**ML LAB ASSESSMENT-1**

PART-1

c) This requires value of b and w i.e. (b=theta1 and w=theta2), training cost (this refers to the error /deviation from actual data) to be observed by changing values of learning rate and training epoch.

i)Initially, epoch is kept constant and corresponding values of training cost is calculated, along with b and w. Then the epoch is varied keeping the L Rate constant

Here are 5 iterations for the same with default theta1 and theta2 values:

L Rate=0.01, epoch=1000 : b=-2.155281,w=73.2087,T Cost=30.91

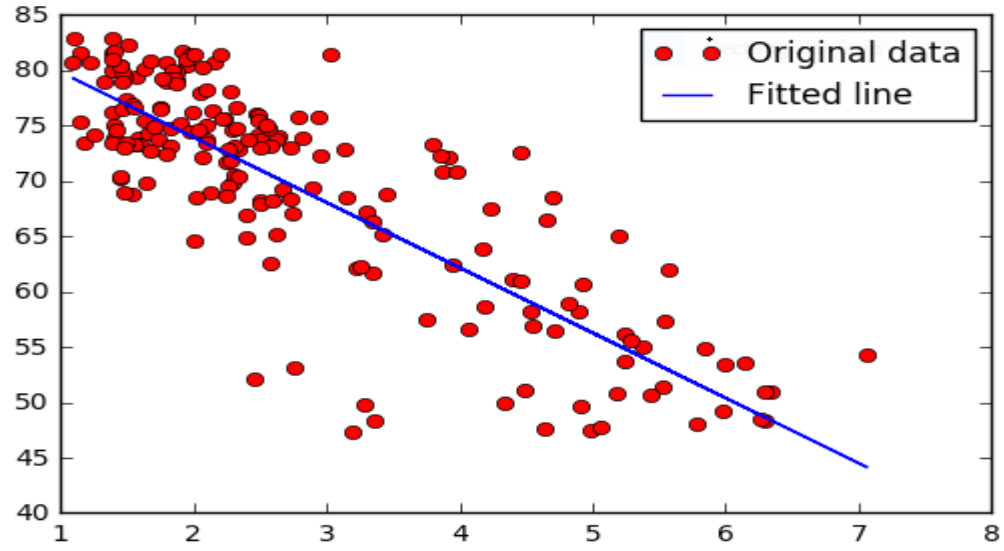
L Rate=0.05, epoch=1000 : b=-5.8065106,w=85.725075,T Cost=15.59005

L Rate=0.10, epoch=1000 : b=5.8876305,w=85.71903,T Cost=15.26245

L Rate=0.10, epoch=500 : b=32.2874,w=85.1161,T Cost=15.262696

L Rate=0.10, epoch=2500 : b=-5.8876305,w=85.71903,T Cost=15.26245

```
Optimization Finished!
Training cost= 15.26245 W= -5.8876305 b= 85.71903
```




This represents the best fitted line, with minimum epoch that is 15.26245

d)At epoch 2500 and learning rate of 0.10, training cost will be minimum and for all values below the threshold, training cost will be 15.26265.

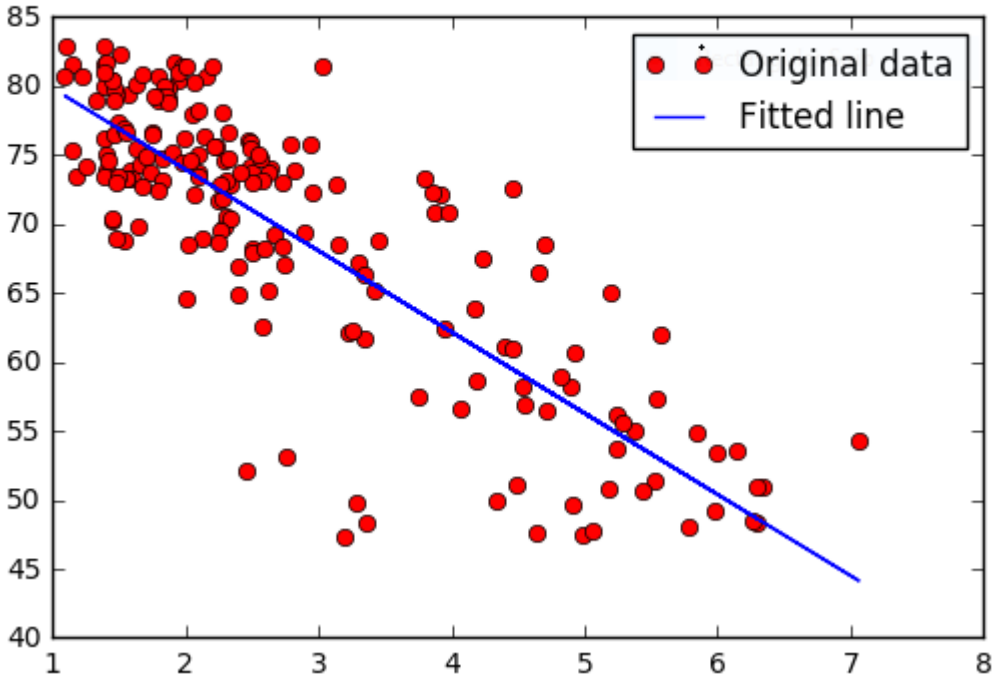
PART 2)

1)Decreasing  Plot of epoch versus training cost(plt.plot(epoch,training_cost))

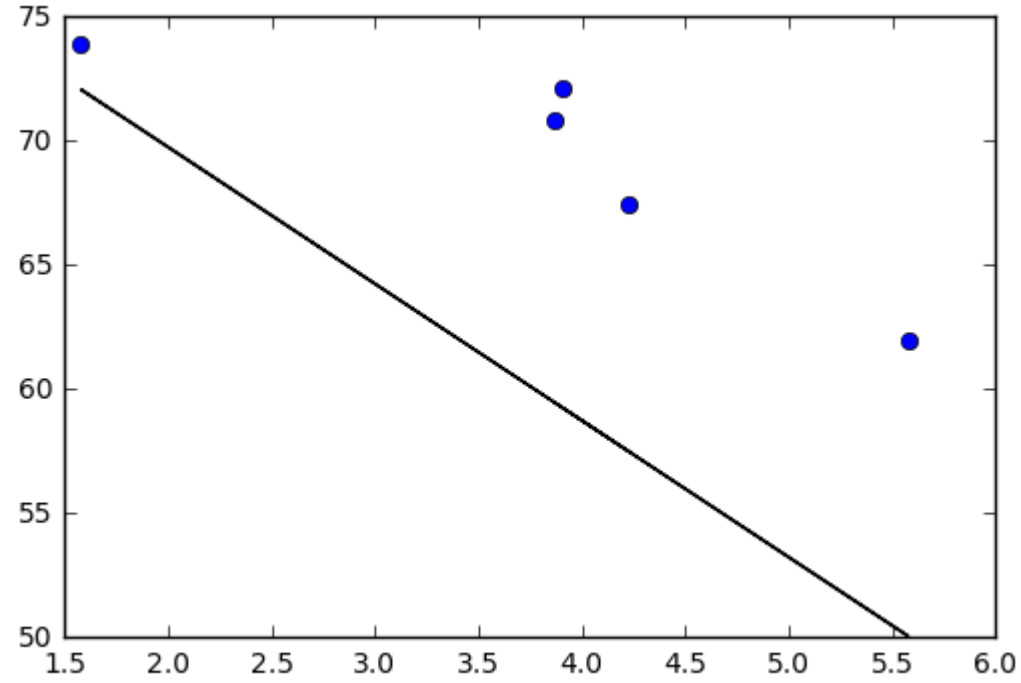
Decreasing Plot of  learning rate versus training cost( plt.plot(learning_rate,training_cost))

2)Best fit for Linear Regression gradient

```
Optimization Finished!
Training cost= 15.26245 W= -5.8876305 b= 85.71903
```

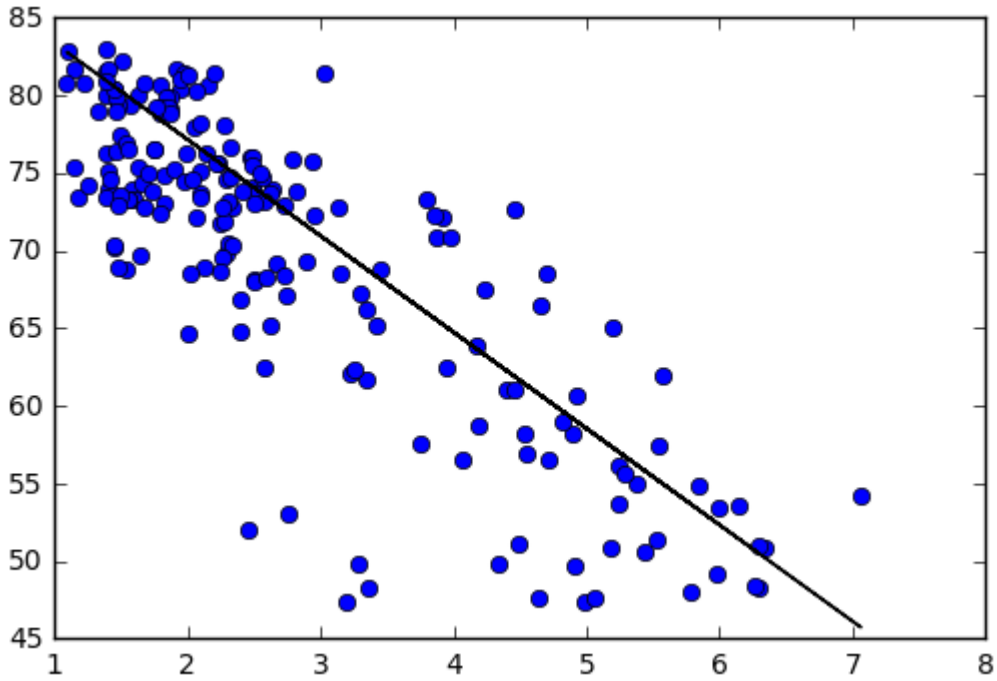



Time complexity is :0.98767




```
[80.76796816193682, -5.504652430486246]
```

Best fit for Schocastic model .This has a time complexity of 1.26466




Best fit for Batch gradient model. Time complexity of 0.5342

Time complexity varies for the models as follows:

Batch gradient<Linear Regression< Stochastic model

3)

Linear Regression:

With initial values of theta1=-5.50and theta2=85.5, gives best fit for model (as shown in the graph above

Batch gradient:

With initial values of theta1=90 and theta2=-5, gives best fit for model (as shown in the graph above

PART 3

1)Changing learning rate and epoch can change training cost, hence leads to optimisation. Here

Linear regression approach models the relationship whose time complexiety is more than batch gradient and less than stochastic gradient model.

2)Cost function:

C=H(x,y)/H(x)+H(y)