ELE 888 Lab 2 Report

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**Plots**

**For Question 2**

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**Figure 1:** Graph using weight vector found in question 1.

**For Question 3**

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**Figure 2:** Graph when data split was reversed (70% training and 30 %testing)

**For Question 4**

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**Figure 3:** Graph using data sets b and C at 30% training and 70 %testing



**Figure 4:** Graph using data sets b and C at 70% training and 30 %testing

**For Question 5 and 6**

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**Figure 5:** Graph at nu=0.1



**Figure 6**: Graph at nu=0.001



**Figure 7**: Graph at initial weight factor 10 0 1



**Figure 8**: Graph at initial weight factor 0 10 1

**Answers and observations for Each part of Lab Report**

1.As the lab manual stated, we set aside 30 % of samples from the original sets which will be used for training purposes. We used the 30% set to compute the weight factor for the required specifications outlined, the weight factor ended up being [0.27 -1.969 3.346].

2. Using the weight factor and 70 percent test sample set, we were able to find the accuracy, which was 0.98571.

3. It was required to do the same thing but to reverse the split into 70 percent training and 30 percent testing samples. This ended up with a weight factor of [0.51 -4.458 7.433] and an accuracy of 0.96667. A key observation made here is that using the 70 percent training set leads to a less accurate result than the original.

4. In this part it was required to do the same steps but to use data set b and C. The weight factor for dataset B was [-1.44 1.44 -0.412], and the weight factor for dataset C was [-4.35 1.528 -2.445]. A key observation made was that reversing the data splits did not affect the accuracy at all, it was 0.5 for both, which was not the case with the previous two classes. The lower accuracy is due to the lack of decision boundary which has a main purpose of accurately classifying the classes.

5&6. The original graph had 47 iterations until it reached convergence, a weight factor of [0.27 -1.969 3.346] and an accuracy of 0.98571. When the nu value was set at 0.1, it took 56 iterations to reach convergence, had a weight factor of [4.1 -19.62 32.93] and an accuracy of 0.98571. Changing the nu value to 0.001, lead to their only needing 6 iterations to each convergence, a weight factor of [-0.07 -0.4184 0.8037] and an accuracy of 0.94286. It was evident that reducing the nu value leads to less iterations being needed to reach convergence, but also reduces accuracy. Next it was required initialize the weight factors, we used [10 0 1] and [0 10 1], both lead to the same iterations to convergence, which was 6, the same weight factor, [-0.07 -0.4184 0.8037] and the same accuracy, 0.94286. It is evident that initializing the weight factor didn’t change anything at all.

**Conclusions**

The main conclusions of this lab were that different parameters effect the weight factors and accuracy differently and some don’t at all, which was evident in the results. For example, it was found that using the 70 percent training set lead to less accurate results in the case where there was a decision boundary but did not affect the accuracy in the case where there is no decision boundary evident in the graph. It was also concluded that initializing the weight vectors have no effect on the parameters at all, all the results stayed the same. It was also found that reducing the nu value leads to lower number of iterations needed to converge but will also lead to slightly less accurate results. To conclude, the results obtained from this lab was expected based on the theory learned from the lectures.