

Homework 3

CS 436/580L: Introduction to Machine Learning

Instructor: Arti Ramesh

Instructions

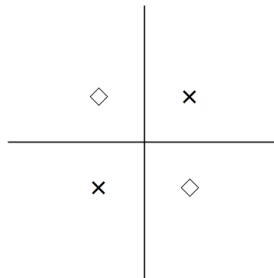
1. You can use either C/C++, Java or Python to implement your algorithms.
2. **Your implementations should compile on remote.cs.binghamton.edu.**
3. Make sure remote.cs.binghamton.edu has the packages that you require before starting to implement.
4. This homework requires you to **implement** Perceptrons. Using existing packages for the algorithm is not allowed.
5. Please make sure your code is readable and well-commented.
6. Your homework should contain the following components:
 - (a) README.txt file with detailed instructions on how to compile and run the code.
 - (b) Code source files
 - (c) Type-written document containing the results on the datasets.
7. Adhere to file naming conventions on myCourses.

1 Perceptrons, and Neural Networks

In this question, you will implement the Perceptron algorithm and compare it with your own implementations of Naive Bayes. If you are unsure of whether your implementation is correct, then you may compare them with WEKA/Scikit-Learn implementations of Naive Bayes. As in homework 2, the classification task is spam/ham (use the same dataset made available as part of homework 2).

80 points Implement the perceptron algorithm (use the perceptron training rule and not the gradient descent rule). Your task here is to experiment with different values of number of iterations and the learning rate. Report the accuracy for 20 suitable combinations of number of iterations and the learning rate. Repeat your experiment by filtering out the stop words. Compare the accuracy of your perceptron implementation with that of Naive Bayes (implemented in Homework 2).

20 points Consider the data set given below. Assume that the co-ordinates of the points are (1,1), (1,-1), (-1,1) and (-1,-1).



Construct a neural network that will have zero training error on this dataset. Write down and explain the solution (no programming is necessary for this part).

(Hint: Think XOR. You will need exactly one hidden layer and two hidden nodes.).

What to Turn in

- Your code
- README file for compiling and executing your code.
- A detailed write up that contains:
 1. The accuracy on the test set different values of the number of iterations and the learning rate.
 2. Compare the accuracy across the different models and report your observations.
 3. Written answer to XOR question.