

Assignment - 15

Manual calculations.

Step-1: $[x, y]_f$ $\eta = 0.1$, $\beta = 0.9$, epochs = 1, $m = 1$, $c = -1$,

$$\epsilon = 10^{-8}, \epsilon_m = \epsilon_c = 0$$

Step-2: iter = 1

Step-3: sample = 1

$$\text{Step-4: } g_m = -(3.4(1)(0.2) + 1)(0.2) = -0.84$$

$$g_c = -4.2$$

$$\text{Step-5: } \epsilon_m = (0.9)(0) + (0.1)(-0.84)^2 = 0.0705$$

$$\epsilon_c = (0.9)(0) + (0.1)(-4.2)^2 = 1.764$$

$$\text{Step-6: } \Delta m = \frac{-0.1}{\sqrt{0.07 + 10^{-8}}} (-0.84) = 0.317$$

$$\Delta c = \frac{-0.1}{\sqrt{1.764 + 10^{-8}}} (-4.2) = 0.322$$

$$\text{Step-7: } m = m + \Delta m = 1 + (-0.317) = 0.686$$

$$c = c + \Delta c = -1 - 0.322 = -1.322$$

$$\text{Step-8: } \text{sample} = \text{sample} + 1 \\ = 1 + 1 = 2$$

Step-9: if (sample > 15) \Rightarrow (2 > 15) goto step 4

$$\text{Step-10: } g_m = (3.5 - 0.686) \times (0.4) + 1.322(0.4) \\ = -1.93704$$

$$g_c = -4.8476$$

$$\text{Step-11: } \epsilon_m = (0.9) \times (0.0705) + (0.1) \times (-1.93704)^2 \\ = 0.4314$$

$$\epsilon_c = (0.9) \times (1.764) + (0.1) \times (-4.8476)^2 \\ = 3.9375$$

$$\text{Step-12: } \Delta m = \frac{-0.1}{\sqrt{0.4394 + 10^{-2}}} \times (-93904) = 0.2925$$

$$\Delta c = \frac{-0.1}{\sqrt{3.9375 + 10^8}} \times (-4.8476) = 0.2442$$

$$\text{Step-13: } m = m + \Delta m = 0.9785$$

$$c = c + \Delta c = -1.0778$$

$$\text{Step-14: } \text{sample} = \text{sample} + 2 + 13 > \text{no. of samples}$$

$$\text{Step-15: } \text{iter} = 1 + 1 = 2 < \text{epochs}$$

$$\text{Step-16: } \text{sample} = 1$$

$$\text{Step-17: } g_m = -(3.4 - (0.9785 \times 0.2) + 1.0778) \times 0.2$$

$$= -0.85642$$

$$g_c = -4.2521$$

$$\text{Step-18: } \epsilon_m = 0.46957$$

$$\epsilon_c = 5.3773$$

$$\text{Step-19: } \Delta m = \frac{-0.1}{\sqrt{0.46957 + 10^{-3}}} \times (-0.85642) = 0.05868$$

$$\Delta c = \frac{-0.1}{\sqrt{5.3773 + 10^8}} \times (-4.2821) = 0.18466$$

$$\text{Step-20: } m = m + \Delta m = 0.9785 + 0.0586 = 1.0371$$

$$c = c + \Delta c = -1.0778 + 0.18466 = -0.89314$$

$$\text{Step-21: } \text{sample} = \text{sample} + 1$$

$$\text{Step-22: } g_m = -(3.8 - (1.0371 \times 0.4) + 0.89314) \times 0.4$$

$$= -1.71132$$

$$g_c = -4.2783$$

$$\text{Step-23: } \epsilon_m = (0.9) \times (5.3773) + (0.1) \times (-4.2783)$$

$$= 6.6699$$

$$\text{Step-24: } \Delta m = \frac{-0.1}{\sqrt{0.7547 + 10^{-3}}} \times (-1.7132) = 0.20231$$

$$\Delta c = \frac{-0.1}{\sqrt{6.6699 + 10^{-8}}} \times (-4.27883) = 0.16565$$

step-25: $m = m + \Delta m = 1.23941$

$$c = c + \Delta c = 0.72749$$

step-26: sample = 2+1=3 > no! of samples

step-27: iter = iter+1=3 > no! of epochs

step-28: print (m, c) = (1.23941, 0.72749)

step-29: calculating mean square error

$$\begin{aligned} mse &= \frac{1}{2 \times 2} \left[(3.4 - (1.23941 \times 0.2 + 0.72749))^2 + \right. \\ &\quad \left. (3.8 - (1.23941 \times 0.4 + 0.72749))^2 \right] \\ &= 7.82654 \end{aligned}$$