Homework 4

Due: 17 March 2020

Problem 4.1

Consider the following data set:

$$\begin{aligned}
&\langle 0, 10\rangle : + \\
&\langle 10, -10\rangle : - \\
&\langle -10, 10\rangle : + \\
&\langle 0, -10\rangle : - \\
&\langle 10, 0\rangle : + \\
&\langle -10, 0\rangle : - \\
&\langle 10, 10\rangle : + \\
&\langle -10, -10\rangle : -
\end{aligned}$$

If you train a simple perceptron, with initial weights of 0 (instead of randomly generated) and learning factor $\alpha = 0.5$, during what epoch (iteration through the data—i.e. the while loop on line 5 of Figure 11.20) would it converge? What would be the final weight vector? Show your work by showing the initial weight vector $\hat{W}_{init} = \langle 0, 0, \theta = 0\rangle$ and the weight vector after each correction. Draw a diagram including the weight vector and a dotted line representing the separator implied by your θ value.

Collaboration policy: group work! If you work with other people on this homework, hand in one copy and put all your names on top. There will be a revision cycle for this.

Note that while I encourage you to work together with your classmates on this, I *discourage* working together in person. Be creative with your collaboration tools (Jason suggests creating a private Slack channel for your homework group).

Handin policy: I'll accept handins in PDF or anything that libreoffice will read (eg docx, odt) (and can negotiate other formats if you find that relevant). Upload it to the department server and **one** of the group members use the handin script, with assignment name `hwk4`, by 11:59pm on the duedate:

```
handin cmsc389 hwk4 percep.pdf
```

(or whatever). Everybody's name should be in/on the document. When I hand back I will send it to everyone in the group.