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Individual Project 1: Perceptron & Hebbian Associator

Part 1: Perceptron training and testing for “A” and “E”

To begin the Perceptron test, a weight and a bias must be trained. I picked a weight matrix that is 1x20 that is full of “0”, and a bias of 0. These values were inputted on the function “tester”. In the tester function, the parameters that are fed are the initial weight, initial bias, the given patterns (PP), and given target which would either be target A (TA) to test A, or target E (TE) to test E. The trained weight and bias for A are WlastA, and blastA respectively. The trained weight and bias for E are WlastE, and blastE respectively. With the trained weight, and trained bias I then had to check the hit/miss ratio against test sets. Before doing this, I had to create test sets.

I created test sets using the toggleask function. This function toggles the specific cell that the user designates with the script between “-1” and “1” depending on what it originally had. To create TSET1 (the first test set) I created PPT, a matrix of 20x25 which had 5 copies of the perfect letters A, E,I,O,U (A is 1-5, E is 6-10, I is 11-15, O is 16-20, and U is 21-15). After toggleing the required bits per the instructions, I then began creating TSET1, TSET2, and TSET3. With TSET2 being based off TSET1, but with more changes, and TSET3 being based off TSET2. With the test sets done, I was ready to get the hit/miss rates with the trained weights.

To get the hit/miss rate, and hit ratio, I used the trained weight and bias that pertained to the letter I was testing for (the set for A or the set for E). I then inputted them into the hittable function. This function calculates the hits that are found, and the hit ratio for the test set. I ran this function first with the trained weight and bias for A with each test set. Then I repeated this but with the trained weights and bias for E. The function returns tables showing the results, the tables for A are TestsTableA1, TestTableA2, TestTableA3, and the tables for E are TestTableE1, TestTableE2, TestTableE3.

Part 2: Hebbian Associator and Pseudoinverse

Two variables were created that are necessary to train a weight for Hebbian and a pseudoinverse associators. These variables are the patterns (PPHeb), and the targets (THeb). With these two variables two weights were created based off the specific type of associator. HebW is the weight created through the Hebbian function hebtrain, and WW is the weight created from the mypseudoinv function. With these weights, I then ran them through the function hebtest. This function prints out tables with the hit/miss rate, the hamming distance, and the hit ratio of these weights being tested against the test sets from part 1 (TSET1, TSET2, and TSET3).

The tables for Hebbian are HebTable1, HebTable2, HebTable3, and for Pseudo inverse are PseudoTable1, PseudoTable2, PseudoTable3.