Introduction to the Perceptron

Consider a set of vectors $\zeta_\mu \in \mathbb{R}^n$, each associated with a label σ_μ . This is the given information . The σ_μ labels takes values ± 1. The simplest perceptron is defined by a vector of weights **J** and a step functions: $sign(x)$ is the sign of x. The perceptron classifies a vector in a class:

$$\sigma = sign(\mathbf{J} \cdot \zeta_\mu)$$

The supervision learning problem consists to find the vector of weights **J** that correctly classifies the vectors ζ_μ . The vector **J** is perpendicular to a hyper plane that divide the 2 different labels of vectors.

The Rosenblatt learning dynamic is given by:

$$\mathbf{J}(t+1) = \mathbf{J}(t) + \frac{f_\mu}{\sqrt{N}} \cdot \zeta_\mu \sigma_\mu$$

where f_μ is 0 if we have a hit and 1 otherwise. This is an error correction algorithm.

If we have a miss, then we update the vector **J**, if we have a hit, then nothing is done.

We shall prove in the next section that if exists a vector **B** that correctly classifies the vectors ζ_μ then in a finite number of steps, **J** converges to **B**.