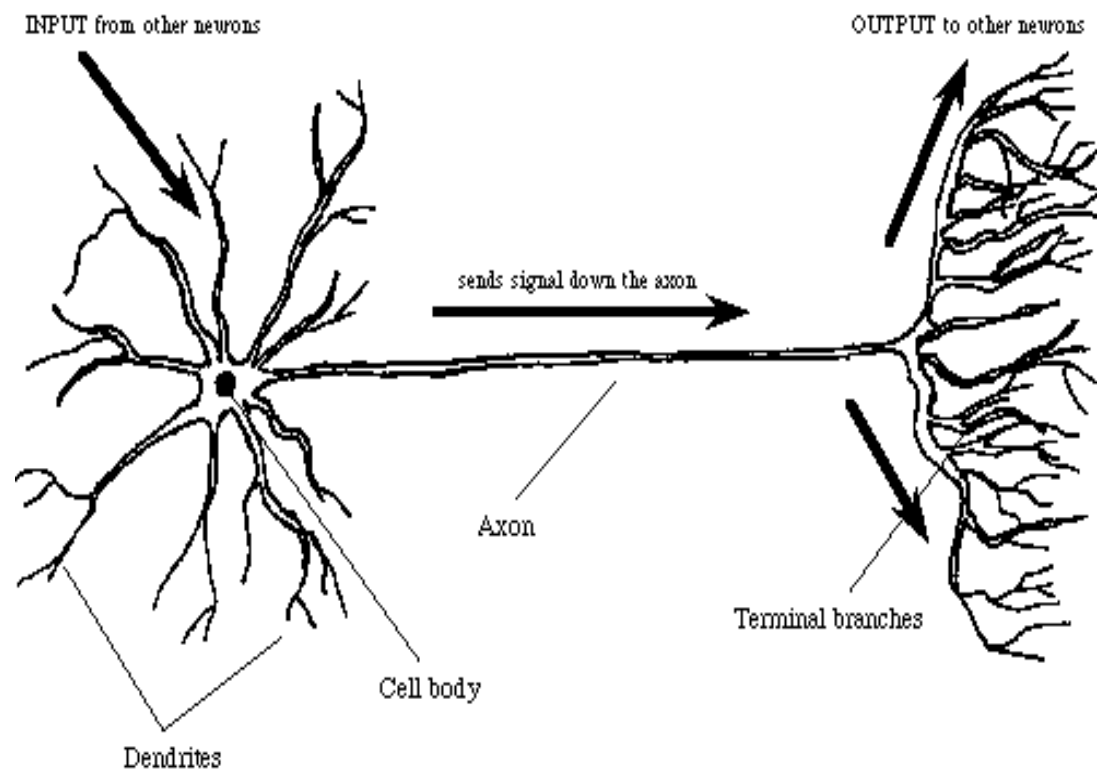
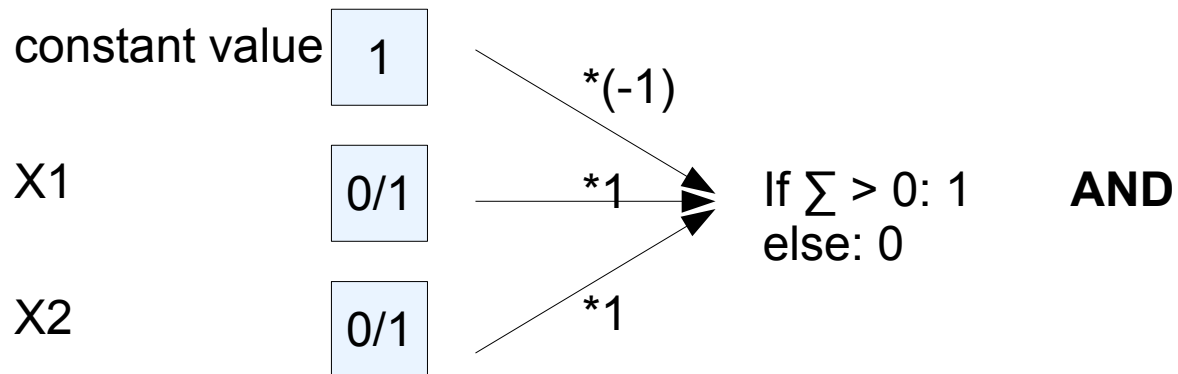
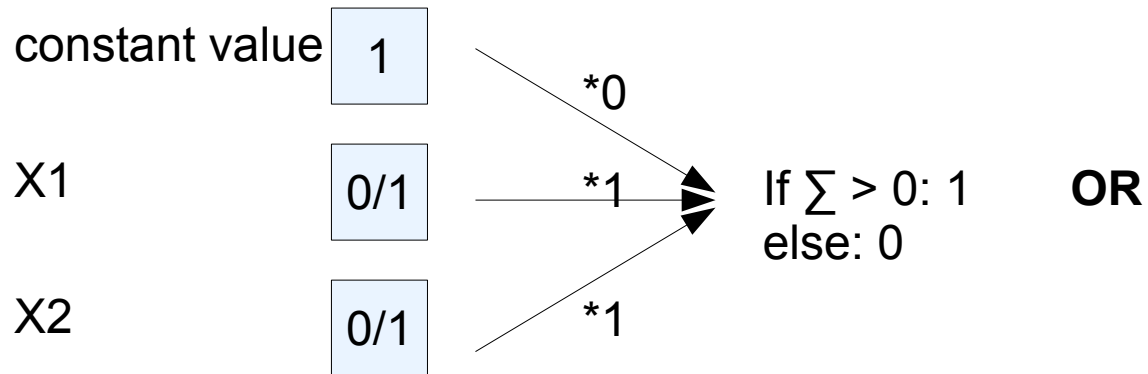


Artificial Neural Networks (ANNs) Basics

Pietro Terna
pietro.terna@unito.it

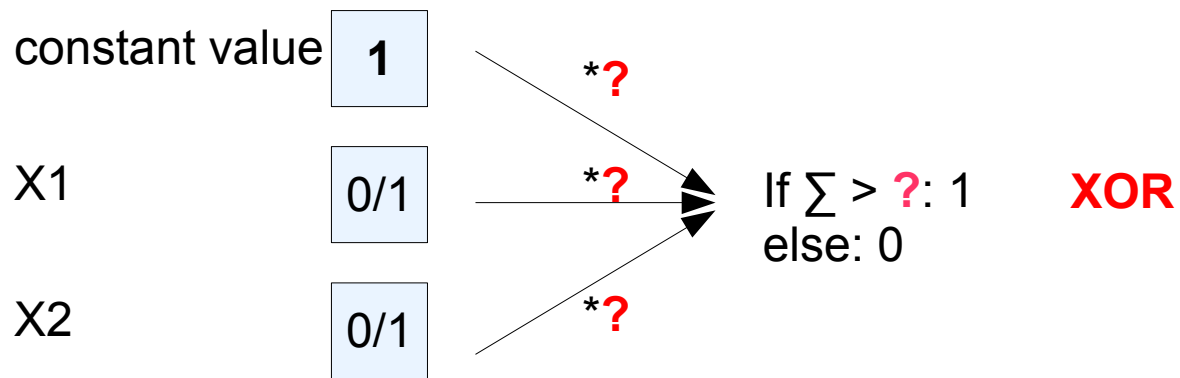


Simple perceptrons, with a unique layer

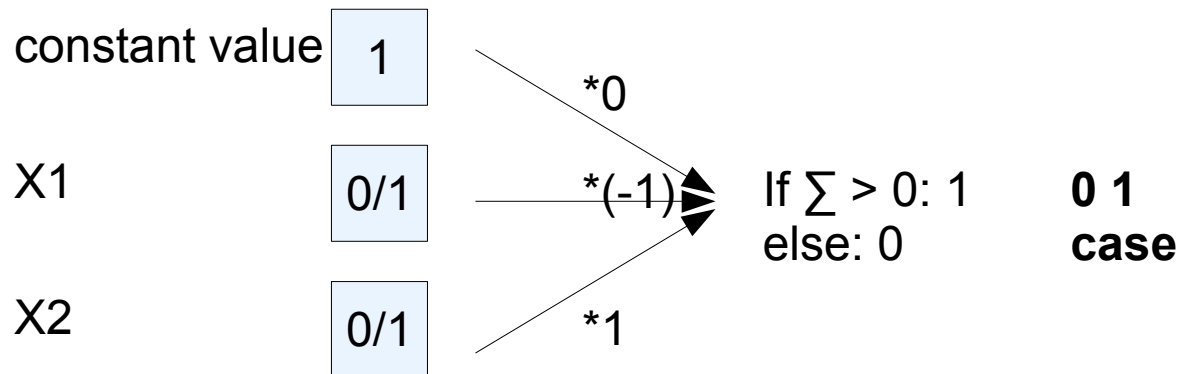
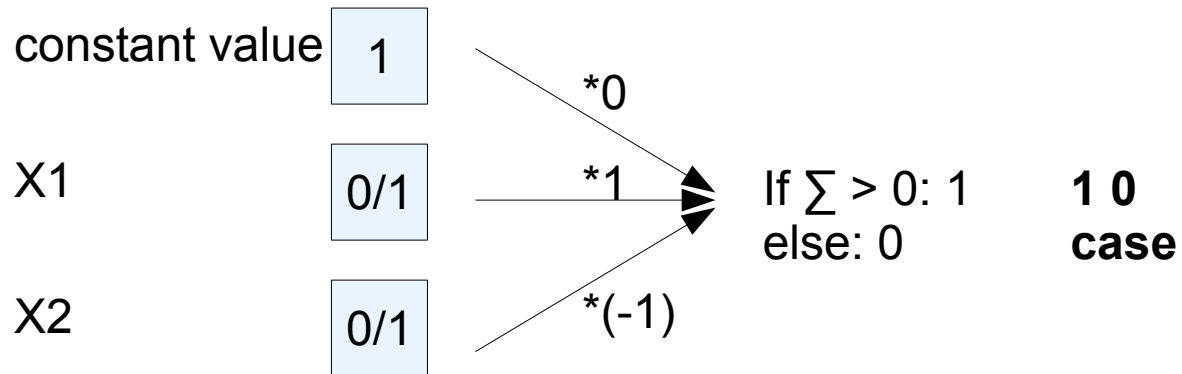


What if **XOR** ?

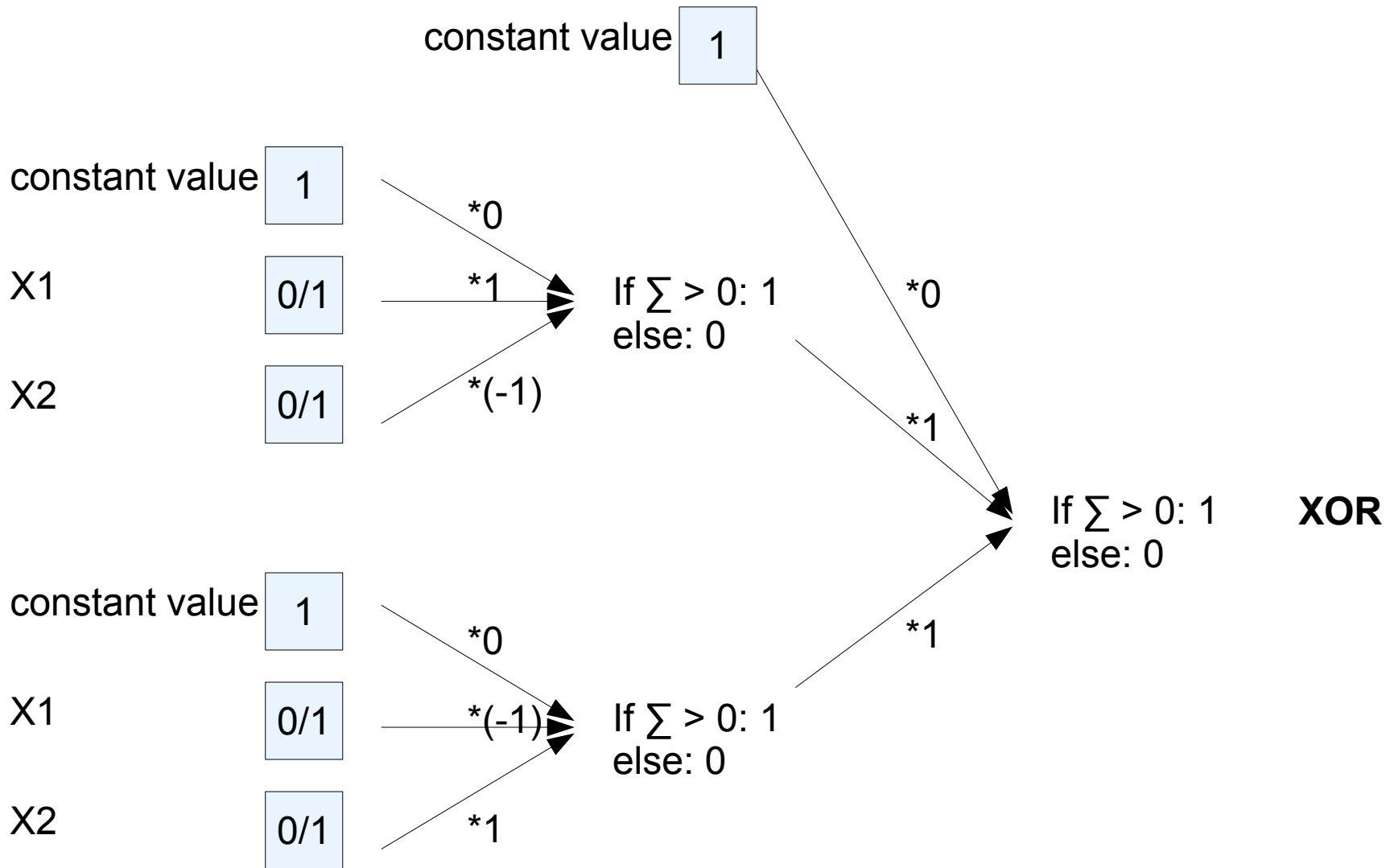
	X1	F	T
X2			
	F	F	T
	T	T	F



Specialized perceptrons

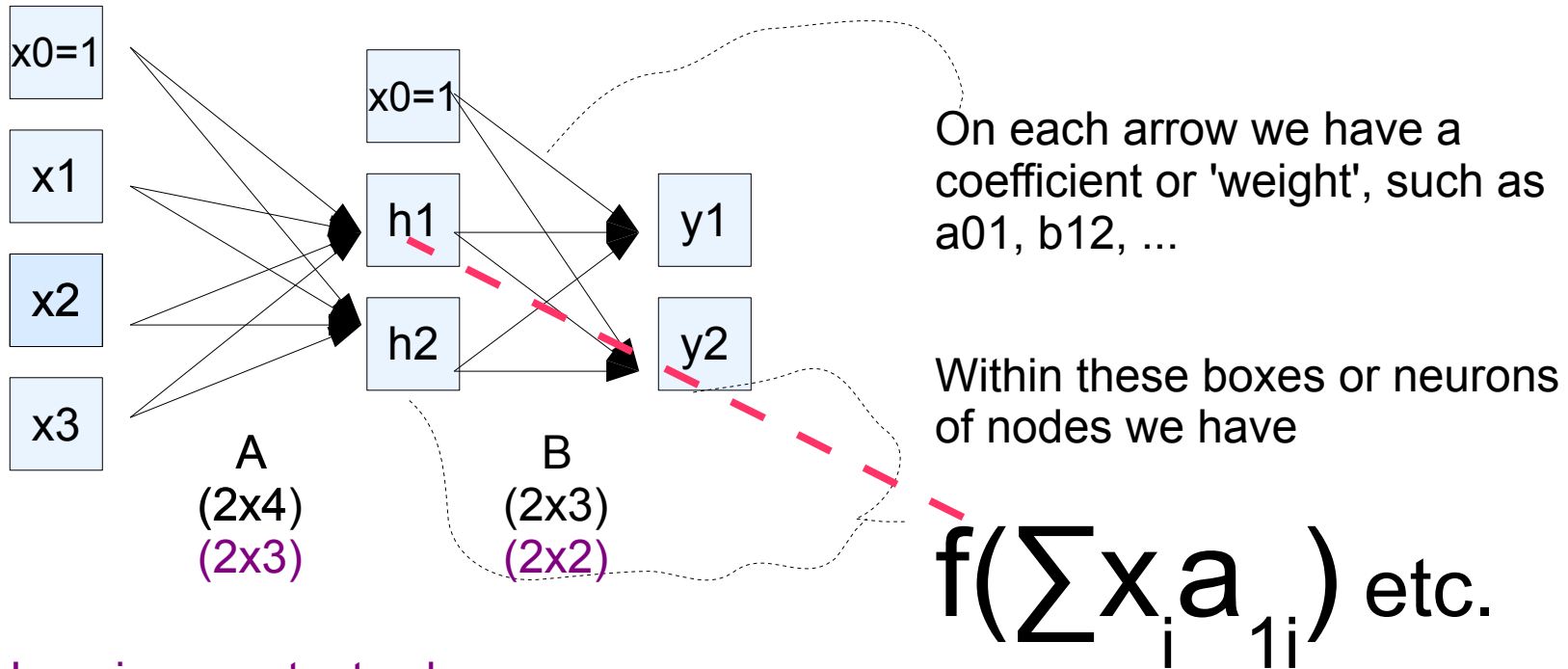


Two layers for the XOR problem



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

The plain vanilla ANN structure



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)

$$\text{Min } \sum_n E = \sum_i [y_{n,i} - F_{\text{ann}}(x_{n,i})]^2$$