

W1L1

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1 Intro

McCulloch and Pitts model

$$s = w_1x_1 + w_2x_2 + w_0$$
$$g = \text{bool} :: (s > 0)$$

Where s is the firing index, g is the transfer function.

Example perceptrons

AND perceptrons $w_1 = w_2 = 1, w_0 = -1.5$

OR perceptrons $w_1 = w_2 = 1, w_0 = -0.5$

NOR perceptrons $w_1 = w_2 = -1, w_0 = 0.5$

Backpropagation

Take a 2-layer MLP with two receptors at each layer, we have backprop DEs,

$$\frac{\partial E}{\partial z} = z - t$$
$$\frac{dz}{ds} = g'(s) = z(1 - z)$$
$$\frac{\partial s}{\partial y_1} = v_1$$
$$\frac{dy_1}{du_1} = y_1(1 - y_1)$$

ADAM

Maintain a running average of gradients (m_t) and squared gradients v_t for each weight in network

$$\begin{aligned}m_t &= \beta_1 m_{t-1} + (1 - \beta_1) g_t \\v_t &= \beta_2 v_{t-1} + (1 - \beta_2) g_t^2\end{aligned}$$