

ASSIGNMENT-13
MANUAL CALCULATIONS OF ADAGRAD:-

Step 1:- $\{x, y\}$, $\eta = 0.01$, epochs = 1, $m = 1$, $c = -1$, $\epsilon = 10^{-8}$

$$G_m = 0, G_c = 0$$

Step 2:- iter = 1

Step 3:- sample = 1

Step 4:- $g_m = -[y_i - mx_i - c]x_i$
 $= -[3.4 - (1 \times 0.2) + 1] \times 0.2$
 $= -0.84$

$$g_c = -4.2$$

Step 5:- $G_m = G_m + (g_m)^2 = 0 + (0.84)^2 = 0.7056$

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

Step 6:- $\Delta m = \frac{-0.01}{\sqrt{0.7056 + 10^{-8}}} \times (0.84) = 0.099999$

$$\Delta c = \frac{-0.01}{\sqrt{17.64 + 10^{-8}}} \times (-4.2) = 0.099999$$

Step 7:- $m = m + \Delta m = 1 + 0.9999 = 1.9999$

$$c = c + \Delta c = -1 + 0.9999 = -0.0001$$

Step 8:- sample = sample + 1 = 1 + 1 = 2

Step 9:- $2 \geq 2 \Rightarrow \text{false}$

go to Step 4.

Step 4:- $g_m = -[y_i - mx_i - c]x_i$
 $= -[3.8 - (1 \times 1.9999) + 0.001] \times 0.9$
 $= -0.72044$

$g_c = -1.8011$

Step 5:- $G_m = G_m + (g_m)^2 = 0.7056 + 0.5190 = 1.2246$
 $G_c = G_c + (g_c)^2 = 1.764 + 3.2439 = 20.8839$

Step 6:- $\Delta m = \frac{-0.1}{\sqrt{1.2246 + 10^8}} \times (-0.72044) = 0.065102$

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

Step 7:- $m = 1.9999 + 0.065102 = 2.0650$
 $c = -0.01 + 0.03941 = 0.3931$

Step 8:- $\text{sample} = \text{sample} + 1 = 271 = 378$
 Now go to 9th step

Step 9:- $\text{iter} = \text{iter} + 1 = 112$

Step 10:- $\text{iter} \text{ epoch} \Rightarrow 272 \Rightarrow \text{false}$ go to step 4

Step 4:- $\text{sample} = 1$

Step 5:- $g_m = -(2.5939) \times 0.2 = -0.5187$
 $g_c = -2.5939$

Step 6:- $G_m = G_m + (g_m)^2 = 1.0246 + 0.2690 = 1.4936$
 $G_c = G_c + (g_c)^2 = 20.8839 + 6.7283 = 27.6122$

Step 7:- $\Delta m = \frac{-0.1}{\sqrt{1.4936 + 10^8}} \times (-0.5187) = 0.01789$
 $\Delta c = \frac{-0.1}{\sqrt{27.6122 + 10^8}} \times (-2.5939) = 0.04936$

Step 8:- $m = m + \Delta m = 2.08289$
 $c = c + \Delta c = 0.44246$

Step 9:- $\text{Sample} = \text{sample} + 1 = 1 + 1 = 2 \neq \text{false}$
 go to step 4.

Step 4:- $g_m = -(38 - (2.08289 \times 0.4) - 0.44246)0.$
 $= -2.50972$
 $g_c = -2.5243$

Step 5:- $G_m = 1.4936 + (-1.00972)^2 = 2.5131$
 $G_c = 27.6122 + (-2.5243)^2 = 33.9842$

Step 6:- $\Delta m = \frac{-0.1}{\sqrt{2.5131 + 10^8}} \times (-1.00972) = 0.06369$

$\Delta c = \frac{-0.1}{\sqrt{33.9842 + 10^8}} \times (-2.5243) = 0.0432$

Step-7:- $m = m + \Delta m = 2.08289 + 0.06369 = 2.14658$

$C = C + \Delta C = 0.48576$

Step-8:- $\text{sample} = \text{sample} + 1 = 241 = 37^{\text{th}} \text{ no of sam}$

Step-9:- $\text{iter} = \text{iter} + 1 = 241 \geq 37 \text{ epoch}$

Step-10:- $\text{print}(mse)$

Step-11:- calculate mean square error

$$= \frac{1}{2 \times 2} \sum [y_i - y_p]^2 = \frac{1}{4} \left[(3.4 - (2.14658 \times 0.2) - 0.48576)^2 \right. \\ \left. + (3.8 - (2.14658 \times 6.4) - 0.48576)^2 \right]$$

$mse = 3.05121,$