ASSIGNMENT-15

Do Manual Calculations for 2 iterations with

2 samples

★ RMS Prop Optimizer

Sample (i)	x_i^a	y_i^a
1	0.2	3.4
2	0.4	3.8

step1 $\eta = 0.1$, epochs = 2, $m = 1$, $c = -1$, $\gamma = 0.9$,

$$E_m = E_c = 0, \quad \varepsilon = 10^{-8}$$

step2 iter = 1

step3 sample = 1 $\quad g_m = -\left(y_i - mx_i - c\right)x_i$, $\quad g_c = -\left(y_i - mx_i - c\right)$

step4 $g_m = -\left(3.4 - (1)(0.2) + 1\right)(0.2) = -0.84$

$$g_c = -\left(3.4 - (1)(0.2) + 1\right) = -4.2$$

step5 $E_m = \gamma E_m + (1 - \gamma)(g_m)^2$

$$= (0.9)(0) + (1 - 0.9)(-0.84)^2$$

$$E_m = 0.07$$

$$E_c = \gamma E_c + (1 - \gamma)(g_c)^2$$

$$= (0.9)(0) + (1 - 0.9)(-4.2)^2$$

$$E_c = 1.764$$

step6: $\Delta m = -\left(\dfrac{\eta}{\sqrt{E_m + \varepsilon}}\right) g_m$

$$\Delta m = \frac{-0.1}{\sqrt{0.07+10^{-8}}} \times 0.18 \, (-0.84)$$

$$= +0.31$$

$$\Delta c = -\left(\frac{\eta}{\sqrt{Em+c}}\right) g_m = \frac{-0.1}{\sqrt{1.764+10^{-8}}} (-4.2)$$

$$\Delta c = 0.31$$

__step7:__ $m = m + \Delta m$

$$= 1 + 0.31 = 1.31$$

__step8:__ $c = c + \Delta c = -1 + 0.31 = -0.69$

__steps:__ Sample $= 1+1 = 2$

__step9:__ if (sample > ns)

$$2 > 2X$$

go step4

__step4__ $g_m = -\left(3.8 - (1.31)(0.4) + 0.69\right)(0.4) = -1.5$

$$g_c = -\left(3.8 - (1.31)(0.4) + 0.69\right) = -3.9$$

__step5__ $E_m = (0.9)(0.07) + (1-0.9)(-1.5)^2 = 0.28$

$$E_c = (0.9)(1.76) + (1-0.9)(-3.9)^2$$

$$E_c = 3.1$$

__step6:__ $\Delta m = \frac{-0.1}{\sqrt{0.28+10^{-8}}} \times (-1.5) = 0.28$

$$\Delta c = \frac{-0.1}{\sqrt{3.1+10^{-8}}} (-3.9) = 0.22$$

Step7 $m = m + \Delta m$

$$= 1.31 + 0.28 = 1.59$$

$$c = c + \Delta c$$
$$= -0.69 + 0.22 = -0.47$$

Step8 sample = sample + 1 = 3

Step9 if (sample > ns)

$$3 > 2 \checkmark$$

next step

Step10 iter = iter + 1 = 1 + 1 = 2

Step11 if (iter > epochs)

$$2 > 2 \times$$

Step3 sample = 1

Step4: $gm = -(3.4 - (1.59)(0.2) + 0.47)(0.2) = -0.7$

$$gc = -(3.4 - (1.59)(0.2) + 0.47) = -3.5$$

Step5 $Em = (0.9)(0.28) + (0.1)(-0.7)^2 = 0.3$

$$Ec = (0.9)(3.1) + (0.1)(-3.5)^2 = 4.0$$

Step6 $\Delta m = \dfrac{-0.1}{\sqrt{0.3 + 10^{-8}}} \ast 0.7 = 0.12$

$$\Delta c = \dfrac{-0.1 \times (-3.5)}{\sqrt{4 + 10^{-8}}} = 0.17$$

step7 $m = m + \Delta m = 1.59 + 0.12 = \underline{1.71}$

   $c = c + \Delta c = -0.47 + 0.17 = \underline{-0.3}$

step8   sample $+ 1 = 1 + 1 = 2$

step9   if (sample $> ns$)

   $2 > 2 X$

step4: $gm = -(3.8 - (1.71)(0.4) + 0.3) * 0.4 = \underline{-1.4}$

   $gc = -(3.8 - (1.71)(0.4) + 0.3) = \underline{-3.6}$

step5 $Em = (0.9)(0.3) + (0.1)(-1.4)^2 = 0.46$

   $Ec = (0.9)(4) + (0.1)(-3.6)^2 = 4.89$

step6 $\Delta m = \dfrac{-0.1}{\sqrt{0.46 + 16^{-8}}} * -1.4 = 0.2$

   $\Delta c = \dfrac{-0.1}{\sqrt{4.89 + 10^{-8}}} \times -3.6 = 0.16$

step7 $m = m + \Delta m = 1.71 + (0.2) = \underline{1.91}$

   $c = c + \Delta c = -0.3 + 0.16 = \underline{-0.14}$

step8   sample $+ 1 = 2 + 1 = 3$

step9.   if (sample $> ns$)

   $3 > 2 \checkmark$

   goto next step

step 10.   if (iter $\geq$ epoch)

   s

   iter $= iter + 1 = 2 + 1 = 3$

step11: Convergence criteria

if (iter > epochs)

$$3 > 2 \checkmark$$

next step

step12: $m = 1.91$ } 2 iterations, for
      $c = -0.14$ } 2 samples