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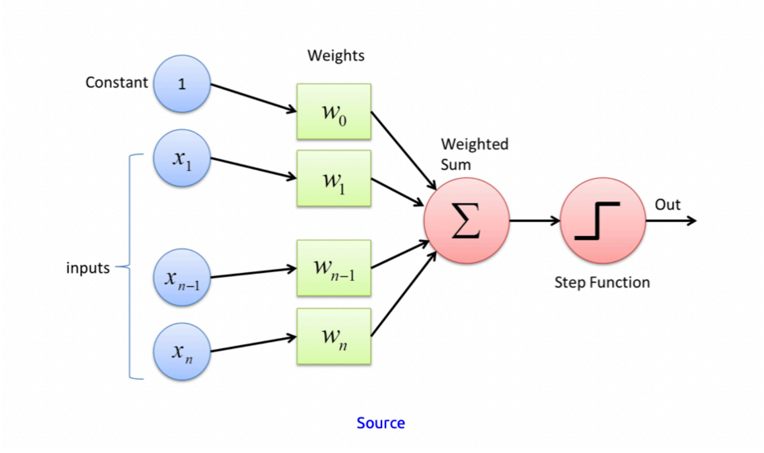
The Perceptron

The Perceptron is a **supervised learning** algorithm for **binary classifiers**. A binary classifier is intended to label some input, usually represented as a series of vectors, as a member of some specific class.



Source

The device can be compartmentalized into four parts: **input values**, **weights & bias**, **weighted sum**, and an **activation function**.

In summary, the provided input values are multiplied by their corresponding weights, then added together as a weighted sum. This sum is applied to an activation function, producing the perceptron output [1].

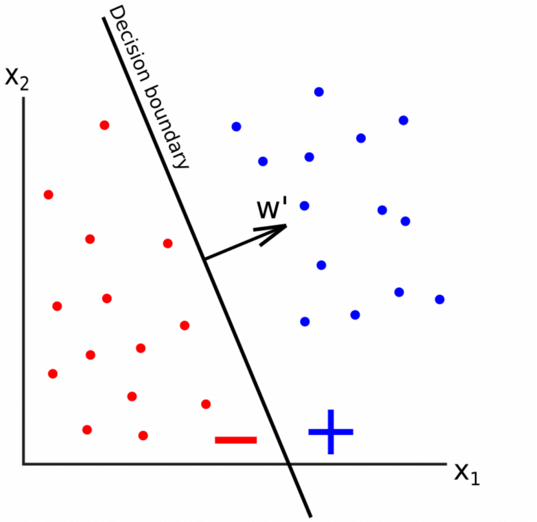
The perceptron is simple in the abstract but perhaps unintuitive in application. Applying vector notation, we imagine an input vector *x* of *n* dimensions alongside a weights vector *w* of equal length:

$$x = [x_1, x_2, \ldots, x_n]$$
$$w = [w_1, w_2, \ldots, w_n]$$

Conveniently, the weighted sum may be represented as the **dot product** between these provided vectors. Recall that the dot product, $x \cdot w$, is computed as:

$$x \cdot w = [x_1 \times w_1, x_2 \times w_2, \ldots, x_n \times w_n]$$

On the right is a visualization of a perceptron with $n = 2$ inputs (mainly for the purposes of plotting). Obviously, the decision boundary determined by the perceptron is a line; however, in the case of $n = 3$ inputs we may expect such a boundary to take the form of a 2D plane; in fact, we expect a boundary of dimensionality $n - 1$, where n is the number of inputs into the perceptron.



Works Cited:

[1] Professor's perceptron paved the way for AI – 60 years too soon
[2] DeepAI Glossary and Terms – The Perceptron
[3] Perceptron: Explanation, Implementation, and a Visual Example
[4] Perceptron vs. SVM: a quick comparison