

Brief Description in English

Diagram of a neural network with two input nodes (input 1, input 2), two hidden nodes (hidden 1, hidden 2), and two output nodes (output 1, output 2). Weights are labeled w_1 through w_8 . Bias nodes are shown at the top.

backpropagation:

output \rightarrow hidden. ie. w_5

$$w_5^+ = w_5 - \eta \frac{\partial E_{total}}{\partial w_5}$$

$$\frac{\partial E_{total}}{\partial w_5} = \frac{\partial E_{total}}{\partial output1} \times \frac{\partial output1}{\partial net1} \times \frac{\partial net1}{\partial w_5}$$

ie. loss function = MSE

$$\delta \left(\frac{1}{2} (target1 - output1)^2 + \frac{1}{2} (target2 - output2)^2 \right) / \partial output1$$

$$\textcircled{1} = -(target1 - output1)$$

sigmoid's derivative

$$\textcircled{2} = output1(1 - output1)$$

$$\textcircled{3} = output1$$

Let $\delta = \textcircled{1} \times \textcircled{2}$ (constant value)

$$\therefore w_5^+ = w_5 - \eta \times \delta_{output1} \times output1$$

hidden \rightarrow input: ie. w_1

$$w_1^+ = w_1 - \eta \frac{\partial E_{total}}{\partial w_1}$$

$$\frac{\partial E_{total}}{\partial w_1} = \frac{\partial E_{total}}{\partial output1} \times \frac{\partial output1}{\partial net1} \times \frac{\partial net1}{\partial w_1}$$

sigmoid derivative

input 1

final formula:

$$w_1^+ = w_1 - \eta (\delta_{output1} \times w_5 + \delta_{output2} \times w_6) \times \text{sigmoid derivative} \times \text{input1}$$

ie. sigmoid

neuron model:

Draft in Chinese

