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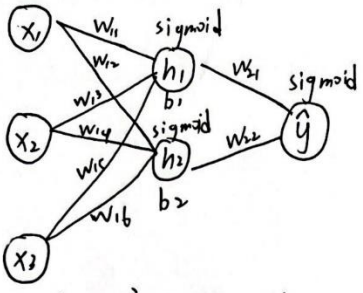
1. Let $\hat{y} = P(y=1|x)$ where $x \in R^3$, The label y will be 1 if $\hat{y} \geq 0.5$, otherwise y will be 0

Network structure:



The network has 3 input nodes, 2 hidden nodes and 1 output node.

The activation function is $\text{sigmoid}(x) = \frac{1}{1+e^{-x}}$

Data: $D = \{(x^{(n)}, y^{(n)}) \mid y^{(n)} \in \{0,1\}\}_{n=1}^{8}$ Learning rate: $\beta = 0.01$

Loss function: Cross Entropy Loss $L_{CE} = -(y \log \hat{y} + (1-y)\log(1-\hat{y}))$

Train process:

Iterate epoch number times:

for $i = 1$ to 8

forward $x^{(i)}$ to the network and obtain $\hat{y}^{(i)}$

compute L_{CE} based on $y^{(i)}$ and $\hat{y}^{(i)}$

backpropagate and uptate $W = W - \frac{\partial L_{CE}}{\partial W} \cdot \beta$

end for

End Loop

2、 Since there are five base learner for a binary classification problem.

The ensemble error rate

$$\varepsilon_{ens} = \sum_{i=\text{floor}(\frac{5}{2})+1}^{5} \binom{5}{i} \varepsilon^i (1-\varepsilon)^{5-i} = \sum_{i=3}^{5} \binom{5}{i} \varepsilon^i (1-\varepsilon)^{5-i}$$

When $\varepsilon = 0.35$

$$\varepsilon_{ens} = 10 \times (0.35)^3 \times (0.65)^2 + 5 \times (0.35)^4 \times (0.65)^1 + 1 \times (0.35)^5$$

$$= 0.2352$$