Assignment-13

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Steps :-

1) [x,y], $\eta = 0.1$, epochs = 1, $w = 1$, $c = -1$, $\epsilon = 10^{-8}$

$G_w = 0$, $G_c = 0$

2) iter = 1

3) sample = 1

4) $g_w = -[y_i - w x_i - c] x_i$

$= -[3.4 - (1 \times 0.2) + 1] \times 0.2$

$= -[3.4 - 0.2 + 1] \times 0.2 = [4.2] \times 0.2 = 0.84$

$g_c = -[4.2]$

5) $G_w = G_w + (g_w)^2 = 0 + (0.84)^2 = 0.7056$

$G_c = G_c + (g_c)^2 = 0 + (4.2)^2 = 17.64$

6) $\Delta w = \frac{-0.1}{\sqrt{0.7056 + 10^{-8}}} \times (-0.84) = 0.09999$

$\Delta c = \frac{-0.1}{\sqrt{17.64 + 10^{-8}}} \times (-4.2) = 0.0999$

7) $w = w + \Delta w = 1 + 0.9999 = 1.9999$

$c = c + \Delta c = -1 + 0.9999 = -0.001$

8) sample = sample + 1 = 1 + 1 = 2

9) $2 > 2 \Rightarrow$ false
goto step4

10) $g_w = -[y_i - wx_i - c]x_i$

$= -[3.8 - (1 \times 1.9999) + 0.001] \times 0.4$

$= -[1.8011] \times 0.4 = -0.72044$

$g_c = -1.8011$

11) $G_w = G_w + (g_w)^2 = 0.7056 + 0.5190 = 1.2246$

$G_c = G_c + (g_c)^2 = 17.64 + 3.2439 = 20.8839$

12) $\Delta w = \frac{-0.1}{\sqrt{1.2246 + 10^{-8}}} \times (-0.72044) = 0.065102$

$\Delta c = \frac{-0.1}{\sqrt{20.8839 + 10^{-8}}} \times (-1.8011) = 0.03941$

13) $w = 1.9999 + 0.065102 = 2.0650$

$c = -0.001 + 0.3941 = 0.3931$

14) sample = sample + 1 = 2 + 1 = 3 > 2 true
goto step15

15) epoch = epoch + 1 = 1 + 1 = 2

16) epoch > epochs $\Rightarrow$ 2 > 2 $\Rightarrow$ false
goto nextstep

17) sample = 1

18) $g_m = -[3.4-(2.0650\times0.2)-0.3931]\times0.2$

$= -[2.5939]\times0.2 = -0.5187$

$g_c = -2.5939$

19) $G_m = G_m + (g_m)^2 = 1.2246 + 0.2690 = 1.4936$

$G_c = G_c + (g_c)^2 = 20.8839 + 6.7283 = 27.6122$

20) $\Delta m = \frac{-0.1}{\sqrt{1.4936+10^{-8}}} \times (-0.5187) = 0.01789$

$\Delta c = \frac{-0.1}{\sqrt{27.6122+10^{-8}}} \times (-2.5939) = 0.04936$

21) $m = m + \Delta m = 2.0650 + 0.01789 = 2.08289$

$c = c + \Delta c = 0.3931 + 0.04936 = 0.44246$

22) sample = sample + 1 = 1 + 1 = 2 > 2 ⇒ false

goto next step

23) $g_m = -[3.8-(2.08289\times0.4)-0.44246]\times0.4$

$= -[2.5243]\times0.4 = -1.00972$

$g_c = -2.5243$

24) $G_m = G_m + (g_m)^2 = 1.4936 + (-1.00972)^2 = 2.5131$

$G_c = G_c + (g_c)^2 = 27.6122 + (-2.5243)^2 = 33.9842$

25) $\Delta w = \frac{-0.1}{\sqrt{2.5191 + 10^{-8}}} \times (-1.00972) = 0.06369$

$\Delta c = \frac{-0.1}{\sqrt{33.9862 + 10^{-8}}} \times (-2.5243) = 0.0433$

26) $w = w + \Delta w = 2.08289 + 0.06369 = 2.14658$

$c = c + \Delta c = 0.44246 + 0.0433 = 0.48576$

27) sample = sample + 1 = 2 + 1 = 3 > no of samples
goto nextstep

28) tot = tot + 1 = 2 + 1 = 3 > epochs
goto nextstep

29) Print (w, c)

30) Calculate Mean Square Error

$$mse = \frac{1}{2 \times 2} \sum [y_T - y_P]^2 = \frac{1}{4} [(3.4 - (2.14658 \times 0.2) - 0.48576)^2 + (3.8 - (2.14658 \times 0.4) - 0.48576)^2$$

$mse = 3.05121$