Assignment -13

18K41A0242

ADAGRAD optimizer

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

Step 1: [x, y], epochs = 2 $m = 1$, $c = -1$, $G_m = G_c = 0$

$\eta = 0.1$, $\varepsilon = 10^{-8}$

Step 2: itr = 1

Step 3: Sample = 1

Step 4: $g_m = -(y_i - mx_i - c)x_i$

$= -4.2$

Step 5: $G_m = G_m + (g_m)^2$, $G_c = G_c + (g_c)^2$

$G_m = 0 + (-0.84)^2$ $G_c = 0 + (-4.2)^2$

$G_m = 0.7056$ $G_c = 17.64$

Step 6: $\Delta m = \frac{-\eta}{\sqrt{G_m + \varepsilon}} g_m = \frac{-0.1}{\sqrt{0.7056 + 10^{-8}}} \times (-0.84)$

$\Delta m = 0.099$

$\Delta c = \frac{-\eta}{\sqrt{G_c + \varepsilon}} g_c = \frac{-0.1}{\sqrt{17.64 + 10^{-8}}} \times (-4.2)$

$$\Delta c = 0.099$$

Step 7: $m + \Delta m = 1 + 0.099$

$$m = 1.099$$

$$c = \Delta c + c = 0.099 - 1$$

$$c = -0.901$$

Step 8: Sample = Sample + 1 = 1 + 1 = 2

Step 9: if (Sample > ns)

$$2 > 2$$

false → go to Step (4)

Step 4: $g_m = -[3.8 - (1.099)(0.4) + 0.901](0.4)$

$$g_m = -1.70456$$

$$g_c = -[3.8 - (1.099)(0.4) + 0.901]$$

$$g_c = -4.2614$$

Step 5: $G_m = G_m + (g_m)^2$ $\quad$ $G_c = G_c + (g_c)^2$

$G_m = 0.7056 + (-1.70456)^2$ $\quad$ $G_c = 17.64 + (-4.2614)^2$

$G_m = 3.6111$ $\quad$ $G_c = 35.799$

Step 6: $\Delta m = \dfrac{-\eta}{\sqrt{G_m + \varepsilon}} \times g_m$

$$= \frac{-0.1}{\sqrt{3.6111 + 10^{-8}}} \times (-1.704)$$

$$\Delta m = 0.0896$$

$$\Delta C = \frac{-\eta}{\sqrt{G_C + \varepsilon}} \times g_c = \frac{-0.1}{\sqrt{35.799 + 10^{-8}}} \times (-4.2614)$$

Step 7: $m = m + \Delta m = 1.099 + 0.0896$

$m = 1.1886$

$c = c + \Delta c = -0.901 + 0.07122$

$c = -0.82978$

Step 8: Sample = 2+1 = 3

Step 9: if (Sample > ns)

3 > 2

Step 10: itr = itr + 1 = 1+1 = 2

Step 11: if (itr > epoch)

2 > 2

false → step ③

Step 3: Sample = 1

Step 4: $g_m = -[3.4 - (1.1886)(0.2) + 0.82978](0.2)$

$g_m = -0.798412$

$g_c = -[3.4 - (1.1886)(0.2) + 0.82978)$

$g_c = -3.99206$

Step 5: $G_m = G_m + (g_m)^2$, $G_c = G_c + (g_c)^2$

$G_m = 3.611 + (-0.798412)^2$ $G_c = 35.799 + (-3.99206)^2$

$G_m = 4.2484$ $G_c = 51.7355$

Step 6: $\Delta m = \frac{-\eta}{\sqrt{G_m + \varepsilon}} g_m = \frac{-0.1}{\sqrt{4.2484 + 10^{-8}}} (-0.7984)$

$\Delta m = 0.0387$

$\Delta c = \frac{-\eta}{\sqrt{G_c + \varepsilon}} g_c = \frac{-0.1}{\sqrt{51.7355 + 10^{-8}}} (-3.99206)$

$\Delta c = 0.0555$

Step 7: $m = m + \Delta m = 1.1886 + 0.0387$

$m = 1.2273$

$c = c + \Delta c = -0.82978 + 0.0555$

$c = -0.77428$

Step 8: Sample = Sample + 1 = 1 + 1 = 2

$2 > 2$

Step (4)

Step 4: $g_m = -[3.8 - (0.4) + 0.77428] 0.4$

$g_m = -1.633$

$g_c = -[3.8 - (1.227)(0.4) + 0.77428]$

$g_c = -4.083$

Step 5: $G_m = 4.2484 + (-1.6)^2 = 6.91$

$G_c = 51.7355 + (-4.08)^2 = 68.3819$

Step 6: $\Delta m = \frac{-0.1}{\sqrt{6.91+10^{-8}}} \times (-4.083)$ (-1.633)

$\Delta m = 0.0621$

$\Delta c = \frac{-0.1}{\sqrt{38.87+10^{-8}}} \times (-4.083)$

$\Delta c = 0.0491$

Step 7: $m = m + \Delta m = 1.22 + 0.06 = 1.2894$

$c = c + \Delta c = -0.77 + 0.049 = -0.72518$

Step 8: Sample = Sample + 1

= 2 + 1

= 3

Step 9: if (Sample > n_s)

3 > 2

Step 10: itr = itr + 1 = 2 + 1 = 3

Step 11: if (itr > epoch)

3 > 2

Step 12: $m = 1.2894$

$c = -0.72518$