Perceptron Learning Lab

Name and period: Anjam Alam Period 7

For boolean functions on n variables, a perceptron can learn:

1) N=2:
    a. Learned: __14____/16 = ___87.5_____%
    b. 2 example functions and the learned weight vectors

[(array([0, 0, 1]), 0), (array([0, 1, 1]), 0), (array([1, 0, 1]), 0), (array([1, 1, 1]), 1)]

Weights: [2 1 -2]

[(array([0, 0, 1]), 0), (array([0, 1, 1]), 0), (array([1, 0, 1]), 1), (array([1, 1, 1]), 0)]

Weights: [1 -2 0]

2) N=3:
    a. Learned: __104____/256= ___40.6_____%
    b. 2 example functions and the learned weight vectors

[(array([0, 0, 0, 1]), 0), (array([0, 0, 1, 1]), 0), (array([0, 1, 0, 1]), 0), (array([0, 1, 1, 1]), 0), (array([1, 0, 0, 1]), 0), (array([1, 0, 1, 1]), 0), (array([1, 1, 0, 1]), 0), (array([1, 1, 1, 1]), 1)]

Weights: [2 1 1 -3]

[(array([0, 0, 0, 1]), 0), (array([0, 0, 1, 1]), 0), (array([0, 1, 0, 1]), 0), (array([0, 1, 1, 1]), 0), (array([1, 0, 0, 1]), 0), (array([1, 0, 1, 1]), 0), (array([1, 1, 0, 1]), 1), (array([1, 1, 1, 1]), 0)]

Weights: [2 1 -3 -2]

3) N=4:
    a. Learned: ___1882_____/65536= ___2.87_____%
    b. 2 example functions and the learned weight vectors

[(array([0, 0, 0, 0, 1]), 0), (array([0, 0, 0, 1, 1]), 0), (array([0, 0, 1, 0, 1]), 0), (array([0, 0, 1, 1, 1]), 0), (array([0, 1, 0, 0, 1]), 0), (array([0, 1, 0, 1, 1]), 0), (array([0, 1, 1, 0, 1]), 0), (array([0, 1, 1, 1, 1]), 0), (array([1, 0, 0, 0, 1]), 0), (array([1, 0, 0, 1, 1]), 0), (array([1, 0, 1, 0, 1]), 0), (array([1, 0, 1, 1, 1]), 0), (array([1, 1, 0, 0, 1]), 0), (array([1, 1, 0, 1, 1]), 0), (array([1, 1, 1, 0, 1]), 0), (array([1, 1, 1, 1, 1]), 1)]

Weights: [4 2 1 1 -7]

[(array([0, 0, 0, 0, 1]), 0), (array([0, 0, 0, 1, 1]), 0), (array([0, 0, 1, 0, 1]), 0), (array([0, 0, 1, 1, 1]), 0), (array([0, 1, 0, 0, 1]), 0), (array([0, 1, 0, 1, 1]), 0), (array([0, 1, 1, 0, 1]), 0), (array([0, 1, 1, 1, 1]), 0), (array([1, 0, 0, 0, 1]), 0), (array([1, 0, 0, 1, 1]), 0), (array([1, 0, 1, 0, 1]), 0), (array([1, 0, 1, 1, 1]),

0), (array([1, 1, 0, 0, 1]), 0), (array([1, 1, 0, 1, 1]), 0), (array([1, 1, 1, 0, 1]), 1), (array([1, 1, 1, 1, 1]), 0)]

Weights: [2 1 1 -4 -3]

Create a training set and a testing set over 10 boolean inputs (x) where the function f(x) = majority. Use a training size of about 100 vectors. Plot the accuracy of a perceptron and of a decision tree, each on the testing set, for the target concept. The x-axis should be “training set size” and the y-axis “accuracy on test set”. Plot both functions on the same set of axes.

For the perceptron: use as many epochs as you deem necessary. For both: do NOT test on the training data!