P318 Computational Modeling
Spring 2011
Week 3 Homework
Due: Wednesday February 2nd

The purpose of this homework assignment is to give you some experience fitting models to actual data.

1. For the first problem, I want you to fit the similarity-choice model to the data from Nosofsky (1985) we used in last week's homework assignment.

   Report the best-fitting values of bias and similarity found by minimizing SSE. Feel free to use either the hook and jeeves routine or simplex (fminsearch).

   Create a plot showing observed against predicted probabilities.

   For this assignment, start with the homework3.m file on the course web site. That file includes the data from Nosofsky (1985).

   Feel free to reuse the code you generated for the last homework assignment, my solution to that homework assignment, and the code we used in class to solve this problem. In fact, I suggest you use the code from class as a starting point. We will adapt some of the code you generate for this assignment for next week's assignment.

2. The second problem will ask you to fit the GCM and a Prototype model to some made up data. Following the procedure demonstrated in class, you will simulate the GCM, use those simulations as "data," and then fit the GCM to that data. You will simulate the Prototype model, use those simulations as "data," and fit the Prototype model to that data. Then you will try to fit the GCM to data generated by the Prototype model, and try to fit the Prototype model to data generated by the GCM.

   For this assignment, you may want to borrow heavily from the code used in class.

   Like the example used in class, this problem will assume two categories defined by unidimensional normal distributions. Each category consists of 100 exemplars drawn from a normal distribution. The accompanying Matlab files homework3.m has code that generates the specific examples. Like the example used in class, the mean for category A is 25 and the mean for category B is 75. But now the standard deviation for category A is 75 and the standard deviation for category B is 20.

   Test stimuli will be uniformly distributed from -100 to 200 in steps of 10.

   (A) Assuming these categories, generate GCM predictions for the test stimuli. Assume c=.1, equal category response bias, and an exponential similarity function. In the next step, you will use these GCM predictions as the data you will fit.

(B) Fit the GCM model to the "data" you generated in part A. Feel free to borrow liberally from the example code used in class.

(C) Now generate predictions for a Prototype model for the test stimuli. Assume c=.1, equal bias, and an exponential similarity function. Hint: The GCM assumes 100 stored exemplars as the representation for each category. A simple Prototype model assumes 1 stored prototype as the representation for each category. Given this, you should be able to program the Prototype model with just a little manipulation of the GCM code.

(D) Fit the Prototype model to the "data" you generated in part C. Hint: This should be structurally identical to part C, but replacing code for the Prototype Model for the GCM.

(E) Now try to fit the GCM to data generated by the Prototype model. This should involve a copy and paste with a few small changes. Compare the GCM predictions to the Prototype "data". How does the GCM do?

(F) Now try to fit the Prototype model to data generated by the GCM. This should involve a copy and paste with a few small changes. Compare the Prototype predictions to the GCM "data". How does the Prototype model do?

As with all the homework assignments, I encourage people to work together. But everyone must ultimately generate code on their own and turn in their own assignment.