Neural Network Alogorithms

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1 Calculating a Node's Input

Foreach node in each layer:

$$net_i = \sum_{j=1}^{J} w_{ij} o_j$$

Where i is the node in question, j is a node in the previous layer that has J total nodes, w_{ij} is the weight of the connection between i and j and o_j is the output of node j.

2 Output Layer Error

Foreach node in the output layer:

$$\delta_k^o = (y_k - o_k) f'(net_k^o)$$

Where y_k is the correct output of the node in the output layer, o_k is the actual output of the node, f is the activation function and net_k^o is the nodes output before the activation function is applied.

3 Hidden Layer Error

Foreach node in each hidden layer:

$$\delta_j^h = f'(net_j^h) \sum_{i=1}^{I} \delta_i w_{ij}$$

Where f is the activation function and net_k^o is the nodes output before the activation function is applied, i is a node in the subsequent layer from layer h, with the subsequent layer having I nodes. δ_i is the error of node i, and w_{ij} is the weight of the connection between node j in the hidden layer and node i in the subsequent layer.

4 Weight Update

Foreach node in each each layer, starting in the input layer:
$w_{ji}^{new} = w_{ji}^{old} + \eta \delta_j f(net_i)$

The new weight of the connection from node i in one layer to node j in the next layer is the old weight, w_{ji}^{old}, plus the product of η, the error of node j, and the output of node i that is received by node j. η is a constant that is used to adjust the magnitude of the change to weights.