Assignment-3 — 18K61A05545

→ let us consider a sample dataset have one input (x_i^a) and one output (y_i^a), & number of samples 4. Develop a simple linear regression model using stochastic gradient descent optimizers.

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

Sol:-

Step 1:- x, y, m = 1, c = −1, η = 0.1, epochs = 2, n = 2

Step 2:- i = 1

Step 3:- s = 1

Step 4:- $\frac{\partial t}{\partial m} = -((8.4-(1))(0.2)-(-1))0.2 = -0.84$

$\frac{\partial t}{\partial c} = -(3.4(1))(0.2+1) = -4.2$

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

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

Step 6:- $m = m + \Delta m = 1 + 0.084 = 1.084$, $c = c + \Delta c = -1 + 0.42 = -0.58$

Step 7:- s = s + 1

1 + 1 = 2

Step-8:- if (s > ns)
step 9
else
step 4

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

$\frac{\partial E}{\partial c} = -(3.8 - (1.084)(0.4) + 0.58)$
$= -3.9464$

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

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

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

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

Step-7:- $s = s + 1$
$2 + 1 = 3$

Step-8:- if (s ≤ ns)
step 9
else
step 4

Step 9:- $i = i + 1$
$= 1 + 1 = 2$

Step-10:- if (i > epoches)
step 11
else
step 3

Step 3:- $s = 1$

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

$= -0.668$

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

$= -3.34$

Step 5:- $\Delta m = -(0.1)(-0.668)$

$= 0.0668$

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

$= 1.24+0.066$ $\quad$ $= 0.18+0.33$

$= 1.3$ $\quad$ $= 0.15$

Step 7:- $s = s+1$

$1+1 = 2$

Step 8:- if ($s > ns$)

step 9

else

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:- $\Delta m = -(0.1)(-1.25) = 0.12$

$\Delta c = -(0.1)(-3.13) = 0.32$

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

$= 1.3+0.12$ $\quad$ $= 0.15+0.31$

$= 1.42$ $\quad$ $= 0.46$

Step 7:- $s = s+1$

$= 2+1 = 3$

Step 8:- if ($s > ns$)

step 9

else
step 4

step 9: i = i+1
2+1 = 3

step 10: if (i > epoches)
step 11
else
step 3

step 11 : print m = 1.42 & c = 0.46.