# Assignment - 15

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Let us consider a sample dataset have one input (x;9) and one output (y;9) and number of samples. 2. Develop a simple linear regression model using RMS prop optimizer.

| Sample(i) | $x_i$ | $y_i$ |
|---|---|---|
| 1 | 0.2 | 3.4 |
| 2 | 0.4 | 3.8 |
| 3 | 0.6 | 4.2 |
| 4 | 0.8 | 4.6 |

Do manual calculations for 2 iterations with first two samples.

**Step-1:** [x, 4], $\eta = 0.1$, epoches = 2, $m = 1$, $c = -1$,

$\gamma = 0.9$, $E_m = E_c = 0$, $\varepsilon = 10^{-8}$

**Step-2:** itr = 1

**Step-3:** Sample = 1

**Step-4:** $g_m = -(3.4 - (1)(0.2) + 1)(0.2) = -0.84$

$g_c = -(3.4 - (1)(0.2) + 1) = -4.2$

Step-5: $Em = (0.9)(0) + (1-0.9)(-0.84)^2$

$= 0.07$

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

$= 1.764.$

Step-6: $\Delta m = \frac{-0.1}{\sqrt{0.07 + 10^{-8}}} \times (-0.84) = 0.31$

$\Delta c = \frac{-0.1}{\sqrt{1.76 + 10^{-8}}} \times (-4.2) = 0.31$

Step-7: $m = m + \Delta m = 1 + 0.31 = 1.31$

$c = c + \Delta c = -1 + 0.31 = -0.69$

Step-8: $\$ample = \$ample + 1$

$= 1 + 1 = 2$

Step-9: if (sample > ns) goto step-10

$2 > 2$

else

goto step-4

Step-4: $gm = -(3.8 - (1.31)(0.4) + 0.69)0.4$

$= -1.5$

$gc = -(3.8 - (1.31)(0.4) + 0.69)$

$= -3.9$

Step-5: $Em = (0.9)(0.07) + (0.1)(-1.5)^2$

$= 0.28$

$$Ec = (0.9)(1.76) + (0.1)(-3.9)^2 = 3.1$$

**Step-6:** $\Delta m = \frac{-0.1}{\sqrt{0.28 + 10^{-8}}} \times (-1.5) = 0.28$

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

**Step-7:** $m = m + \Delta m = 1.31 + 0.28 = 1.59$

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

**Step-8:** sample = sample + 1
= 2 + 1 = 3.

**Step-9:** if (sample > ns)
Goto step-10
3 > 2
else
step-4

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

**Step-11:** if (itr > epoches)
goto step-12
else
goto step-3

**Step 3:** sample = 1

**Step-4:** $gm = -(3.4 - (1.59)(0.2) + 0.47)(0.2) = -0.7$

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

Step-5: $Em = (0.9)(0.28) + (0.1)(-0.7)^2$

$= 0.3$

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

Step-6: $\Delta m = \frac{-0.1}{\sqrt{0.3 + 10^{-8}}} \times (-0.7) = 0.12$

$\Delta c = \frac{-0.1}{\sqrt{4.0 + 10^{-8}}} \times (-3.5) = 0.17$

Step-7: $m = m + \Delta m = 1.59 + 0.12 = 1.71$

$c = c + \Delta c = -0.47 + 0.17 = -0.3$

Step-8: Sample = Sample + 1

$= 1 + 1 = 2$

Step-9: if (sample > ns)

$2 > 2$ goto step-10

else

goto step-4

Step-4: $gm = -(3.8 - (1.71)(0.4) + 0.3) \times 0.4$

$= -1.4$

$gc = -(3.8 - (1.71)(0.4) + 0.3) = -3.6$

Step-5: $Em = (0.9)(0.3) + (0.1)(-1.4)^2$

$= 0.46$

$Ec = (0.9)(4.0) + (0.1)(-3.6)^2$

$= 4.89.$

Step-6: $\Delta m = \frac{-0.1}{\sqrt{0.46+10^8}} \times (-1.4) = 0.2$

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

Step-7: $m = m + \Delta m = 1.71 + 0.2 = 1.91$

$c = c + \Delta c = -0.3 + 0.16 = -0.14$

Step-8: Sample = Sample + 1

$= 2 + 1 = 3$

Step-9: if (Sample > ns)

$3 > 2$ goto step-10

else

goto step-4

Step-10: $i+r = i + r + 1$

$= 2 + 1 = 3$

Step-11: if (i+r > epoches)

$3 > 2$ goto step-12

else

goto step-3

Step-12: $m = 1.91$

$c = -0.14$.