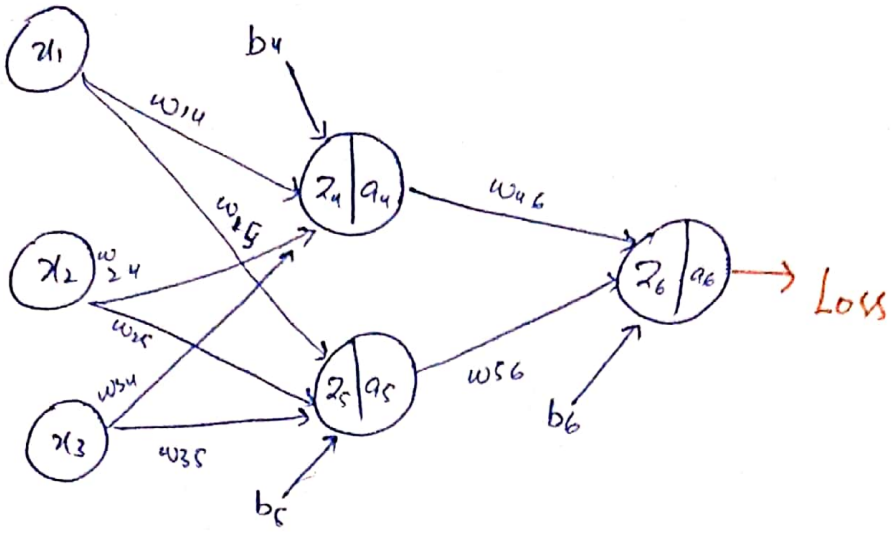



$$z_4 = w_{14}x_1 + w_{24}x_2 + w_{34}x_3 + b_4$$

$$a_4 = \text{sigmoid}(z_4)$$

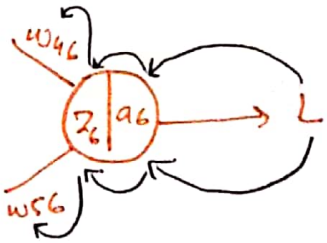
$$z_5 = w_{15}x_1 + w_{25}x_2 + w_{35}x_3 + b_5$$

$$a_5 = \text{sigmoid}(z_5)$$

$$z_6 = w_{46}a_4 + w_{56}a_5 + b_6$$

$$a_6 = \text{sigmoid}(z_6)$$

$$L = \frac{1}{2}(y - a_6)^2$$




$$\frac{\partial L}{\partial w_{46}} = \frac{\partial L}{\partial a_6} \cdot \frac{\partial a_6}{\partial z_6} \cdot \frac{\partial z_6}{\partial w_{46}}$$

$$\boxed{\frac{\partial L}{\partial w_{46}} = -(y - a_6)\, a_6(1 - a_6)\, a_4}$$

$$w_{46}^{+} = w_{46} - \eta \frac{\partial L}{\partial w_{46}}$$

$$\frac{\partial L}{\partial w_{56}} = \frac{\partial L}{\partial a_6} \cdot \frac{\partial a_6}{\partial z_6} \cdot \frac{\partial z_6}{\partial w_{56}}$$

$$\boxed{\frac{\partial L}{\partial w_{56}} = -(y - a_6)\, a_6\, (1 - a_6)\, a_5}$$

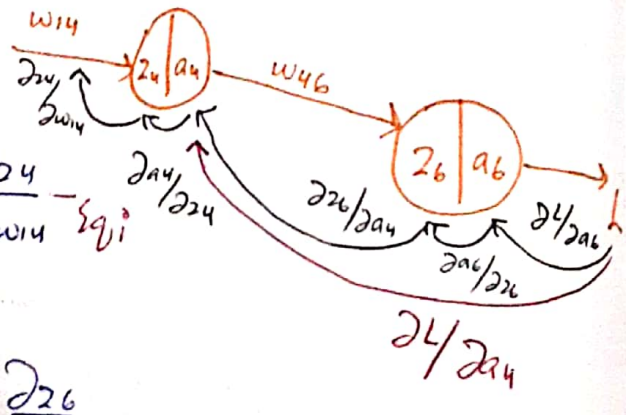
$$\frac{\partial L}{\partial b_6} = \frac{\partial L}{\partial a_6} \cdot \frac{\partial a_6}{\partial z_6} \cdot \frac{\partial z_6}{\partial b_6}$$

$$\boxed{\frac{\partial L}{\partial b_6} = -(y - a_6)\, a_6\, (1 - a_6)}$$

$$w_{56}^{+} = w_{56} - \eta \frac{\partial L}{\partial w_{56}}$$

$$b_6^{+} = b_6 - \eta \frac{\partial L}{\partial b_6}$$

For Hidden Layer:




$$\frac{\partial L}{\partial w_{14}} = \frac{\partial L}{\partial a_4} \cdot \frac{\partial a_4}{\partial z_4} \cdot \frac{\partial z_4}{\partial w_{14}} - \text{Eqi}$$

$$\frac{\partial L}{\partial a_4} = \frac{\partial L}{\partial a_6} \cdot \frac{\partial a_6}{\partial z_6} \cdot \frac{\partial z_6}{\partial a_4}$$

$$\partial L/\partial a_4 = -(y - a_6)\, a_6 (1 - a_6)\, w_{46}$$

Plugging $\frac{\partial L}{\partial a_4}$ in Eq i°

$$\frac{\partial L}{\partial w_{14}} = -(y-a_6)\,a_6(1-a_6)\,w_{46}\,a_4(1-a_4)\,x_1$$

$$w_{14}^{+} = w_{14} - \eta \frac{\partial L}{\partial w_{14}}$$

$$\frac{\partial L}{\partial w_{24}} = -(y-a_6)\,a_6(1-a_6)\,w_{46}\,a_4(1-a_4)\,x_2$$

$$\frac{\partial L}{\partial w_{34}} = -(y-a_6)\,a_6(1-a_6)\,w_{46}\,a_4(1-a_4)\,x_3$$

$$\frac{\partial L}{\partial b_4} = -(y-a_6)\,a_6(1-a_6)\,w_{46}\,a_4(1-a_4)$$

$$w_{24}^{+} = w_{24} - \eta\, \partial L/\partial w_{24}$$

$$w_{34}^{+} = w_{34} - \eta\, \partial L/\partial w_{34}$$

$$w_{b4}^{+} = b_4 - \eta\, \partial L/\partial b_4$$

$$\frac{\partial L}{\partial w_{15}} = -(y-a_6)\,a_6(1-a_6)\,w_{56}\,a_5(1-a_5)\,x_1$$

$$\frac{\partial L}{\partial w_{25}} = -(y-a_6)\,a_6(1-a_6)\,w_{56}\,a_5(1-a_5)\,x_2$$

$$\frac{\partial L}{\partial w_{35}} = -(y-a_6)\,a_6(1-a_6)\,w_{56}\,a_5(1-a_5)\,x_3$$

$$\frac{\partial L}{\partial b_5} = -(y-a_6)\,a_6(1-a_6)\,w_{56}\,a_5(1-a_5)$$