Part A Report

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Assignment 6: Perceptron Classification and Training

CSE 415 Introduction to Artificial Intelligence, Autumn 2022, University of Washington

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.

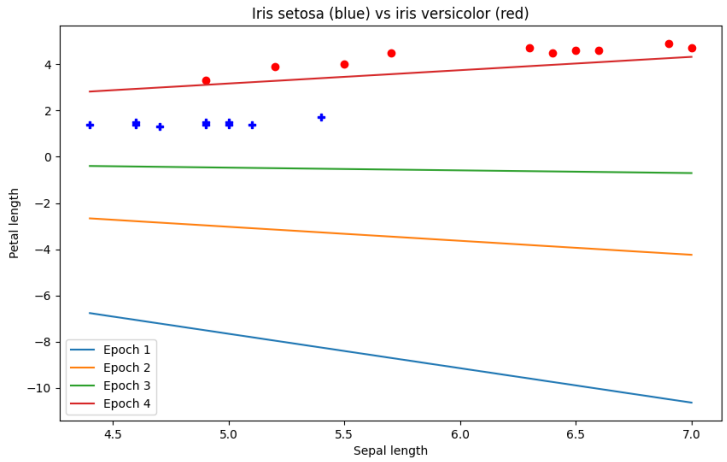
A1. How many epochs were required to train your perceptron on the 2-class Iris data having 2 features? What was the performance of your perceptron on the test data?

It took 4 epochs to train the perceptron on the 2 class Iris data having 2 features.

There are 2 errors spotted out of the 80 items

This is a good performance.

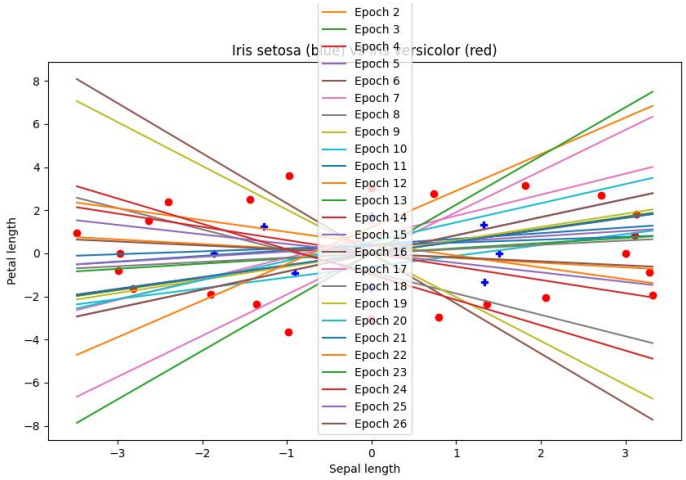
A2. Include a graphic produced using matplotlib that shows both the training data points (in separate colors) and the "separating" lines implied by the weights at the end of each training epoch." (Reduce the graphic as necessary to make it fit here without taking up more than half the page.)



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 is little to no thrashing in the above plot. There are no oscillation in the separator(no flipping slopes and no Y intercept stayed relatively still). The progress of learning is good. The slope increments from negative to more positive as the number of increase.

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

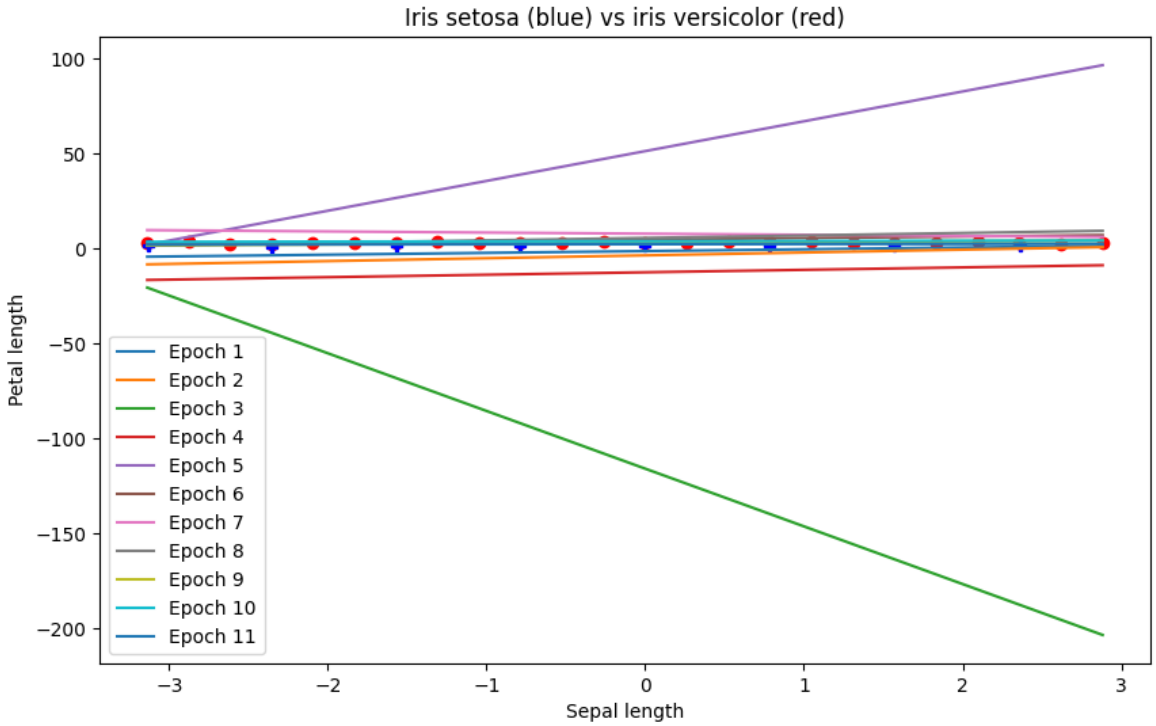


The points are all spread out in a ring shape, while the lines are intersected at the center of the graph.

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?

There is a lot of thrashing. It did not achieve convergence at all, and the model will not fully converge if it was runed with more epochs.

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



There is far less intersection between the lines, and that the data points are all evenly distributed along the lines. It is a linear distribution now.

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

It did achieve convergence. It achieved convergence at 11 epochs

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)?

The result suggested that when encountering data that consist of clusters that cannot be separated by a linear manifold, perceptron are not enough. When there is a linear manifold, however, perceptron will be suitable to use.