# NNDL Assignment-15

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Let us consider a sample dataset have one input $(x_i^a)$ and one output $(y_i^a)$ and number of samples 2. Develop a simple linear regression model using RMS prop 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 |

Do manual calculations for 2 iterations with first two samples.

Step-1: [x,y], $\eta = 0.1$, epoches = 2, $m = 1$, $c = -1$, $\beta = 0.9$, $E_m = E_c = 0$, $\varepsilon = 10^{-8}$

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: $E_m = (0.9)(0) + (1 - 0.9)(-0.84)^2 = 0.07$

$E_c = (0.9)(0) + (1 - 0.9)(-4.2)^2 = 1.764$

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

$\Delta c = \frac{-0.1}{\sqrt{1.764 + 10^{-8}}} \times -4.2 = 0.31$

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

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

Step-8: sample = sample + 1

= 1 + 1

= 2

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

2 > 2

else

goto step-4

Step-4: $g_m = -(3.8-(1.31)(0.4)+0.69)\,0.4 = -1.5$

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

Step-5: $E_m = (0.9)(0.07)+(0.1)(-1.5)^2 = 0.28$

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

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: $m = m+\Delta c = 1.31+0.28 = 1.59$

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

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

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

Step-5: $E_m = (0.9)(0.28)+(0.1)(0.7)^2 = 0.3$

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

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: $g_m = -(3.8 - (1.71)(0.4) + 0.3)(0.4) = -1.4$

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

step-5: $E_m = (0.9)(0.3) + (0.1)(-1.4)^2 = 0.46$

$E_c = (0.9)(4.0) + (0.1)(-3.6)^2 = 4.89$

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: itr = itr + 1

$= 2 + 1 = 3$

step-11: if(itr > epochs)

$3 > 2$

goto step-12

else

goto step-3

Step-12: $m = 1.91$

$c = -0.41$