CS 1390-01: Introduction to Machine Learning

HW 3 (Given Sept. 28, 2020; Due Oct. 5, 2020)

Your answers must be entered in Google Classroom by midnight of the day it is due. If the question requires a textual response, you can create a PDF and upload that. The PDF might be generated from MS-WORD, LaTeX, the image of a handwritten response, or using any other mechanism. Numbers in the parentheses indicate points allocated to the question.

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1. *Implement* the generalized delta rule algorithm (*do not use a packaged implementation*). You may want to write the program in a way that is modular and which can read in parameters from a configuration file. That way you will be able to use your implementation with other data sets easily. You may use any language of your choice though you must implement it from the ground up (e.g. Matlab is fine but use constructs like for loop, if-then etc. to implement it. Do not use library routines that implement the generalized delta rule).

   A datafile called "hw3data" has been shared with you (you can download it from the Classroom). There are 2 inputs (first two columns) and 1 output (third column).

   (a) Obtain a reasonably good single layered perceptron (try a few varations; not necessarily exhaustive). Obtian the test error and plot the decision boundary **(50 points)**

   (b) Obtain a reasonably good multi layered perceptron (try a few varations; not necessarily exhaustive). Obtain the test error and plot the decision boundary **(50 points)**

   (c) Why is one test error lower than the other? **(20 points)**

2. What would happen if you initialize a multi-layered perceptron with (i) equal weights, (ii) large weights **(20 points)**