

Steps

$$1) [x, y], \eta = 0.1, \gamma = 0.9, \text{epochs} = 1, m = 1, C = -1, E = 10$$

$$E_m = E_c = 0$$

$$2) \text{iter} = 1$$

$$3) \text{sample} = 1$$

$$4) g_m = -(3.4 - (1)(0.2) + (1)(0.2)) = -0.84$$

$$g_c = -4.2$$

$$5) E_m = (0.9)(0) + (0.1)(-0.84)^2 = 0.0705$$

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

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

$$\Delta c = \frac{-0.1}{\sqrt{1.76 + 10^{-8}}} (-4.2) = 0.322$$

$$7) m = m + \Delta m = 1 + (0.317) = 0.686$$

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

$$8) \text{sample} = \text{sample} + 1 = 1 + 1 = 2$$

$$9) \text{if } (\text{sample} > n_s) \Rightarrow 2 > 2$$

go to step 4

$$10) g_m = -(3.8 - (0.686)(0.4) + 1.322)(0.4) = -1.93964$$

$$g_c = -4.8476$$

$$11) E_m = 0.9 \times (0.0705) + (0.1) \times (-1.93904)^2 \\ = 0.4394$$

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

$$12) \Delta m = \frac{-0.1}{\sqrt{0.4394 + 10^{-9}}} \times (-1.93904) = 0.2925$$

$$\Delta c = \frac{-0.1}{\sqrt{3.9375 + 10^{-9}}} \times (-4.8476) = 0.2442$$

$$13) m = m + \Delta m = 0.9785$$

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

$$14) \text{sample} = \text{sample} + 1 = 2 + 1 = 3 > \text{no of samples}$$

$$15) \text{itr} = 1 + 1 = 2 < \text{epochs}$$

$$16) \text{sample} = 1$$

$$17) g_m = -(3.4 - (0.9785 \times 0.2) + 1.0778) \times 0.2 \\ = 0.85642$$

$$g_c = -4.2821$$

$$18) E_m = (0.9) \times (0.4394) + (0.1) \times (-0.8564) \\ = 0.41957$$

$$E_c = (0.9 \times 3.9375) + (0.1) \times (-4.2821) \\ = 5.3773$$

$$19) \Delta m = \frac{-0.1}{\sqrt{0.4697 + 10^{-8}}} \times (0.85642) = 0.05868$$

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

$$20) m = m + \Delta m = 0.9785 + 0.0586 = 1.0371$$

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

$$21) \text{ sample} = \text{sample} + 1$$

$$22) g_m = -(3.8 - (1.0371 \times 0.4) + 0.89314) \times 0.4 \\ = -1.71132$$

$$\Rightarrow g_c = -4.2783$$

$$23) E_m = (0.9) \times (0.41957) + (0.1) \times (-1.71132) \\ = 0.71547$$

$$E_c = (0.9) \times (5.3773) + (0.1) \times (-4.2783) \\ = 4.6649$$

24)

$$A_m = 0.1$$

$$\sqrt{0.71547 \times 10^{-9}} \times (-1.7132) = 0.20231$$

$$A_c = \frac{-0.1}{\sqrt{6.6699 \times 10^{-8}}}$$

$$\times (-4.2783) = 0.16565$$

25)

$$m = m + \Delta m = 1.0371 + 0.20231 = 1.23941$$

$$c = c + \Delta c = -0.89314 + 0.16565 = -0.72749$$

26)

$$\text{Sample} = 2 + 1 = 37 \text{ no of samples}$$

27)

$$\text{iter} = \text{iter} + 1 = 37 \text{ no of epochs}$$

$$28) \text{ print}(m, c) \Rightarrow (1.23941, -0.72749)$$

29) Mean Square Error

$$mse = \frac{1}{2 \times 2} \left[(3.4 - (1.23941 \times 0.2 + 0.72749))^2 + \right.$$

$$\left. (3.8 - (1.23941 \times 0.4 + 0.72749))^2 \right]$$

$$= \frac{1}{4} [15.05135 + 16.25481]$$

$$mse = 7.82654$$