

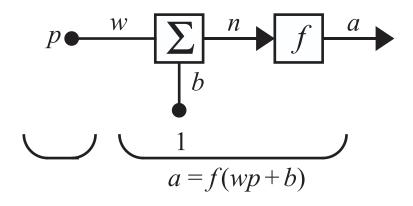
# Neuron Model and Network Architectures

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# Single-Input Neuron



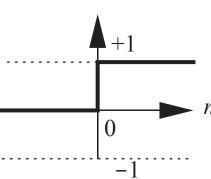




#### Transfer Functions









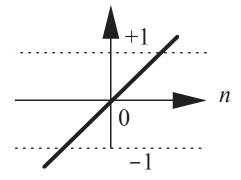
a = hardlim(n)

#### a = hardlim(wp + b)

-b/w

#### Hard Limit Transfer Function





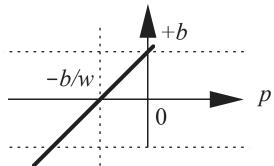


$$a = purelin(n)$$

#### **Linear Transfer Function**

Single-Input hardlim Neuron

a

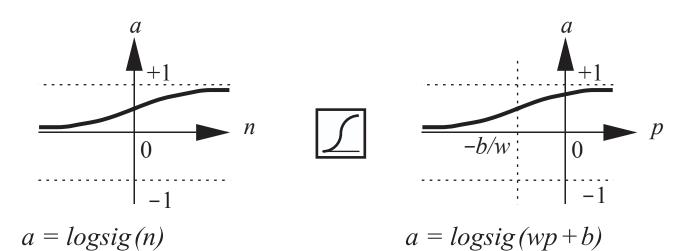


$$a = purelin(wp + b)$$

Single-Input purelin Neuron

#### **Transfer Functions**





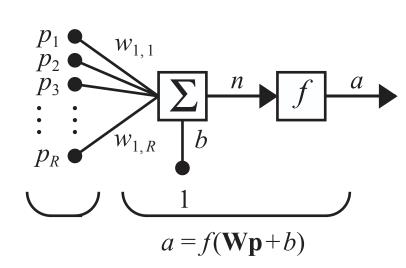
Log-Sigmoid Transfer Function

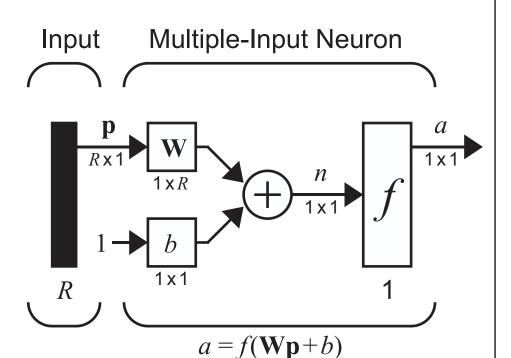
Single-Input logsig Neuron

# Multiple-Input Neuron





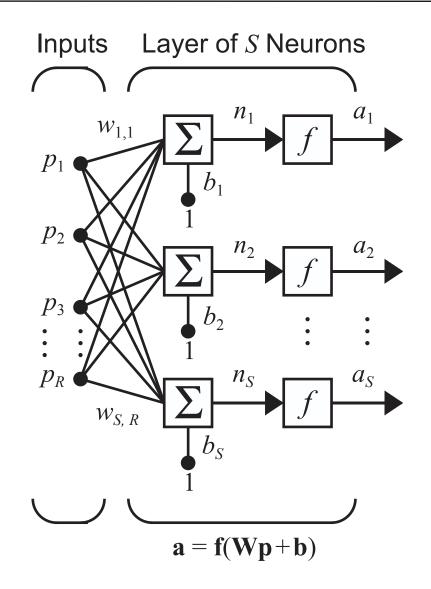




**Abreviated Notation** 

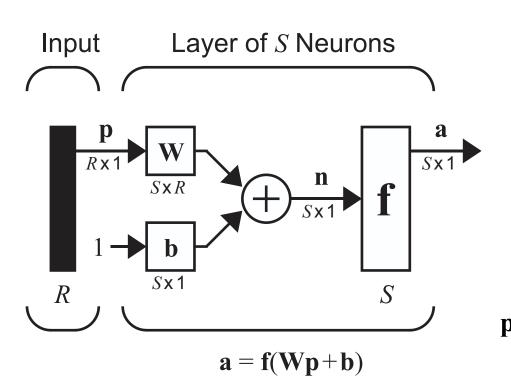
# Layer of Neurons





#### Abbreviated Notation





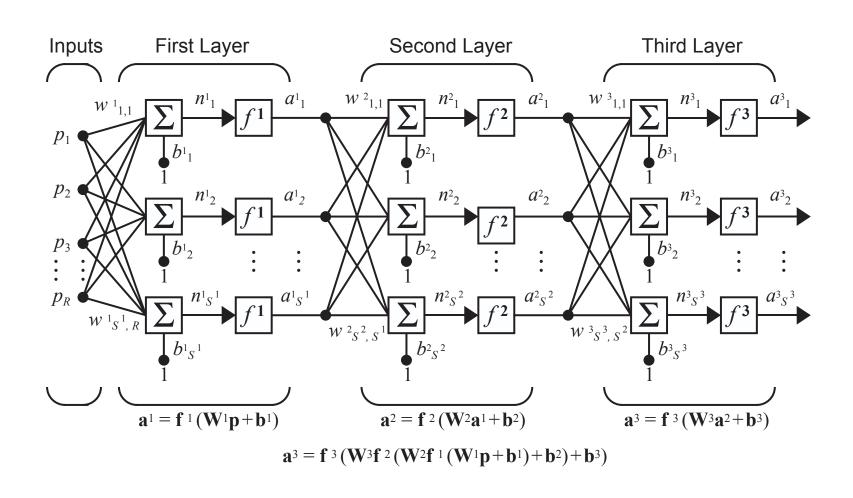
$$\mathbf{W} = \begin{bmatrix} w_{1,1} & w_{1,2} & \cdots & w_{1,R} \\ w_{2,1} & w_{2,2} & \cdots & w_{2,R} \\ \vdots & \vdots & & \vdots \\ w_{S,1} & w_{S,2} & \cdots & w_{S,R} \end{bmatrix}$$

$$\mathbf{p} = \begin{bmatrix} p_1 \\ p_2 \\ \vdots \\ p_R \end{bmatrix} \quad \mathbf{b} = \begin{bmatrix} b_1 \\ b_2 \\ \vdots \\ b_S \end{bmatrix} \quad \mathbf{a} = \begin{bmatrix} a_1 \\ a_2 \\ \vdots \\ a_S \end{bmatrix}$$

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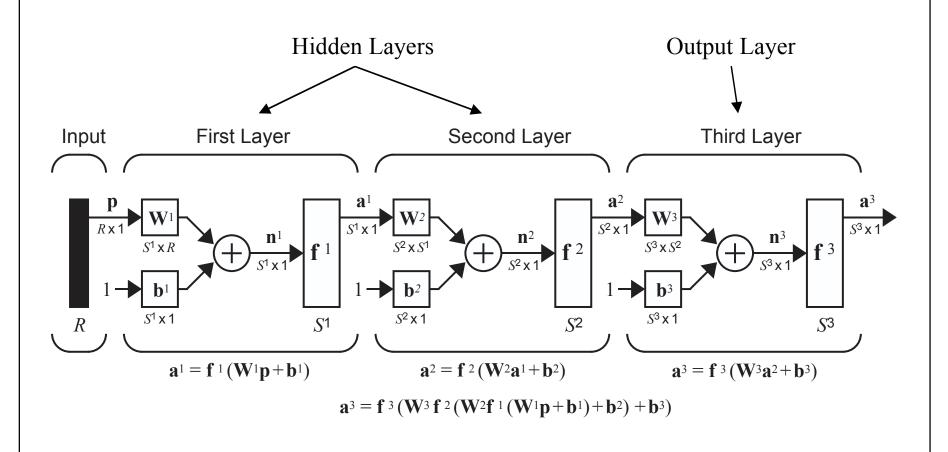
### Multilayer Network





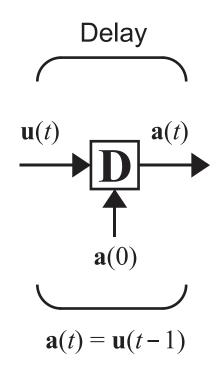
#### Abreviated Notation

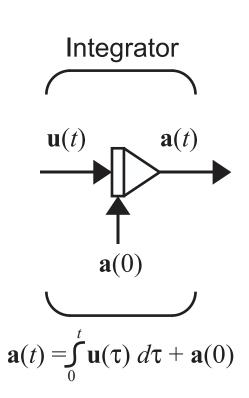




### Delays and Integrators

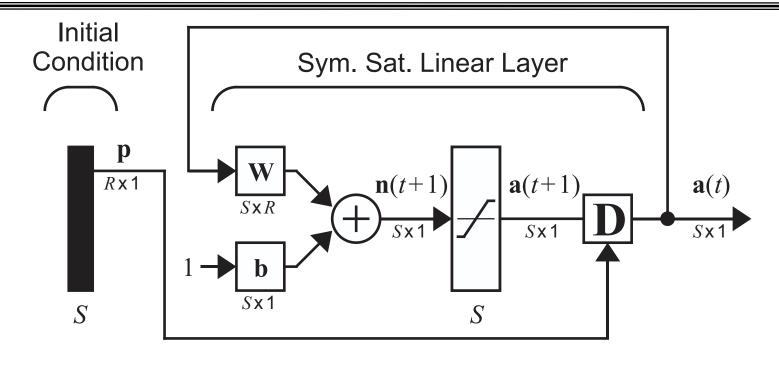






#### Recurrent Network





$$\mathbf{a}(0) = \mathbf{p}$$
  $\mathbf{a}(t+1) = \mathbf{satlin}(\mathbf{W}\mathbf{a}(t)+\mathbf{b})$ 

$$\mathbf{a}(1) = \mathbf{satlins}(\mathbf{Wa}(0) + \mathbf{b}) = \mathbf{satlins}(\mathbf{Wp} + \mathbf{b})$$

$$\mathbf{a}(2) = \mathbf{satlins}(\mathbf{Wa}(1) + \mathbf{b})$$