Topics: Perceptrons and the perceptron learning algorithm

Announcements:
• Reminder: the first homework is due this Monday. Please read (and follow) the directions carefully.
• Please bring this handout to next lecture.

The perceptron learning algorithm

This picture depicts our setting and assumptions (in two dimensions):

We therefore must restrict the learner to zero-threshold perceptrons, for otherwise, success against our restricted oracle is trivial (why?).

Here’s Rosenblatt’s perceptron learning algorithm (PLA):

Set $\overrightarrow{w}$ to all zeroes
For each example $\overrightarrow{x}(i)$
If $\overrightarrow{w} \cdot \overrightarrow{x}(i) \leq 0$
change $\overrightarrow{w}$ to $\overrightarrow{w} + \overrightarrow{x}(i)$

Note that vector addition (and subtraction) is component-wise, that is, for $\overrightarrow{v} = (v_1, v_2, \ldots, v_n)$ and $\overrightarrow{w} = (w_1, w_2, \ldots, w_n)$, $\overrightarrow{v} + \overrightarrow{w} \overset{\text{def}}{=} (v_1 + w_1, v_2 + w_2, \ldots, v_n + w_n)$. Hence $(2, 3) + (-1, -5) = (1, -2)$. 