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Task 5 write-up

T5.1

To determine if a certain model is linearly separable, we can look at the graph/data and see what causes the program to end. If the program ended because a certain epoch had 0 errors, then the data was linearly separable. If the program ended because the errors stopped going down after 3 epochs, then the program was not linearly separable.

Based on our results, for task 2, only the setosa vs non-setosa data was linearly separable while the versicolor vs non-versicolor and the virginica vs non-virginica were not linearly separable. It took 4 total epochs for the setosa test to end, while it took the versicolor 5 and the virginica 6 epochs to finish.

T5.2

For task 3 we repeated our process for task 2 however we looked into changing the initial model for our learner. For task 2 we had all of the initial weights set to 0. For task 3.1 we changed all of these weights to 1, for 3.2 we had these weights changed to various values between 0 and 1 and for 3.3 we changed them again for different values between 0 and 1.

Our end results after changing the initial weights to 1 for task 3.1 ended up being identical to the task 2 learner. For 3.2 and 3.3, the end results ended up being the same, the algorithm just took a longer time to come to these conclusions. In both of these scenarios the setosa data ended up being linearly separable while the versicolor and virginica ended up being not linearly separable. For the setosa flower, during the 3.2 run it only took 2 epochs to be correct, while for 3.3 it ended up taking 7 epochs. For the versicolor 3.2 and 3.3 it took 5 epochs to finish. For the virginica 3.2 and 3.3, it took 4 epochs to finish. 3.2 and 3.3 also ended up having a lot more errors found throughout its run. For the task 2/3.1 learners the highest number of errors for one epoch was 3. The versicolor and virginica's 3.3 ended up having 11 total errors for the first epoch.

T5.3

For task 4 we repeated the process for task 2 but this time we randomized the order the sampling data was given to the model to train on. We did this twice to see how two different random orders affected the results. These randomized orders ended up with the same results. Setosa finished both times with a linear separation while the versicolor and virginica were not linearly separable. The big difference this time was the number of errors that occurred. The setosa only took 2 epochs both times and had 5 errors each time. Versicolor 4.1 had a peak of 68 errors in a single epoch and by the end of its 7 epochs it had 415 total errors. Versicolor 4.2 had a peak of 67 errors in a single epoch and by the end of its 36 epochs it had made 1827 total errors. Virginica 4.1 had a peak of 32 errors in a single epoch and after 22 epochs it had made a total of 415 errors. Virginica 4.2 had a peak of 38 errors in a single epoch and after 19 epochs it had made a total of 327 errors.