

$$3-3) \eta = 0.1$$

$$\boxed{1} W_{2,1}^{(1)}$$

$$\frac{\partial J_{total}}{\partial W_{2,1}^{(1)}} = \left( \frac{\partial J_1}{\partial a_1^{(2)}} + \frac{\partial J_2}{\partial a_1^{(2)}} \right) \cdot \frac{\partial a_1^{(2)}}{\partial W_{2,1}^{(1)}} \cdot W_{1,2}^{(1)}$$

$$\boxed{2} W_{2,2}^{(2)} = \frac{\partial J_2}{\partial a_2^{(3)}} \times \frac{\partial a_2^{(3)}}{\partial z_2^{(3)}} \times \frac{\partial z_2^{(3)}}{\partial W_{2,2}^{(2)}}$$

$$\boxed{1} \frac{\partial J_1}{\partial a_1^{(2)}} \times \frac{\partial a_1^{(2)}}{\partial z_1^{(2)}} \times \frac{\partial z_1^{(2)}}{\partial a_2^{(2)}} \times \frac{\partial a_2^{(2)}}{\partial z_2^{(2)}} \times \frac{\partial z_2^{(2)}}{\partial W_{2,1}^{(1)}} + \frac{\partial J_2}{\partial a_2^{(3)}} \times \frac{\partial a_2^{(3)}}{\partial z_2^{(3)}} \times \frac{\partial z_2^{(3)}}{\partial a_2^{(2)}} \times \frac{\partial a_2^{(2)}}{\partial z_2^{(2)}} \times \frac{\partial z_2^{(2)}}{\partial W_{2,1}^{(1)}}$$

$$\textcircled{1} \frac{\partial J_1}{\partial a_1^{(2)}} = \frac{\partial}{\partial a_1^{(2)}} (a_1^{(2)} - y_1)^2 = (a_1^{(2)} - y_1) \quad 0.57 - 0.5 = 0.07$$

$$\textcircled{2} \frac{\partial a_1^{(2)}}{\partial z_1^{(2)}} = \sigma(z_1^{(2)}) (1 - \sigma(z_1^{(2)})) = a_1^{(2)} (1 - a_1^{(2)})$$

$$= 0.57(1 - 0.57)$$

$$= 0.57(0.43)$$

$$= 0.245$$

$$\textcircled{3} z_1^{(2)} = a_1^{(1)} \times W_{1,1}^{(2)} + a_2^{(1)} \times W_{1,2}^{(2)}$$

$$\textcircled{4} = 0.54 \times 0.4 + 0.54 \times 0.15 = 0.3 \quad \text{and} \quad \frac{\partial z_1^{(2)}}{\partial a_2^{(1)}} = W_{1,2}^{(2)} = 0.15$$

$$\textcircled{5} \frac{\partial a_2^{(2)}}{\partial z_2^{(2)}} \times \frac{\partial z_2^{(2)}}{\partial a_2^{(1)}} = 0.124$$

$$\textcircled{6} a_2^{(2)} - y_2 = 0.61 - 0.8 = -0.19$$

$$\textcircled{7} 0.61 \times 0.39 = 0.24$$

$$\textcircled{8} 0.45$$

$$\textcircled{9} 0.54 \times 0.46 \times \frac{1}{2} = 0.124$$

$$\frac{\partial E_t}{\partial W_{2,1}^{(1)}} = 0.0003 + (-0.0003) = 0$$

$$\therefore W_{2,1}^{(1)} = 0.2 - 0.1(0) = 0.2$$

$$\textcircled{2} = \textcircled{5} \times \textcircled{6} \times 0.54 = -0.025$$

$$W_{2,2}^{(1)} = 0.45 - 0.1(-0.025) = 0.453$$