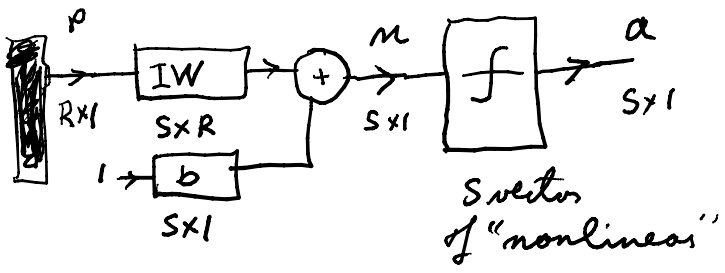
EE434
01/30/08



S = # of neurons in the layer

new ff cascades these

$$y(x) = \tanh(x) = \frac{\sinh(x)}{\cosh(x)} = \frac{(e^{x}-e^{-x})/2}{(e^{x}+e^{-x})/2}$$

n = 2/(1+exp(-2*n))-1

$$\Rightarrow y = \frac{2}{1+e^{-2x}} - 1$$

$$= \frac{2-1-e^{-2x}}{1+e^{-2x}} = \frac{1-e^{-2x}}{1+e^{-2x}} \times \frac{e^{x}}{e^{x}} = \frac{e^{x}-e^{-x}}{e^{x}+e^{-x}}$$

$$= \tanh x = \text{tansig}(x)$$

$$\frac{dy(x)}{dx} = \frac{d\left((e^{x}-e^{-x})/(e^{x}+e^{-x})\right)}{dx} = \frac{d\left[\frac{2}{1+e^{-2x}} - 1\right]}{dx} = \frac{-1}{(1+e^{-2x})^{2}} \times (-2e^{-2x})$$

$$= \frac{2}{(e^{2x}+1)(1+e^{-2x})} = \frac{2}{2+e^{2x}+e^{-2x}}$$

$$= \frac{d\left(\sinh x/\cosh x\right)}{dx} = \frac{\cosh(x)}{\cosh(x)} + \sinh x\left(\frac{-1}{\cosh^{2} x}\right)(\sinh x)$$

$$= 1-\left(\frac{\sinh(x)}{\cosh(x)}\right)^{2} = 1-\tanh^{2} x = 1-y^{2}(x)$$

useful for back-propagation