Homework #4 (100 points)

207.547 Seminar in Experimental Psychology: Computational Modeling

Spring 2018

Due: Thursday, May 17th, at 11:59 pm

1. (50 pts). Consider another hierarchical Bayesian model (M4) of memory retention where we assume no individual differences for beta (β):

(1) **(5 pts)** Download `Retention_3_Stan.R` file from the GitHub repo (https://github.com/stan-dev/example-models/tree/master/Bayesian_Cognitive_Modeling)

(2) **(25 pts)** Modify "`Retention_3_Stan.R`", create M4, and save it as "`Retention_4_Stan.R`". Modify codes as needed for the latest Stan version (e.g., replace # with //).

(3) **(20 pts)** Using Stan, find the following:
(2a) The posterior distribution of individual and group (hyper) parameters.
(2b) The 95% Highest Density Interval (HDI) for the parameters.

(4) **Bonus point (30 pts – warning: it may take extra effort to finish this bonus question)**: add lines in the generated quantities block so that you can add the 'log_lik' variable, and compute leave-one-out cross validation information criterion (LOOIC) using the loo package in R. See this example: https://github.com/CCS-Lab/hBayesDM/blob/master/exec/ra_prospect.stan. Then, calculate LOOIC using the loo:loo function. See this example showing how to extract LOOIC (https://github.com/CCS-Lab/hBayesDM/blob/master/R/extract_ic.R).

Attach your R/Stan program and outputs.

2. (50 pts).

(1) Using `ra_prospect_stan_singleSubj.R`, program an R code that will run `ra_prospect_w_reparam.stan`.

(2) Run and acquire the posterior distribution of individual and group parameters. Compute the 95% HDI for the parameters.

(3) Try the following priors and repeat (2)
   a. Half-Normal(0, 1) (mean of 0 and SD of 1) for sigma of all three parameters
   b. Use Half-Cauchy(0, 5) for sigma of tau and lambda but Half-Normal(0, 1) for sigma of rho. Hint: you may need to use different variable names for sigma of each parameter.

Attach your R/Stan program and outputs.