Artificial Neural Networks (ANNs) Basics

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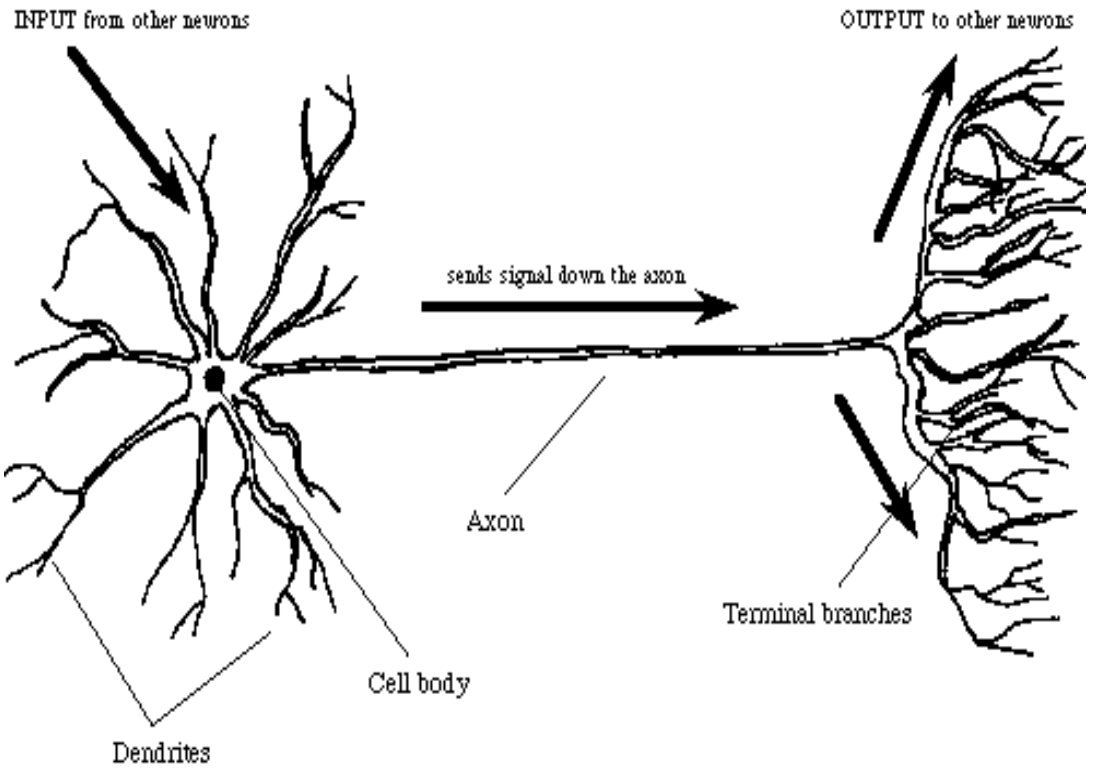
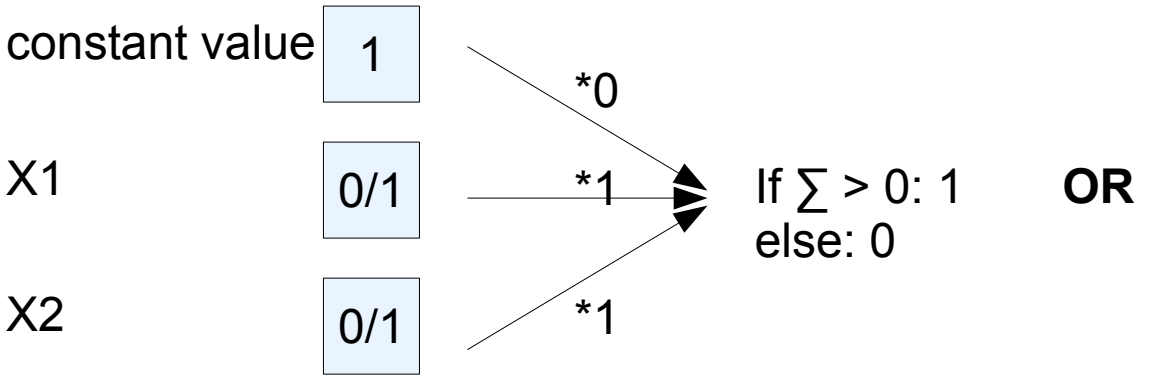
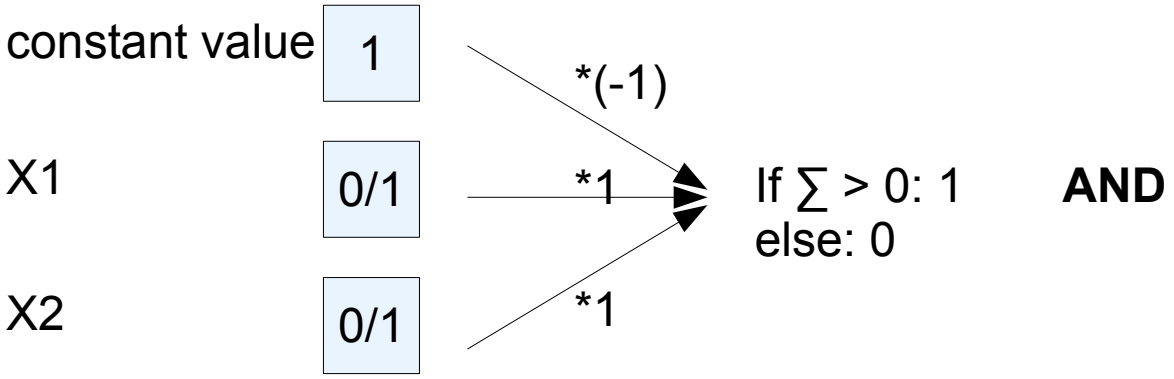

INPUT from other neurons
OUTPUT to other neurons
sends signal down the axon
Axon
Terminal branches
Cell body
Dendrites

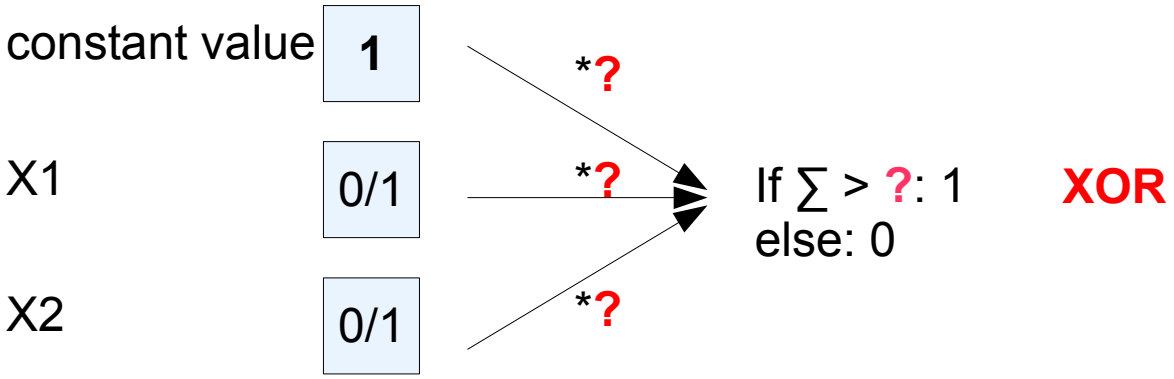
Simple perceptrons, with a unique layer



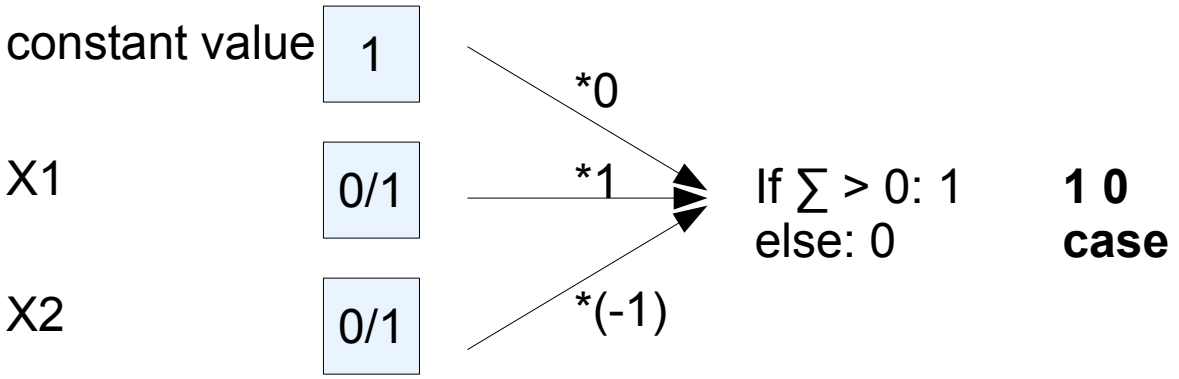


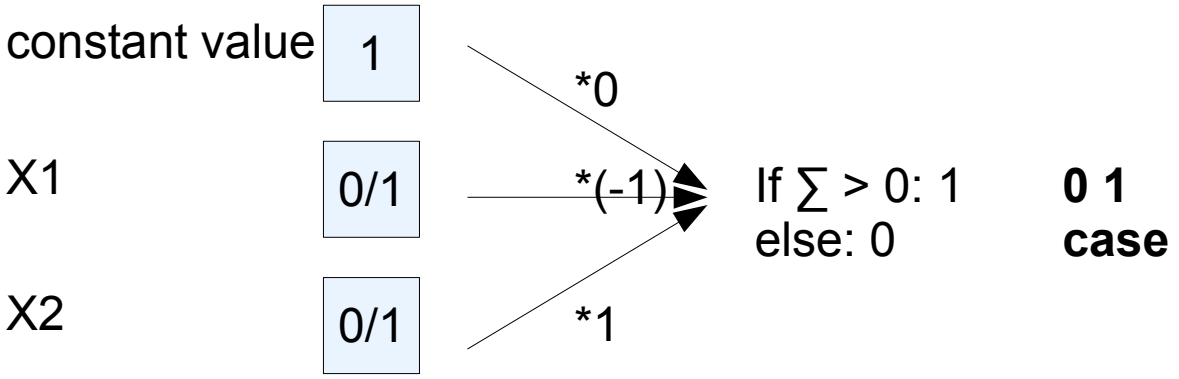
What if **XOR** ?

X2 \ X1	F	T
F	F	T
T	T	F

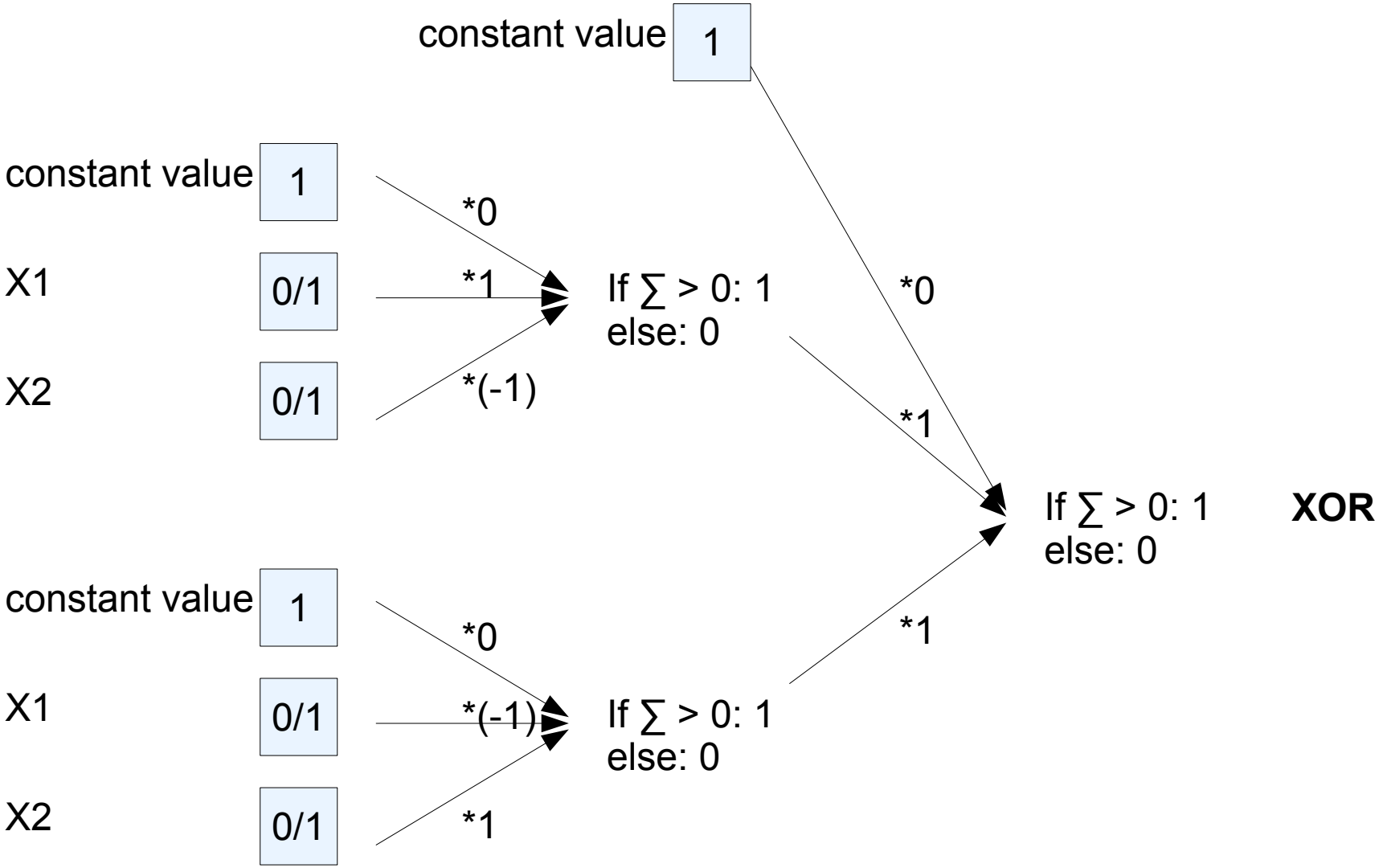


Specialized perceptrons



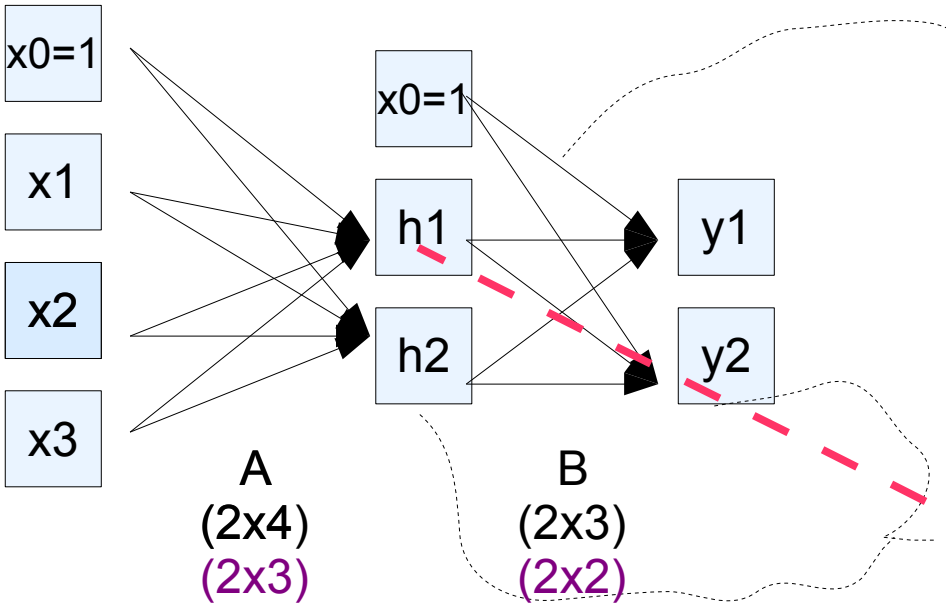


Two layers for the XOR problem



- The Minsky and Papert “error”
- The algorithmic solution
- The genetic algorithm solution

The plain vanilla ANN structure



On each arrow we have a coefficient or 'weight', such as a01, b12, ...

Within these boxes or neurons of nodes we have

$$f(\sum x_i a_{1i}) \text{ etc.}$$

Ignoring constant values

$$y = f\,(B\ f(Ax))$$

With constant values

$$y = f(B\ (1,\ f(\ A(1,\ x')'\ )'\ )'\ )$$

Estimating A and B

We have **n** vectors *x* and *y*: only 4 in the XOR case; medium or huge numbers in other cases, such as classification, time series …

How to proceed?

(n is the number of cases)

$$\text{Min} \sum_n E = \sum_i [y_{n,i} - F\_ann(x_n)_i]^2$$