Homework 1 - Write Up

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The output tables are printed into the file names output.txt and also print onto the terminal.

Problem 1b and 2b. Observations:
I will talk about the general pattern in the tables generated for 1b and 2b, later compare these two tables.
1. Greater the value of alpha, lesser is the accuracy which is as expected
2. Greater the no of training data points, greater is the accuracy i.e for a particular value of alpha, with greater no of training data points, the accuracy increases. This is also as expected as greater the training data, better we learn the model.
3. The standard deviation of accuracy increases with increase in alpha. With greater alpha, greater is the chance of variations in the accuracy as the points of two classes get closer to each other.
4. With increasing training data points, for a given alpha, the standard deviation decreases with a few outliers.

The general level of accuracy of table for 2b is lesser than that of table for 1b. With greater alpha, the accuracy of table 2b decreases a lot compared to table 1b. The reason could be that data in 2b is highly susceptible to noise, seems intuitive as we are dealing with pixels and if we are adding a lot of noise, prediction can go wrong.

Problem 1c and 2c. Observations:
1. Increasing the number of iterations, the accuracy increases and then after a certain iterations, it almost stays constant. Also there is a dramatic increase in accuracy from 1st iteration to 2nd second iteration. So it seems that after a certain number of iterations, it almost learns the discriminant, and not change much after that. 2. The standard deviations are decreasing evidently with increasing iterations. 3. There is a decrease in deviation of accuracy with increasing testing set data.

Overall the accuracy in table for 1c are better than table for 2c.

The run time for analytical solution is much lesser than that for perceptron update algorithm.