Part A Report

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Assignment 6: Perceptron Classification and Training

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Please answer each question using text in Blue, so your answers stand out from the questions.

Note: If not otherwise specified, use the default parameters present in the starter code to answer the questions.

A1. How many epochs were required to train your perceptron on the 2-class Iris data having 2 features? What was the performance of your perceptron on the test data?

Training converged in 4 epochs. The performance of the perceptron was 2 errors out of 80 items in the test data.

A2. Include a graphic produced using matplotlib that shows both the training data points (in separate colors) and the “separating” lines implied by the weights at the end of each training epoch.” (Reduce the graphic as necessary to make it fit here without taking up more than half the page.)

Chart, scatter chart

Description automatically generated

A3. In the above plot, was there any thrashing (oscillation in the separator, such as flipping slope back and forth between positive and negative values, or having its y intercept jumping up and down as epochs proceed? How would you describe the progress of the learning, on the basis of the plot?

There didn’t seem to be any thrashing behavior: the slope did progress from negative to slightly positive, but the y intercept was positive throughout the epochs. Overall, the separator’s slope and y intercept increased monotonically as the epochs proceeded.

A4. After plotting the ring data, describe its distribution in words.

The distribution of the pre-remapped ring data seemed random, with no clear separation between Iris Setosa and Iris Versicolor datapoints.

A5. Describe the sequence of separators obtained when training your perceptron for 25 epochs using the ring data. Is there any thrashing? To what extent did it achieve convergence? And finally, do you think if the model is run for more epochs it will eventually fully converge?

Throughout the epochs, the separator thrashed constantly, and did not seem to be approaching convergence. The model did not converge in 20 epochs, and won’t likely ever converge.

A6. After you have re-mapped the ring data with the provided non-linear mapping function, plot the data and describe the distribution.

A7. After training your perceptron on the re-mapped ring data, did it achieve convergence, and if so, how many epochs were used?

A8. What do these results suggest about the power of perceptrons to classify data that may consist of clusters that cannot be separated by a linear manifold (such as a line or plane)?