2. Long Answer

$net_{h_1} = w_1 \cdot i_1 + w_3 \cdot i_2 + b_1 \cdot 1$

$= 0.24(0.8) + 0.43(0.3) + 1$

$= 0.192 + 0.129 + 1$

$= 1.321$

$net_{h_2} = w_2 \cdot i_1 + w_4 \cdot i_2 + b_2 \cdot 1$

$= 0.67(0.8) + 0.14(0.3) + 1$

$= 0.536 + 0.042 + 1$

$= 1.578$

$out_{h_1} = max(0, 1.321) \rightarrow ReLu$

$= 1.321$

$out_{h_2} = max(0, 1.578) \rightarrow ReLu$

$= 1.578$

$net_{o_1} = h_1 \cdot w2\_1 + h_2 \cdot w2\_3 + b2 \cdot 1$

$= 1.321(0.34) + 1.578(0.81) + 1(1)$

$= 0.44914 + 1.27818 + 1 \rightarrow = 2.72732$

$net_{o_2} = h_1(w2\_2) + h_2(w2\_4) + b2 \cdot 1$

$= 1.321(0.63) + 1.578(0.72) + 1(1)$

$= 0.83223 + 1.13616 + 1$

$= 2.96839$

$out_{o_1} = max(0, 2.72732) \rightarrow ReLu$

$= 2.72732$

$out_{o_2} = max(0, 2.96839) \rightarrow ReLu$

$= 2.96839$

$$E_{total} = \sum \frac{1}{2}(target - output)^2$$

$$E_{o_1} = \frac{1}{2}(target_{o_1} - out_{o_1})^2$$
$$= \frac{1}{2}(0 - 2.72732)^2$$
$$= 3.719137191 2$$

$$E_{o_2} = \frac{1}{2}(target_{o_2} - out_{o_2})^2$$
$$= \frac{1}{2}(1 - 2.96839)^2$$
$$= 1.937279596 05$$

$$E_{total} = E_{o_1} + E_{o_2}$$
$$= 3.719137191 2 + 1.937279596 05$$
$$= 5.656416787 25$$

$$\frac{\partial E_{total}}{\partial out_{h_1}} = -(target_{o_1} - out_{o_1})$$
$$= -(0 - 2.72732) \cdot (-1)(0)$$
$$= 2.72732$$

$$\frac{\partial out_{o_1}}{\partial net_{o_1}} = out_{o_1}(1 - out_{o_1})$$
$$= 2.72732(1 - 2.72732)$$
$$= -4.710954384$$

$$\frac{\partial net_{o_1}}{\partial w_5} = out_{h_1} = 1.321$$

$$\frac{\partial E_{total}}{\partial w_5} = \frac{\partial E_{total}}{\partial out_{o_1}} \cdot \frac{\partial out_{o_1}}{\partial net_{o_1}} \cdot \frac{\partial net_{o_1}}{\partial w_5}$$
$$= 2.72732(-4.710954384)(1.321)$$
$$= -16.9726$$

$$w2\text{-}1^{+} = w2\text{-}1 - \eta \frac{\partial E_{total}}{\partial w} = 0.34 - 0.1(-16.9726) = 2.03726$$

$w2\text{-}1 = 0.2037$

$$w2\_2^{+} = w2\_2 - \eta \frac{\partial E_{total}}{\partial w}$$

$$= 0.63 - 0.1(-18.1489)$$

$$= 2.44489 \rightarrow \boxed{w2\_2 = 0.2447}$$

$$w2\_3^{+} = w2\_3 - \eta \frac{\partial E_{total}}{\partial w}$$

$$= 0.81 - 0.1(-16.9726)$$

$$= 2.50726 \rightarrow \boxed{w2\_3 = 0.2507}$$

$$w2\_4^{+} = w2\_4 - \eta \frac{\partial E_{total}}{\partial w}$$

$$= 0.72 - 0.1(-18.1489)$$

$$= 2.53489$$

$$\boxed{w2\_4 = 0.2535}$$

$$\frac{\partial E_{o_1}}{\partial net_{o_1}} = \frac{\partial E_{o_1}}{\partial out_{n_1}} \cdot \frac{\partial out_{o_1}}{\partial net_{n_1}}$$

$$= -4.7110(2.72732)$$

$$= -12.8484$$

$$\frac{\partial net_{o_1}}{\partial out_{n_1}} = w2\_1 = 0.34$$

$$\frac{\partial E_{o_1}}{\partial out_{n_1}} = -12.8484(0.34)$$

$$= -4.3685$$

$$\frac{\partial E_{o_2}}{\partial net_{o_2}} = -5.8429(1.96839)$$

$$= -11.5011$$

$$\frac{\partial net_{o_2}}{\partial out_{n_2}} = w2\_2 = 0.63$$

$$\frac{\partial E_{total}}{\partial out_{n_2}} = -(target_{o_2} - out_{o_2})$$

$$\partial out_{n_2} = -(1 - 2.96839)$$

$$= 1.96839$$

$$\frac{\partial out_{o_2}}{\partial net_{o_2}} = out_{o_2}(1 - out_{o_2})$$

$$= 2.96839(1 - 2.91839)$$

$$= -5.8429$$

$$\frac{\partial net_{o_2}}{\partial w_{2\text{-}2}} = out_{n_2}$$

$$= 1.578$$

$$\frac{\partial E_{total}}{\partial w_{2\text{-}2}} = 1.96839(-5.8429)(1.578)$$

$$= -18.148879557$$

$\frac{\partial E_{o_2}}{\partial out_{n_2}} = -11.5011(0.63)$

$\frac{\partial out_{n_2}}{} = -7.245693$

$\frac{\partial E_{o_1}}{\partial out_{n_1}} = -12.8484(0.81)$

$= -10.407204$

$\frac{\partial E_{o_2}}{\partial out_{n_2}} = -11.5011(0.72)$

$= -8.820792$

$\frac{\partial E_{o_1}}{\partial out_n} = -10.4073 + (-4.36$

$= -14.7758$

$\frac{\partial E_{o_2}}{\partial out_n} = -7.2457 + (-8.820$

$= -15.526492$

$\frac{\partial E_{total}}{\partial out_{n_1}} = \frac{\partial E_{o_1}}{\partial out_n} + \frac{\partial E_{o_2}}{\partial out_{n_2}} = -14.7758 + 15.526492$

$= 0.7507$

$\frac{\partial out_{n_1}}{\partial net_{n_1}} = out_{n_1}(1 - out_{n_1}) = .47(1 - .47)$

$= 0.2491$

$\frac{\partial net_{n_1}}{\partial w1\_1} = i_1 = 0.8$

$\frac{\partial E_{total}}{\partial w1\_1} = .7507(.2491)(0.8)$

$= .1496$

$\frac{\partial E_{total}}{\partial w1\_2} = .7507(.0819)(0.8) = .0492$

$\frac{\partial E_{total}}{\partial w1\_3} = .7507(.2491)(0.3) = .0561$

$\frac{\partial E_{total}}{\partial w1\_4} = .7507(.0819)(0.3) = .0184$

$\frac{\partial out_{n_2}}{\partial net_2} = .09(1 - .09)$

$= 0.0819$

$w1\_1 = 0.1496$

$w1\_2 = 0.492$

$w1\_3 = 0.561$

$w1\_4 = 0.184$