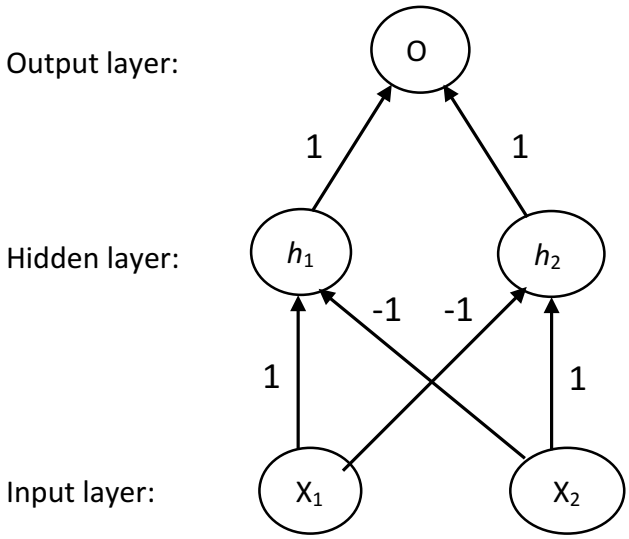


**repeat**
  **for each** $e$ **in** *examples* **do**
    **for each** node $j$ in the input layer **do** $a_j \leftarrow x_j[e]$
    **for** $\ell = 2$ **to** $M$ **do**
      $in_i \leftarrow \sum_j W_{j,i}\, a_j$
      $a_i \leftarrow g(in_i)$
    **for each** node $i$ in the output layer **do**
      $\Delta_i \leftarrow g'(in_i) \times (y_i[e] - a_i)$
    **for** $\ell = M - 1$ **to** 1 **do**
      **for each** node $j$ in layer $\ell$ **do**
        $\Delta_j \leftarrow g'(in_j) \sum_i W_{j,i}\, \Delta_i$
        **for each** node $i$ in layer $\ell + 1$ **do**
          $W_{j,i} \leftarrow W_{j,i} + \alpha \times a_j \times \Delta_i$
**until** some stopping criterion is satisfied

Sigmoid activation function
Learning rate 0.7
Fill in the table independently of prior weight adjustments
https://www.tinkershop.net/ml/sigmoid_calculator.html

## XOR FFNet Perceptron

| X1 | X2 | y | $h_1$ | $h_2$ | $h'_1$ | $h'_2$ | O | O' | E | $\Delta w_{h1\text{-}o}$ | $\Delta w_{h2\text{-}o}$ | $w_{h1\text{-}o}$ | $w_{h2\text{-}o}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | **0** | 0 | | | | | | | | | | | |
| **0** | **1** | 1 | | | | | | | | | | | |
| **1** | **0** | 1 | | | | | | | | | | | |
| **1** | **1** | 0 | | | | | | | | | | | |

| X1 | X2 | $\Delta w_{x1\text{-}h1}$ | $\Delta w_{x1\text{-}h2}$ | $w_{x1\text{-}h1}$ | $w_{x1\text{-}h2}$ | $\Delta w_{x2\text{-}h1}$ | $\Delta w_{x2\text{-}h2}$ | $w_{x2\text{-}h1}$ | $w_{x2\text{-}h2}$ |
|---|---|---|---|---|---|---|---|---|---|
| **0** | **0** | | | | | | | | |
| **0** | **1** | | | | | | | | |
| **1** | **0** | | | | | | | | |
| **1** | **1** | | | | | | | | |