Assignment - 4

momentum gradient descent

Step 0: [x, y], m = 4, c = -1, η = 0.4, γ = 0.9, epochs = 2

vm = vc = 0

Step 1: Iteration = 1

Step 2: sample = 1

Step 3: $E = \frac{1}{2}(y_i - mx_i - c)^2$

given	
0.2	3.4
0.4	3.8
0.6	4.2
0.8	4.6

$$\frac{\partial E}{\partial m} = -(3.4 - (1)(0.2) - 1)(0.2)$$

$$= (4.2)(0.2)$$

$$= 0.84$$

$$\frac{\partial E}{\partial c} = -(3.4 - (1)(0.2) - (-1))$$

$$= -(3.4 - 0.2 + 1)$$

$$= -(4.2)$$

Step 5: $v_m = (\gamma)(v_m) - \eta \frac{\partial E}{\partial m} = (0.9)(0) - (0.1)(-0.84)$

$$= 0.084$$

Step 6: $v_c = (\gamma)(v_c) - \eta \frac{\partial E}{\partial c} = (0.9)(0) - (0.1)(-4.2)$

$$= 0.42$$

Step 6: $m = m + v_m$ | $c = c + v_c$

$1 + 0.084$ | $-1 + 0.42$

$= 1.084$ | $= -0.58$

sample = 1+1 = 2

if (sample > ms)

2 > 2 - false

go to step 7

Step 9: $\frac{dE}{dm} = -(3.8 - (1.084 \times 0.4) + 0.58)\ 0.4$

$= -(3.9464) \times 0.4$

$= 1.57856$

$\frac{dE}{dc} = -3.9464 = -(y_i - mx_i - c)$

$\leftarrow -(-3.8 - ((1.084)(0.2) - (-0.58)))$

Step 10

$v_m = (0.9)(0.084) - (0.1)(1.57856)$

$= +0.08225$

$v_c = (0.9)(0.42) - (0.1)(-3.9464)$

$= 0.77264$

Step 11:

$m = m + v_m$ ∃ $1.084 + 0.08225 = 1.16625$

$c = -0.58 + 0.77264 = 0.19264$

Step 12:

sample = $2+1 = 3$

if sample < ns

3 > 2

True

go to step 14

Step 14: Iteration = Iteration + 1

= 2

if Iteration > epochs

then 2 > 2

false

Goto Step 3

Step 16: sample = 1

Step 17: $E = \frac{1}{2}(y - mx - c)^2$

$\frac{\delta E}{\delta m} = -(3.4 - (1.66281 \times 0.2) - 0.19264) \times 0.2)$

$-(2.97411) \times 0.2$

$= -0.594821$

$\frac{\delta E}{\delta c} = -2.97411$

Step 18: $v_m = (0.9)(0.085225) - (0.1)(-0.59482)$

$= 0.133507$

$v_c = (0.9)(0.77264) - (0.1)(-2.97411)$

$= 0.992787$

Step 19: m = m + Δm

1.16625 + 0.133507

= 1.299757

c = c + Δc

0.19264 + 0.992787

= 1.185427

Step 20: sample = 1 + 1 = 2

if sample ? 75 = 272 false

go to step 4

$\frac{\partial E}{\partial m} = -(3.8 - (1.299757 \times 0.4) - 1.185427) \times 0.4$

$= -(2.094670 \times 0.4$

= 0.83786

$\frac{\partial E}{\partial c} = -2.09467$

Step 22: $\Delta m = (0.4)(0.133507) - (0.1)(-0.83786)$

= 0.70394

$\Delta c = (0.9)(0.992787) - (0.1)(-2.09467)$

= 1.10297

Step 24: $m = 1.299157 + 0.203947$

$= 1.503697$

$c = 1.102977 + 1.855427$

$= 2.958397$

Step 25: Iteration = 2-1 = 3

If Iteration > epoch

3 > 2

True

go to step 22

print (m, c)

$= 1.503697, 2.958397$

Calculating mean square error & printing it //