Title: Analysis of Response Time

Instructor: Trish van Zandt

Abstract:

Description. This workshop will introduce the participants to modeling response time (RT) data. Using current models of choice (such as Ratcliff's drift diffusion model or others of general interest), participants will fit models to their own data, estimate the parameters of those models and evaluate the goodness of fit of those models. The first day will focus on traditional methods, such as maximum likelihood estimation of parameters, and on estimation of functions that characterize the RT distribution such as the density and hazard functions. The second day will focus on issues involved in estimating the parameters of models with no explicit likelihood. These models are evaluated by way of repeated simulation. For models with no explicit likelihood, the best approach is that of Approximate Bayesian Computation (ABC). Participants will be introduced to the concept of ABC, and estimate the posterior distributions of model parameters using basic ABC algorithms.

Objectives. At the conclusion of this workshop, participants should be able to

(Day 1)
- Understand how random variables are characterized and be able to formulate a likelihood function;
- Estimate density, distribution and hazard functions of RT data;
- Describe different methods for parameter estimation and their strengths and weaknesses;
- Compute maximum likelihood estimation of parameters for simple models;
- Evaluate model fit and perform simple model comparisons.

(Day 2)
- Simulate a diffusion process (or other data generating mechanism of interest);
- Describe the three components of a Bayesian analysis;
- Describe and possibly implement in code an Approximate Bayesian Computation (ABC);
- Execute simple code for estimating posterior distributions of parameters for models with no explicit likelihood.

Materials. Readings will be provided electronically. Participants should have a workstation or laptop with the most recent version of R installed and working properly. Participants should also have a data set consisting of RT and accuracy

data from a simple choice task. If the data set is from an experiment with multiple conditions, it may need to be subsetted or collapsed. If any participant does not have a data set of his/her own, one will be provided."

Assignment: Active participation

Credits: 2 workshop days