

A6 Report

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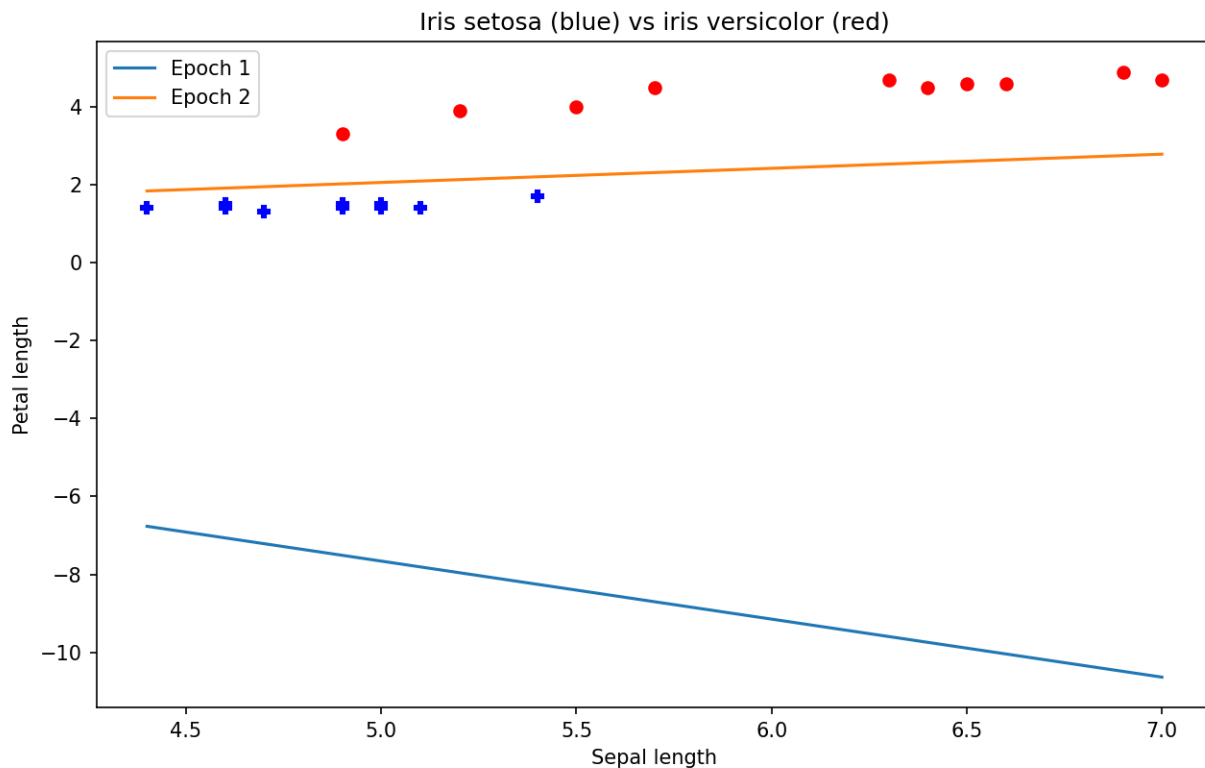
Assignment 6: Perceptron Classification and Training

CSE 415 Introduction to Artificial Intelligence, Winter 2024, University of Washington

Q1. 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?

Converged in 2 epochs. 0 errors on the test data, out of 80 items.

Q2. 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.)



Q3. 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 was thrashing. The y intercept increased significantly, and the slope changed direction. Progress happened very quickly, through just two epochs, the perceptron was able to find a line that was below all of the red points, and above all the blue points.

Q4. After plotting the ring data, describe its distribution in words.

The ring data consists of a small ring of blue points, and a larger ring of red points surrounding the blue ring.

Q5. 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?

The separators, as number of epochs increased, decreased in y intercept, and increased in slope. There was no thrashing. I do not think it will eventually converge because by looking at the distribution, there does not look like a separating line is possible.

Q6. After you have re-mapped the ring data with the provided non-linear mapping function, plot the data and describe the distribution.

The remapped distribution is a row of many red points, above a row of a smaller number of blue points.

Q7. After training your perceptron on the re-mapped ring data, did it achieve convergence, and if so, how many epochs were used?

After remapping, my perceptron achieved convergence in 4 epochs.

Q8. 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)?

These results show that unless data points are remapped into a form where they can be separated by a line or plane, then a perceptron is unable to correctly classify data into different clusters. Perhaps a higher layer perceptron would be able to solve some of these issues.