Perceptron Exercise 10-18-18

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$\Delta W_i = \eta(y - \hat{y})x_i$

Since we set b to right, W is $[W_1, W_2, W_3, W_0]$

Given

epoch 1

X	b	y	W	$W^T x$	out($\hat{y}$)	ΔW
0 0 1	1	0	0 0 0 0	0	0	0 0 0 0
1 1 1	1	1	0 0 0 0	0	0	1 1 1 1
1 0 1	1	1	1 1 1 1	3	1	0 0 0 0
0 1 1	1	0	1 1 1 1	3	1	0 -1 -1 -1

We leave epoch 1 with $W = [1\ 0\ 0\ 0]$

epoch 2

0 0 1	1	0	1 0 0 0	0	0	0 0 0 0
1 1 1	1	1	1 0 0 0	1	1	0 0 0 0
1 0 1	1	1	1 0 0 0	1	1	0 0 0 0
0 1 1	1	0	1 0 0 0	0	0	0 0 0 0

epoch 2 immediately converged. $W = [1\ 0\ 0\ 0]$ still.

Let's say W starts at $W = [0\ 0\ 0]$

epoch 1

X	b	y	W	$W^T x$	out($\hat{y}$)	ΔW
0 0	1	0	0 0 0	0	0	0 0 0
0 1	1	1	0 0 0	0	0	0 1 1
1 0	1	1	0 1 1	1	1	0 0 0
1 1	1	0	0 1 1	2	1	-1 -1 -1

For the last entry our ΔW calculation is:

$\Delta W_1 = \eta(y - \hat{y})x_i = 1 \cdot (0 - 1) \cdot 1 = -1$

$\Delta W_2 = \eta(y - \hat{y})x_i = 1 \cdot (0 - 1) \cdot 1 = -1$

$\Delta W_0 = \eta(y - \hat{y})x_i = 1 \cdot (0 - 1) \cdot 1 = -1$

Thus, our final W here is $W = [-1\ 0\ 0]$

This above sample will never converge since it isn't linearly separable. (xor problem)