Assignment-13 18K41A0443.

Manual calculations of ADAGRAD:-

step 1:- $[x,y]$, $\eta=0.1$, epochs $=1$, $m=1$, $c=-1$, $\varepsilon=10^{-8}$,

$G_m=0$, $G_c=0$

step 2:- iter $=1$

step 3:- sample $=1$

step 4:- $g_m=-[y_i-mx_i-c]x_i$

$=-[3.4-(1\times0.2)+1]\times0.2$

$=-0.84$

$g_c=-4.2$

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:- $\Delta m=\frac{-0.01}{\sqrt{0.7056\times10^{-8}}}\times(-0.84)=0.09999$

$\Delta c=\frac{-0.1}{\sqrt{17.64+10^{-8}}}\times(-4.2)=0.09999$

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

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

step 8:- sample = sample $+1=1+1=2$

step 9:- $2>2 \Rightarrow$ false

go to step 4.

step 4:- $g_m=-[y_i-mx_i-c]x_i$

$=-[3.8-(1\times1.9999)+0.001]\times0.4$

$g_m=-0.72044$

$g_c=-1.8011$

Step 5:- $G_m = G_m + (g_m)^2 = 0.7056 + 0.5190 = 1.2246$

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

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:- $m = 1.9999 + 0.065102 = 2.0550$

$c = -0.01 + 0.3941 = 0.3931$

Step 8:- sample = sample + 1 = 2 + 1 = 3 > 2

true go to 9th step

Step 9:- iter = iter + 1 = 1 + 1 = 2

Step 10:- iter > epochs $\Rightarrow$ 2 > 2 $\Rightarrow$ false go to step 4.

Step 4:- sample = 1

Step 5:- $g_m = -(2.5937) \times 0.2 = -0.5187$.

$g_c = -2.5939$

Step 6:- $G_m = G_m + (g_m)^2 = 1.2246 + 0.2690 = 1.4936$

$G_c = G_c + (g_c)^2 = 20.8839 + 6.7283 = 27.612$

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

$\Delta c = \frac{-0.1}{\sqrt{27.61 + 10^{-8}}} \times (-2.5939) = 0.04936$

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

$c = c + \Delta c = 0.44246$

Step 9:- Sample = Sample + 1 = 1 + 1 = 2 > 2 false

go to step 4.

step 4:- $g_m = -[3.8 - (2.08289 \times 0.4) - 0.44246)]$

$= 1.00972$

$g_c = -2.5243$

step 5:- $g_m = 1.4936 + (-1.00972)^2 = 2.5131$

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

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

$\Delta c = \frac{-0.1}{\sqrt{33.9842 + 10^{-8}}} \times (-2.5243) = 0.0433$

step 7:- $m = m + \Delta m = 2.08289 + 0.06369 = 2.1465$

$c = c + \Delta c = 0.48576$

Step 8:- sample = sample+1 = 2+1 = 3 > no. of samples

step 9:- iter = iter + 1 = 2+1 = 3 > epochs.

Step 10:- point (m, c)

Step 11:- Calculate mean square error:

$= \frac{1}{2 \times 2} \Sigma [y_i - y_p]^2 = \frac{1}{4} [(3.4 (2.1465 \times 0.2) - (0.48576)^2 +$

$(3.8 - (2.14658 \times 0.4) - 0.4857)^2]$

mse = 3.05121