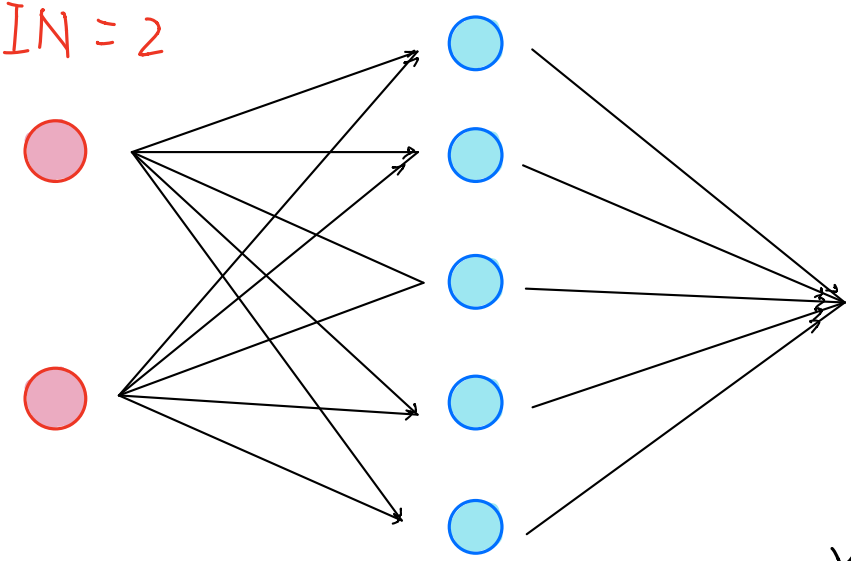
Train an OR gate

input

hidden

$h = 5$

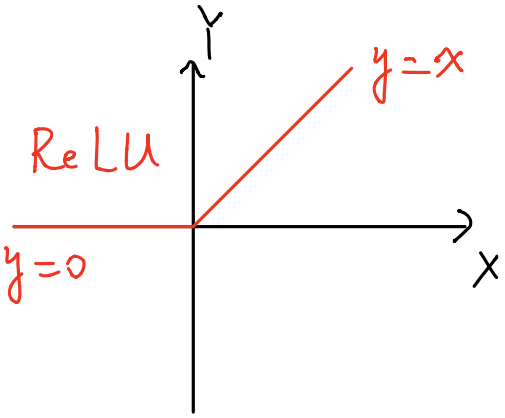
$D\_IN = 2$



output

$D\_OUT = 1$

$$X = \begin{bmatrix} 1 & 1 \\ 1 & 0 \\ 0 & 1 \\ 0 & 0 \end{bmatrix} \qquad Y = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 0 \end{bmatrix}$$



forward:

$$H = X \cdot w1, \quad HR = \mathrm{ReLU}(H)$$

$$YP = HR \cdot w2.$$

$$loss = \frac{1}{N_0} \sum (y_p - y)^2$$

backward:

$$\frac{\partial L}{\partial w_2} = \frac{\partial L}{\partial YP} \cdot \frac{\partial YP}{\partial w_2} = \frac{1}{N_0} 2(y_p - y) h_r$$

$$\frac{\partial L}{\partial w_1} = \frac{\partial L}{\partial y_p} \cdot \frac{\partial y_p}{\partial h_r} \frac{\partial h_r}{\partial w_1} = \frac{1}{N_0} 2(y_p - y) w_2 x$$

$$w_1 -= \eta \cdot \frac{\partial L}{\partial w_1} \qquad w_2 -= \eta \cdot \frac{\partial L}{\partial w_2}$$

Lian Tongda
Tokyo Institute of Technology