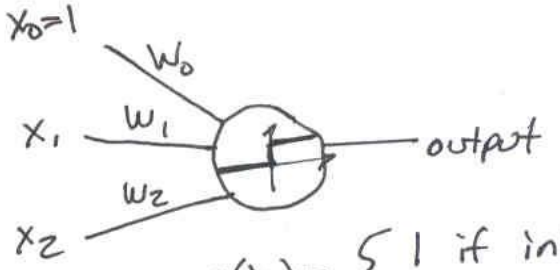
CSCI-4150 Intro to Artificial Intelligence, Fall 2004

Perceptron learning example

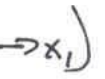
Suppose we have the following training data that we wish to use to ~~learn~~ train a perceptron.

	x_1	x_2	output
①	-1	0	0
②	0	0	1
③	0	1	0
④	1	0	1
⑤	1	1	0



$$g(in) = \begin{cases} 1 & \text{if } in \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

Note we have encoded the threshold as a weight by adding another input, x_0, that will always be 1

A) Plot the examples (with a ⊕ or ⊖ for 1 and 0 outputs, respectively) and the linear separator for the weights $W_0 = 0.2$, $W_1 = -0.2$, $W_2 = 0.5$ on two dimensional axes $x_1 - x_2$ (i.e. )

B) Apply the perceptron learning rule ($\vec{W} \leftarrow \vec{W} + \alpha \times Err \times \vec{x}$) to example ① and create a plot (as in part A) with the new weights. Use $\alpha = 0.1$

optional! C) Write a little (scheme) program to calculate weight updates with the perceptron learning rule and do updates for examples ② – ⑤ to complete the epoch. Make another plot with the final weights.