

## Assignment - 6

### Manual calculation

① Read data

X	Y
7.6	15.7
7.1	1.74

② Data preprocessor using normalization

X	Y
0.428	0.537
0.109	0.612

③ initialization  $m_1 = 1$   $m_2 = 1$ ,  $c = -1$

Max iteration = 1000,  $\eta = 0.1$ , epochs = 1

④ set iter = 1

⑤ set sample  $(i) = 1$

$$\begin{aligned}\frac{dE}{dm_1} &= -1(Y - m_1 * X * X - m_2 * X - c)^* X * X \\ &= -1(0.537 - 1 * (0.4) (0.4) - 1 * (0.4) + 1) (0.4) (0.4) \\ &= -0.1552\end{aligned}$$

$$\begin{aligned}\frac{dE}{dm_2} &= -1(Y - m_1 * X * X - m_2 * X - c)^* X \\ &= -1(0.537 - 1 * (0.4) (0.4) - 1 * (0.4) + 1) * (0.4) \\ &= -0.398\end{aligned}$$



$$\frac{dG}{dC} = -1 * (y - m_1 * x_1 - m_2 * x_2 - C) \\ = -0.97$$

$$7) \Delta m_1 = -\eta \frac{dG}{dm_1} = -0.1(-0.155) = 0.0155$$

$$\Delta m_2 = -\eta \frac{dG}{dm_2} = -0.1(-0.388) = 0.0388$$

$$\Delta C = -\eta \frac{dG}{dC} = -0.1(-0.97) = 0.097$$

$$8) m_1 = m_1 + \Delta m_1 = 1 + 0.0155 = 1.0155$$

$$m_2 = m_2 + \Delta m_2 = 1 + 0.0388 = 1.0388$$

$$C = C + \Delta C = -1 + 0.097 = -0.903$$

$$9) \text{sample } (i) = i+1 \\ i = 1+1=2$$

$$10) \text{if } (\text{sample}(i) \leq n)$$

if  $(2 \leq 2)$  true steps

$$11) \frac{dG}{dm_1} = -(0.42 - 1.0155 * 0.190 + 0.190) - 1.0388 * 0.190 \\ + 0.903 * (0.19) \\ = -0.04624$$



$$\frac{dG}{dm_2} = 1.0612 - 1.015 * 0.190 * 0.190 - 1.038 * 0.190 * 0.903 * 0.190$$

$$= -0.24341$$

$$\frac{dG}{dC} = -0.612 - 1.015 * 0.190 * 0.190 - 1.038 * 0.190 + 0.903$$

$$= -1.281$$

$$7. \Delta m_1 = -\eta \frac{dG}{dm_1} = -0.1 (-0.0462) = 4.62 \times 10^{-3}$$

$$= -\eta \frac{dG}{dm_2} = -0.1 (-0.243) = 0.0243$$

$$= -\eta \frac{dG}{dC} = -0.1 (-1.281) = 0.1281$$

$$8. m_1 = m_1 + \Delta m_1 = 1.0155 + 4.62 \times 10^{-3} = 1.020$$

$$m_2 = m_2 + \Delta m_2 = 1.038 + 0.024 = 1.062$$

$$C = C + \Delta C = -0.903 + 0.1281 = -0.775$$

$$9. \text{sample } (i) = i+1 \quad i=2+1=3$$

$$10. \text{if } (\text{sample } (i) \leq n) \\ \text{if } (3 \leq 2) \text{ false} \rightarrow \text{next step}$$

$$11. \text{iter} = \text{iter} + 1 = 1+1=2$$

$$12. \text{if } (\text{iter} \leq \text{epoch}) \\ \text{if } (2 \leq 1) \rightarrow \text{false} \rightarrow \text{next step}$$

$$13. \text{stop} \\ \text{print } m \text{ and } C$$

$$m = 1.020, 1.062$$

$$C = -0.775$$