Let us consider a sample dataset have one input (x_i^a) and one output (y_i^a) and number of samples 4.

Develop a simple linear regression model using stochastic gradient descent optimizer.

Sample (i)	x_i^a	y_i^a
1	0.2	3.4
2	0.4	3.8
3	0.6	4.2
4	0.8	4.6

• Do manual calculations for two iterations with first two samples.

• Write the python code to build simple linear regression model using SGD optimizer.

step 1: $x, y, m = 1, c = -1, \eta = 0.1$, epoches $= 2$ $\int$ $bs = 2$

step 2:- $itr = 1$

step 3:- sample $= 1$

step 4:- $\dfrac{\partial E}{\partial m} = -(8.4 \cdot (1))(0.2) - (-1))0.2 = -0.84$

$\dfrac{\partial E}{\partial c} = -(3.4(1))(0.2 + 1) = -4.2$

step 5: $\Delta m = (0.1)(-0.84) = 0.084$

$\Delta c = -(0.1)(-4.2) = 0.42$

Step 6:- $m = m + \Delta m$

$\qquad = 1 + 0.084 = 1.084$

$\qquad c = c + \Delta c = -1 + 0.42 = -0.58$.

Step 7: sample $+= 1 = 1 + 1 = 2$

Step 8:- y (sample $> ns$)

$\qquad 2 > 2$

$\qquad goto$ step-9

$\qquad$ eln

$\qquad goto$ step-4

Step 4: $\dfrac{\delta E}{\delta m} = -(3.8 - (1.084)(0.4) + 0.58)0.4 = -1.5785$

$\qquad \dfrac{\delta E}{\delta c} = -(3.8 - (1.084)(0.4) + 0.58) = -3.9464$

Step 5:- $\Delta m = -(0.1)(-1.5785) = 0.1578$

$\qquad \Delta c = -(0.1)(-3.9464) = 0.3946$.

Step 7: - sample $+= 1$

$\qquad 2 + = 3$

Step 6: $m = m + \Delta m = 1.084 + 0.1578 = 1.2418$

$\qquad c = c + \Delta c = -0.58 + 0.3946 = -0.1854$.

Step 8: y (sample $> ns$)

$\qquad 3 > 2$

$\qquad goto$ step 9

$\qquad$ eln

$\qquad goto$ step-4

Step 9:- itr $+= 1$, $1 + 1 = 2$

$\qquad$ $\downarrow$

step 10: ÿ (itr > epoches) 272

goto step-11

eln

goto step-3

step 3 : sample = 1

step 4: $\frac{\partial E}{\partial m}$ = -(3.4 - (1.2) (0.2) + 0.18)0.2

= -(3.34) 0.2 = -0.668

$\frac{\partial E}{\partial c}$ = -(3.4 - (1.2) (0.2) + 0.18)

= 3.34

step 5 :. Δm = -(0.1)(-0.668) = 0.0668 :

step 6 :. m = m + Δm = 1.24 + 0.066 = 1.3

c = c + Δc = 0.18 + 0.33 = 0.15

step 7: sample t = 1 - 1 + 1 = 2

step 8: ÿ (sample > ns) 272

goto step-9

eln

goto step-4

step 4 : $\frac{\partial E}{\partial m}$ = -(3.8 - (1.3) (0.4) - 0.15)0.4

= -1.25

$\frac{\partial E}{\partial c}$ = -(3.8 - (1.3)(0.4) - 0.15) = -3.13

step 5 : Δm = -(0.1)(-1.25) = 0.12

Δc = -(0.1)(-3.13) = 0.3)

step 6 : m = m + Δm = 1.3 + 0.12 = 1.42

c = c + Δc = 0.15 + 0.31 = 0.46

step 7 : sample = sample + 1

2 + 1 = 3

step 8 :- if (sample > no)
                    372
          goto step-9
    eln
          goto step -4

step9 :- itr =itr +1   2+1=3

step 10 :- if (itr > epoches) 372
              goto step -11
      eln
          goto step -3

Step 11 :- print m & c
          m =1·42, c= 0·46