ASSIGNMENT - 2

$f(x) = x^2 + y^2 + 10$

Step 1: let $x = -1$, $y = 1$, $\eta = 0.1$, epoch : 2

Step 2: itr = 1

Step 3: $\frac{\partial f}{\partial x} = 2x = -2$

$\frac{\partial f}{\partial y} = 2y = 2$

Step 4: $\Delta x = -\eta \frac{\partial f}{\partial x} = -0.1\,(-2) = 0.2$

$\Delta y = -\eta \frac{\partial f}{\partial y} = -0.1\,(2) = -0.2$

Step 5: $x = x + \Delta x = -1 + 0.2 = -0.8$

$y = y + \Delta x = 1 - 0.2 = 0.8$

Step 6: itr = itr + 1 $\Rightarrow 1 + 1 = 2$

Step 7: if (itr > epoch)

if $(2 > 2)$

false so go to step (3)

step 3: $\frac{\partial f}{\partial x} = 2x = 2(-0.8) = -1.6$

$\frac{\partial f}{\partial x} = 2y = 2(0.8) = 1.6$

Step 4: $\Delta x = -\eta \frac{\partial f}{\partial x} = -0.1(-1.6) = 0.16$

$\Delta y = -\eta \frac{\partial f}{\partial y} = -0.1(1.6) = -0.16$

Step 5: $x = x + \Delta x = -0.8 + 0.16 = -0.64$

$y = y + \Delta x = 0.8 - 0.16 = 0.64$

Step 6: itr = itr + 1 $\Rightarrow 2 + 1 = 3$

Step 7: if $(3 > 2)$ true so

$x = -0.64$, $y = 0.64$

$f(x, y) = x^2 + y^2 + 10$

$= (-0.64)^2 + (0.64)^2 + 10$

$\therefore f(x, y) = 10.8192$

Assignment-3

Sample	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

Step 1: $m=+1$, $c=-1$, $\eta=0.1$, epoch $=2$

Step-2: itr $=1$

Step-3: Sample $=1$

Step-4:
$$\frac{\partial f}{\partial m} = -(y_i - mx_i - c)x_i$$
$$= -(3.4 - (1)(0.2) - (-1))(0.2)$$
$$= -0.84$$
$$\frac{\partial f}{\partial c} = -(y_i - mx_i - c)$$
$$= -(3.4 - (1)(0.2) - (-1))$$
$$= -4.2$$

Step (5):
$$\Delta m = -\eta \frac{\partial f}{\partial m} = -0.1(-0.84) = 0.084$$
$$\Delta c = -\eta \frac{\partial f}{\partial c} = -0.1(-4.2) = 0.42$$

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

Step (7): if (2 > 2)
false

Step (8):
$$\frac{\partial f}{\partial m} = -(3.8 - (1.084)(0.4) - 1.0(-0.58))(0.4)$$
$$= -1.528$$
$$\frac{\partial f}{\partial c} = -(3.8 - (1.084)(0.4) - 1.0(-0.58))$$
$$= -3.8456$$

Step ⑤:

$$\Delta m = -\eta \frac{\partial E}{\partial m} = 0.1578$$

$$\Delta c = -\eta \frac{\partial E}{\partial c} = 0.39464$$

Step ⑥:

$$m = m + \Delta m = 1.084 + 0.1578 = 1.2418$$

$$C = C + \Delta m = -0.58 + 0.39464 = -0.18536$$

Assignment-5

sample(i)	x_i	y_i	
1	0.2	3.4	batch=1
2	0.4	3.8	
3	0.6	4.2	batch=2
4	0.8	4.6	

1) $[x, y]$; $m = 1$, $c = -1$, $\eta = 0.1$, epochs: 2, bs=2

2) $nb = \frac{ns}{bs} = \frac{4}{2} = 2$

3) itr = 1

4) Batch = 1

5) $\frac{\partial E}{\partial m} = \frac{-1}{bs} \sum_{i=1}^{bs} (y_i - mx_i - c) x_i$

$= \frac{-1}{2} \left[(3.4 - (1)(0.2) + 1)0.2 \right] + \left[3.8 - 0.4 + 1 \right] 0.4 \Big]$

$= -1.34$

$\frac{\partial E}{\partial c} = \frac{-1}{2} \left[(3.4 - 0.241) + (3.8 - 0.4 + 1) \right]$

$= -4.3$

6) $\Delta m = -(0.1)(-1.34) = 0.134$

$= -(0.1)(-43) = 0.43$

7) $m = m + \Delta m = 1 + 0.134 = 1.34$

$c = c + \Delta c = -1 + 0.43 = -0.57$

8) Batch + = 1

9) if (batch > nb)

3 > 2

goto next step

10) itr = itr + 1

11) if (2 > 2) got to step 12 else step 4

4) Batch = 1

$$\frac{\partial E}{\partial m} = \frac{-1}{2}\left[3.4 - (1.4)(0.2) + (0.5)0.2 + 3.8 - (1.4)(0.4) + 0.15)0.4\right]$$

$$= -1.0029$$

5) $$\frac{\partial E}{\partial c} = \frac{-1}{2}\left[3.4 - (1.42)(0.2) + 0.1523) + 3.8 - (1.4)(0.4) + 0.15\right]$$

$$= -3.3241$$

6) $\Delta m = -0.1(-1.0029) = 0.1002$

$\Delta c = -0.1(-3.3241) = 0.8324$

7) $m+ = \Delta m = 1.42 + 0.1002 = 1.5$

$c+ = \Delta c = -0.15 + 0.3 = 0.17$

8) Batch + = 1

9) if (2>2) go to step 10 else step 7

10) $$\frac{\partial E}{\partial m} = \frac{-1}{2}\left[4.2 - (1.5(0.6) - 0.17)0.6 + 4.6 - (1.5(0.8) - 0.17(0.8)\right]$$

$$= -2.21$$

$$\frac{\partial E}{\partial c} = -3.151$$

6) $\Delta m = -0.1 \times 2.21 = 0.221$

$\Delta c = -0.1 \times -3.15 = 0.315$

7) $m+ = \Delta m = 1.5 + 0.22 = 1.7$

$c+ = \Delta c = 0.17 + 0.3 = 0.4$

8) Batch + = 1

9) if (Batch > nb) go to step 10 else step 7

10) itr = itr + 1

11) if (3 > 2) go to step 12

12) print m, c

m = 1.748

c = 0.494

Assignment-3

Sample	x_i	y_i
1	0.2	3.4
2	0.4	3.8
3	0.6	4.2
4	0.9	4.6

1) (x,y); m=1, c=-1, η=0.1, epoch= 2, ns=4

2) itr = 1

3) $\frac{\partial E}{\partial m} = \frac{-1}{2}\left[(3.4 - (1)(0.2)+1)0.2 + (3.8-(1)(0.4)+1)0.4\right)$

$= -1.34$

$\frac{\partial E}{\partial c} = \frac{-1}{2}\left[(3.4-0.2+1)+(3.8+0.4+1)\right)$

$= -4.3$

4) $\Delta m = -\eta \frac{\partial E}{\partial m}$

$= -0.1 \times -1.34 = 0.134$

$\Delta c = -\eta \frac{\partial E}{\partial c}$

$= -0.1(4.3) = 0.43$

5) $m = m + \Delta m = 1 + 0.134 = 1.13$

$c = c + \Delta m = -0.1 * -4.3 = 0.43$

6) itr = itr+1

7) itr < 2

go to step3

3) $\frac{\partial E}{\partial m} = \frac{1}{2}[3.4 - (1.134)(0.2) + 0.54)(0.2) + 3.8 - (1.134)(0.4) + 0.57)0.4]$

$= -1.57$

$\frac{\partial E}{\partial c} = -3.829$

4) $\Delta m = -0.1 \times 1.15 = 0.1157$

$\Delta c = -0.1 \times -3.8 = 0.3829$

5) $m = m + \Delta m = 1.2497$

$c = c + \Delta m = -0.127$

6) $itr = itr + 1$

7) if (itr > epoch)

$3 > 2$

8) $m = 1.24$, $c = -0.127$

ASSIGNMENT-9

x	y
0.2	3.4
0.4	3.8

1) (x,y) , m=1, c=-1, η=0.1, epoch = 2, & γ=0.9, $V_m = V_c = 0$

2) itr = 1

3) sample = 1

4) $\frac{\partial E}{\partial m} = -0.84 = g_m$

$\frac{\partial E}{\partial c} = -4.2 = g_c$

5) $v_m = \gamma v_m - \eta g_m$

$= (0.9)(0) - (0.1)(-0.84)$

$v_m = 0.084$

$v_c = \gamma v_c - \eta g_c$

$= (0.9)(0) - (0.1)(-4.2)$

$v_c = 0.042$

6) ~~steps~~ : $m + = N_m = 1 + 0.084 = 1.084$

$c = c + v_c = -1 + 0.042 = -0.58$

7) sample = 1 + 1 = 2

8) if (sample > n's)

2 > 2

4) $g_m = \frac{\partial E}{\partial c} = -1.57856$

$g_c = \frac{\partial E}{\partial c} = -3.9464$

5) $v_m = \delta v_m - \eta g_m$

$= 0.223486$

$v_c = \delta v_c - \eta g_c$

$= 0.77264$

6) $m = 1.3174$

$c = 0.19264$

7) sample $= 2+1 = 3$

8) if $(3 > 2)$

9) itr $=$ itr $+1 = 1+1 = 1$

10) if$(2 > 2)$

3) sample $= 1$

4) $g_m = \frac{\partial E}{\partial m} = -0.5887$

$g_c \quad \frac{\partial E}{\partial c} = -2.9438$

5) $v_m = \delta v_m - \eta g_m = 0.28897$

$v_c = \delta v_c - \eta g_c = 0.9897$

6) $m = m + v_m = 1.5863$

$c = c + v_c = 1.18234$

7) sample $= 1+1 = 2$

8) if (sample > ns)

4) $g_m = -1.7391$

$g_c = -4.3499$

5) $v_m = \gamma v_m - \eta g_m$

$= 0.41604$

$v_c = \gamma v_c - \eta g_c$

$= 1.3255$

6) $m = m + v_m = 2.0023$

$c = c + v_c = 2.507$

7) sampl = 2+1 = 3

8) if (3>2)

9) if r = 2+1 = 3

10) if (3>2)

11) m = 2.00 , c = 2.507