Homework 1

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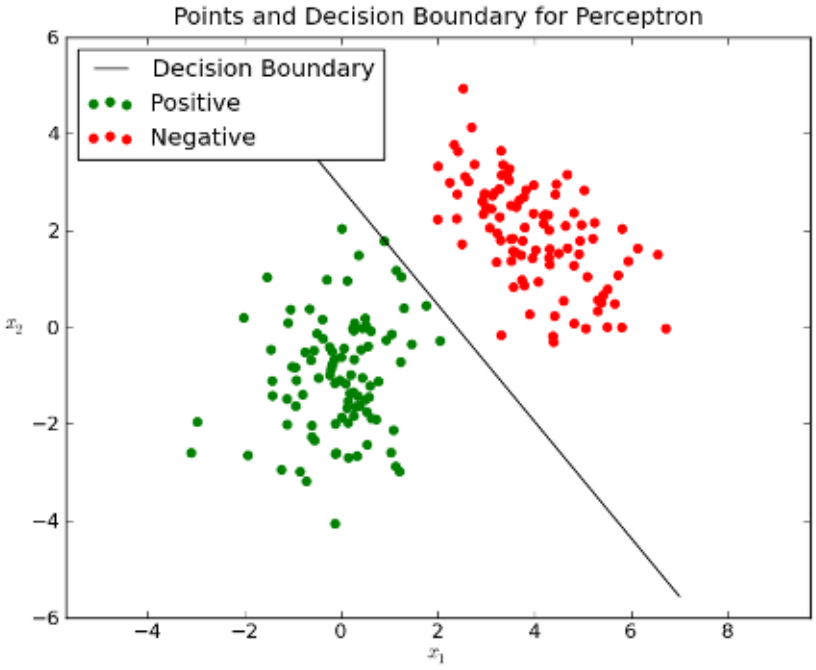
CS534

Prof. Fern

1 Perceptron

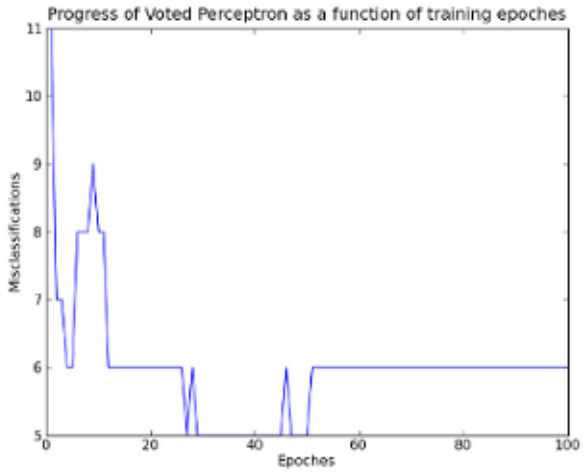
1. Did not bother to do this part, because only one training epoch was required for this batch algorithm to linearly separate the data.

2. Below are the points in twogaussian.csv together with their correct classifications, and a linear decision boundary. w = (1.5, -0.629, -0.521)

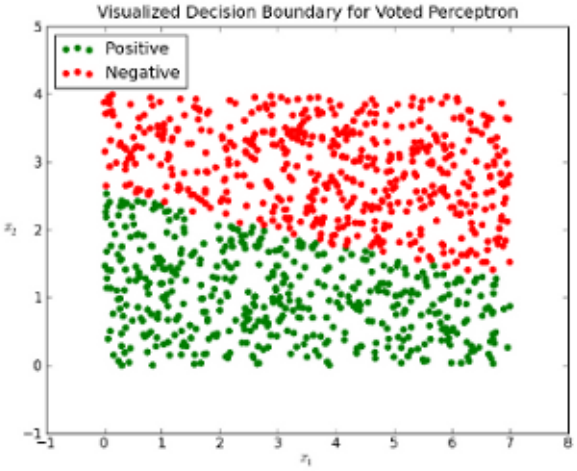


2 Voted Perceptron

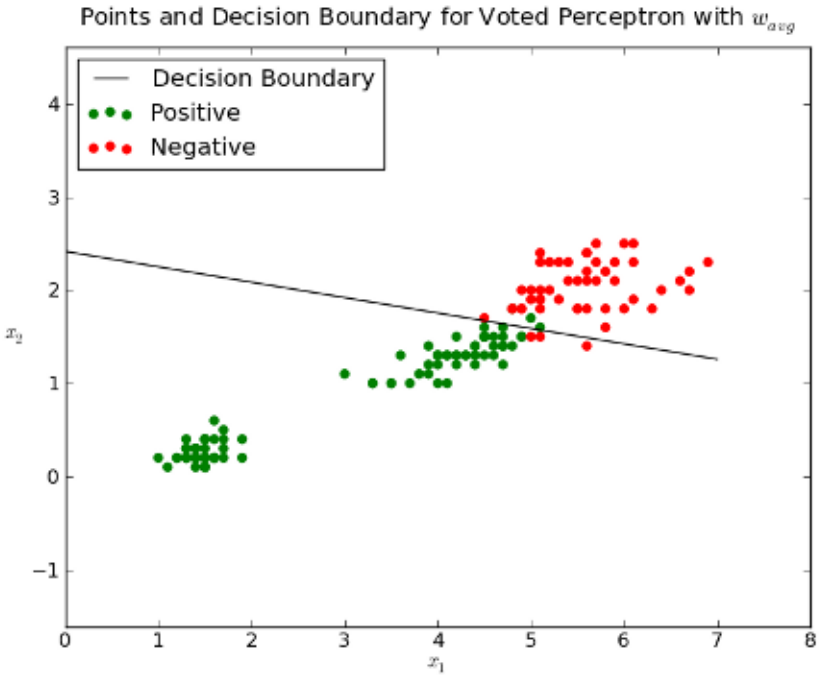
1. From the graph below, it appears that the number of misclassifications of the iris set bottomed out at around epoch 10 for this particular run, and in the next 90 epoches the algorithm flailed around slightly, finally settling at a respectable 5 misclassifications out of 150.



2. Below is a visualization of the calculated voted perceptron boundary for a sample run on the iris set, using 1000 random points. The linear decision boundary is clear.



3. Below is the linear decision boundary and plotted points for the voted perceptron algorithm using $w_i avg$. Only half a dozen out of 150 points are misclassified. w = (1162932, -79670, -481308)



By looking at this graph and the one before it, it is obvious that the two decision boundaries similar, but not identical. This is because the data is shuffled randomly between training epoches, which results in slightly different decision boundaries for each run of the algorithm. Additionally, using w_{avg} keeps some information that is lost when performing the $sgn\{wx\}$ calculation in standard voted perceptron.