18K41A0278

Assignment - 9

Momentum gradient descent

Step1: $[x,y], m=1, c=-1, \eta=0.1, \gamma=0.9$, epochs = 2

$V_m = V_c = 0$

X	Y
0.2	3.4
0.4	3.8
0.6	4.2
0.8	4.6

Step2: iteration = 1

Step3: sample = 1

Step4: $E = \frac{1}{2}\left[y_i - mx_i - c\right]^2$

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

$$= (4.2)(0.2) = 0.84$$

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

$$= -(3.4-0.2+1) \Rightarrow -4.2$$

Step5: $V_m = (\gamma)(V_m) - \eta\frac{\partial f}{\partial m} = (0.90)(0) - (0.1)(-0.84) \Rightarrow 0.084$

$$V_c = (\gamma)(V_c) = -\eta\frac{\partial f}{\partial c} = (0.9)(0) - (0.1)(-4.2) \Rightarrow 0.42$$

Step6: $m = m + \Delta m = 1 + 0.084 = 1.084$

$C = C + \Delta C = 1 + 0.42 = -0.58$

Step 7:

sample = 1+1 = 2

Step 8: if (sample > no. of samples)

2 > 2 false

go to step 7

Step 9: $\frac{\partial f}{\partial m} = -(3.8 - (1.084 \times 0.4) + 0.58)0.4$

$= -(3.476.4) \times 0.4 \Rightarrow 1.57856$

$\frac{\partial f}{\partial c} = -3.9464 \Rightarrow -(y_i - mx_i - c)$

$-(-3.8 - (1.084)(0.2) - (0.58)) = -3.9464$

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: $m = m + Dm \Rightarrow 1.084 + 0.0828 = 1.16628$

$C = C + \Delta C = -0.58 + 0.77264 = 0.19264$

Step 12: sample = 2+1 = 3

Step 13: if (sample > no. of samples)

3 > 2

True

go to step 14

Step 14: Iteration = Iteration+1 = 2

Step 15: if (iteration > epochs)

2 > 2

false go to Step 3

Step 16: Sample = 1

Step 17: $F = \frac{1}{2}[y_i - mx_i - c]^2$

$\frac{\partial f}{\partial m} = -(3.4 - (1.16628 \times 0.2) - (0.19264) \times 0.2) - (2.97411 \times 0.2)$

$= -0.59482$

$\frac{\partial f}{\partial c} = -2.97411$

Step 18: $V_m = (0.9)(0.08225) - (0.1)(-0.59482) = 0.135507$

$V_c = (0.9)(0.77264) - (0.1)(-2.97411) = 0.992789$

Step 19: $m = m + \Delta m$

$= 1.16625 + 0.133587 = 1.299757$

$C = C + \Delta C$

$= 0.19264 + 0.992787 = 1.185427$

Step 20: Sample = 1+1 = 2

Step 21: if (sample > no. of samples)

2 > 2 false

go to step 4

Step 22:

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

$= -(2.094670 \times 0.4) = 0.83786$

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

Step 23: $U_m = (0.9)(0.133507) - (0.1)(0.83756)$.

$= 0.20394$

$V_c = (0.9)(0.992187) - (0.1)(-2.09467)$

$= 1.10297$

Step 24:

$m = 1.299757 + 0.20394 = 1.503697$.

$c = 1.10297 + 1.15427 = 2.285397$

Step 25: iteration = 2+1 = 3

Step 26: if (iteration > epochs)

3 > 2

True

go to step 27

Step 27: print (m, c)

→ 1.503699, 2.28397

Calculating mean square error and printing it.