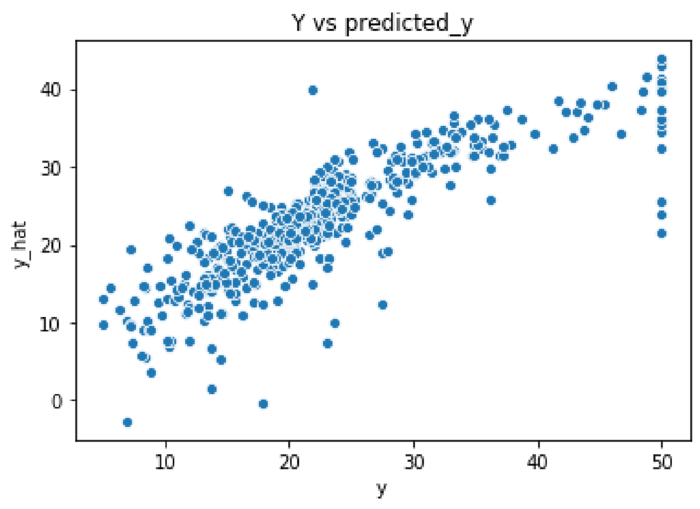
In [312]:

```
#w0=np.ones((1,13))
b=1
w0=np.random.randn(13)[np.newaxis]
m=len(X)
r=.1
b=.5
#derivative_w=0
new_w=w0
new_b=b
list_of_mse=[]
for i in range(0,200):
  y_hat=np.dot(new_w,X.T)+new_b

  loss=Y-y_hat
  #mse=np.mean(loss**2)/(2)

  mse=mean_squared_error(Y[np.newaxis],y_hat)
  #print(new_w)
  #derivative_w=np.sum((-2* X.T*loss),axis=1)/m
  #derivative_b=(-2*np.sum(loss.T))/m
  derivative_w=np.sum(cost_dev(loss,X.T),axis=1)/m
  derivative_b=np.sum(cost_dev(loss))/m
  list_of_mse.append(mse)

  #new_mse=mean_squared_error(Y[np.newaxis],y_hat)
  if(i>1):
    if((list_of_mse[-2] <list_of_mse[-1])):
      break;
  new_w=new_w-((r*derivative_w.T))
  new_b=new_b-((r*derivative_b.T))
  if(i%10==0):
    r+=r/10
list_of_mse.pop()
print("Gradient descent is converged at step %i with mse: %f"%(i-1,list_of_mse[-1]))
```

```
Gradient descent is converged at step 162 with mse: 23.988261
```

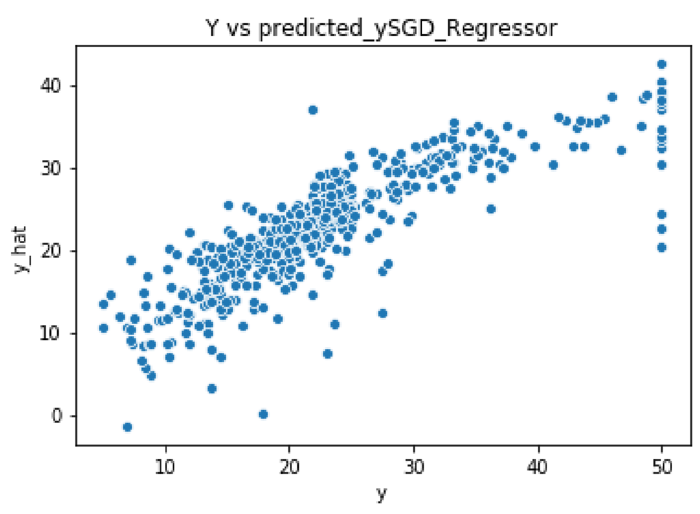
In [332]:

```
sns.scatterplot(Y, y_hat.T.ravel())
plt.title('Y vs predicted_y')
plt.ylabel('y_hat')
plt.xlabel('y')
plt.show()
```



In [334]:

```
sns.scatterplot(Y, clf.predict(X))
plt.title('Y vs predicted_ySGD_Regressor')
plt.ylabel('y_hat')
plt.xlabel('y')
plt.show()
```



In [0]:

```
aa= new_w.tolist()[0]
aa.append(new_b)
```

In [0]:

```
bb
```

In [0]:

```
bb=clf.coef_.tolist()
bb.append(clf.intercept_[0])
```

In [369]:

```
comparison=pd.DataFrame(data=[aa,bb],index=['my_impl','sgd_impl'])
comparison
```

Out[369]:

	0	1	2	3	4	5	6	7	8	9	10	11	12	13
my_impl	-3.414033	2.675381	-1.263762	3.368599	-2.016154	23.581129	1.309973	-5.364998	3.012743	-2.367558	-7.300306	6.282593	-16.754728	15.724783
sgd_impl	-2.762843	3.503853	-1.057134	3.537972	-1.746341	20.538130	1.527249	-3.408195	2.661334	-2.960624	-6.234819	7.069877	-14.301381	14.114069

In [0]:

```
# the 13th term is the bias
```

In [370]:

```
print(mean_squared_error(Y, clf.predict(X)))
print(list_of_mse[-1])
```

```
25.5786524656501
23.988261225821713
```