Forward

$y_1 = 1 \times 2 + -1 \times 1 = 1$

$y_2 = 1 \times 0 + -1 \times -1 = 1$

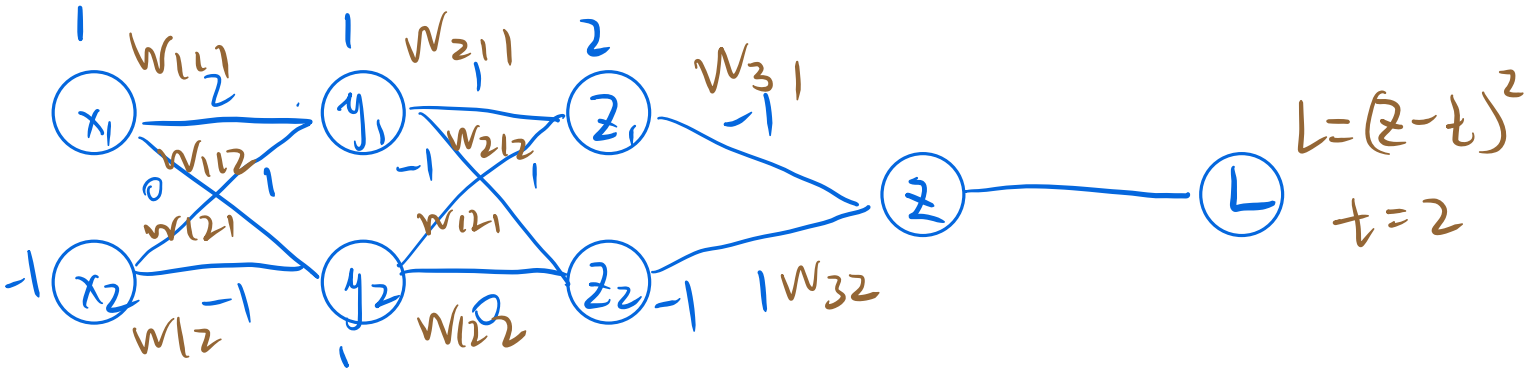
$z_1 = y_1 \times 1 + y_2 \times 1 = 2$

$z_2 = y_1 \times -1 + y_2 \times 0 = -1$

$z = z_1 \times -1 + z_2 \times 1 = -3$

$\therefore L = (z-t)^2 = 25$

Backword



$$\frac{\partial L}{\partial z} = 2(z-t) = -10$$

$$\frac{\partial L}{\partial w_{31}} = \frac{\partial L}{\partial z} \cdot \frac{\partial z}{\partial w_{31}} = -20$$

$$\frac{\partial L}{\partial w_{32}} = \frac{\partial L}{\partial z} \cdot \frac{\partial z}{\partial w_{32}} = 10$$

$$\frac{\partial L}{\partial z_1} = \frac{\partial L}{\partial z} \cdot \frac{\partial z}{\partial z_1} = 10$$

$$\frac{\partial L}{\partial z_2} = \frac{\partial L}{\partial z} \cdot \frac{\partial z}{\partial z_2} = -10$$

$$\frac{\partial L}{\partial W_{2,1,1}} = \frac{\partial L}{\partial z_1} \cdot \frac{\partial z_1}{\partial W_{2,1,1}} = 10 \cdot y_1 = 10$$

$$\frac{\partial L}{\partial W_{2,2,1}} = \frac{\partial L}{\partial z_1} \cdot \frac{\partial z_1}{\partial W_{2,2,1}} = 10 \cdot y_2 = 10$$

$$\frac{\partial L}{\partial W_{2,1,2}} = \frac{\partial L}{\partial z_2} \cdot \frac{\partial z_2}{\partial W_{2,1,2}} = -10 \cdot y_1 = -10$$

$$\frac{\partial L}{\partial W_{2,2,2}} = \frac{\partial L}{\partial z_2} \cdot \frac{\partial z_2}{\partial W_{2,2,2}} = -10 \cdot y_2 = -10$$

$$\frac{\partial L}{\partial y_1} = \frac{\partial L}{\partial z_1} \cdot \frac{\partial z_1}{\partial y_1} + \frac{\partial L}{\partial z_2} \cdot \frac{\partial z_2}{\partial y_1}$$
$$= 10 \cdot W_{2,1,1} + -10 \cdot W_{2,1,2} = 20$$

$$\frac{\partial L}{\partial y_2} = \frac{\partial L}{\partial z_2} \cdot \frac{\partial z_2}{\partial y_1} + \frac{\partial L}{\partial z_2} \cdot \frac{\partial z_2}{\partial y_2}$$
$$= 10 \cdot W_{2,2,1} + -10 \cdot W_{2,2,2} = 10$$

$$\frac{\partial L}{\partial W_{1,1,1}} = \frac{\partial L}{\partial y_1} \cdot \frac{\partial y_1}{\partial W_{1,1,1}} = 20 \cdot x_1 = 20$$

$$\frac{\partial L}{\partial W_{1,2,1}} = \frac{\partial L}{\partial y_1} \cdot \frac{\partial y_1}{\partial W_{1,2,1}} = 20 \cdot x_2 = -20$$

$$\frac{\partial L}{\partial W_{1,1,2}} = \frac{\partial L}{\partial y_2} \cdot \frac{\partial y_2}{\partial W_{1,1,2}} = 10 \cdot x_1 = 10$$

$$\frac{\partial L}{\partial W_{1,2,2}} = \frac{\partial L}{\partial y_2} \cdot \frac{\partial y_2}{\partial W_{1,2,2}} = 10 \cdot x_2 = -10$$

$$\frac{\partial L}{\partial x_1} = \frac{\partial L}{\partial y_1} \cdot \frac{\partial y_1}{\partial x_1} + \frac{\partial L}{\partial y_1} \cdot \frac{\partial y_1}{\partial x_1}$$

$$= -20 \cdot w_{111} + -20 \cdot w_{112} = 40$$

$$\frac{\partial L}{\partial x_2} = \frac{\partial L}{\partial y_2} \cdot \frac{\partial y_2}{\partial x_2} + \frac{\partial L}{\partial y_2} \cdot \frac{\partial y_2}{\partial x_2}$$

$$= 10 \cdot w_{121} + 10 \cdot w_{122} = 10$$