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Assignment - 11

Mestrio Accelerated gradient descent

Step 1: $[x, Y]$, $m = 9$, $c = -1$, $n = 0.9$, $\gamma = 0.9$, $v_m = 0$,

$v_c = 0$, epoche $= 2$, $n_s = 2$

X	Y
0.2	3.4
0.4	3.8

Step 2: iteration = 1

Step 3: sample = 1

Step 4: $q_{ms} = -(y_i - (m + \gamma v_m) x_i - (c + \gamma v_c) x_i$

$= -(3.4 - (1 + (0.9)0)(0.2) - (-1 + 0) 0.2$

$= -(3.4 - 0.2 + 1) 0.2 = -(4.2 \times 0.2) \Rightarrow -0.84$

$q_c = -4.2$

Step 5: $v_m = \gamma v_m - n q_{ms} \Rightarrow (0.9)(0) - (0.1)(-0.84)$

$= 0.084$

$v_c = \gamma v_c - n q_c = 0 - (0.1)(-4.2) = 0.42$

Step 6: $m = m + v_m = 1 + 0.084 \Rightarrow 1.084$

$c = c + v_c = 1 + 0.42 = 1.42$

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

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

2>2 false

go to step 7

Step 9:

$$q_m = -(3.8 - (1.084 + (0.9) \times (0.084)(0.4) - (-0.58 + 0.9 \times 0.42)0.4)$$

$$= -[(3.8) - (1.596 \times 0.4) + 0.958)0.4] - (4.29416 \times 0.4)$$

$$= -1.717664$$

$$q_c = -4.29416$$

Step 10:

$$V_m = rv_m - nq_m = 0.9(1.0084) - 0.1(-1.717664)$$

$$= 0.2493664$$

$$V_c = rv_c - nq_c = (0.9)(0.2) - (0.1)(-4.29416)$$

$$= 0.807416$$

Step 11:

$$m = m + V_m = 1.084 + 0.24736 = 1.33136$$

$$c = c + V_c = -0.58 + 0.907416 = 0.227416$$

Step 12:

sample = 2+1

= 3

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Step 13:

If (sample > no. of samples)

3 > 2 true

go to next step

step 14: iteration = 1+1 = 2

step 16: If (iteration > epochs)

2 > 2 false

go to step 3

step 17: sample = 1

step 18: $g_m = -(y_i - (m + \gamma v_m)x_i - ((+\gamma v_c)x_i$

$= -(3.4 - (1.33136) + (0.9)(0.24736) \times 0.2 -$

$10.27741 6 + 0.9 \times 0.87416)$

$= -(3.4 - (1.553984) \times 0.2 - (0.95409)$

$= -2.13511$

$g_c = -(34 - 1.553984 - 0.954091)$

$= -0.891926$

$V_m = \gamma v_m - \eta g_m = 0.9(0.2473664 - 0.1 \times (-2.13511)$

$= 0.436414$

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$V_c = \gamma v_c - \eta g_c = 0.9(0) - 0.807416 - (0.1)(-0.891926)$

$= 0.815867$

Step 19:

$m = m + \gamma m = 1.3316 + 0.43614 = 1.76774$

$C = C + v_c = 0.227416 + 0.815867 = 1.043283$

Step 20: sample = sample + 1 = 1 + 1 = 2

Step 21: if (sample > no. of samples) * 2 > 2

Repeat step 9 false

Step 22:

$g_m = -(y_1 - (m + \gamma v_m)x_i - (c + \gamma v_c)x_i)$

$= -(3.8 - (1.76774 + 0.9 \times 0.43614) \times 0.4 - 1.043283 + 0.9 \times 0.815867) 0.4$

$= -[38 - (2.160266) \times 0.4 - 1.777583) \times 0.4$

$= -0.463332$

$$g_c = -(3.8 - (2.160266)[0.4) - 1.7795633]$$

$$= 1.1583303$$

Step

$$V_m = rV_m - n\frac{\partial f}{\partial m}$$

$$(0.9)(0.43814) - (0.1)(-0.463332)$$

$$= 0.4388592$$

$$V_c = rV_c - n\frac{\partial f}{\partial c}$$

$$0.9(0.815867) - (0.1)(-1.1583303) = 0.8501183$$

Step 23: $m = 1.76774 + 0.4385592 = 2.2065992$

$c = 1.043383 + 1.1583303 = 2.2016133$

Step 24: Sample $= 2+1 = 3 > 2$

Step 25: if(Sample > Epochs)

go to next step

Step 26: iteration $2+1 = 3$

$3 > 2$ (epoch)

goto next step.

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Step 27: Print (m, c)

2.2065992, 2.2016133

Step 28:
Calculate MSE

$$= \frac{(3.4-(2.2065992\times 0.2)-(2.2016133))^2 + (3.8-(2.2065992\times 0.4)-(2.2016133))^2}{2}$$

$$= \frac{(0.57135)+(0.5122293)}{2} \Rightarrow 0.54271$$