Homework #3 (100 points)

207.547 Seminar in Experimental Psychology: Computational Modeling
Spring 2018
Due: Thursday, May 3rd, at 11:59 pm

1. (50 pts). Consider the following binomial model and data:

Model M1: $Prior$: $\theta \sim Beta(2,2)$
$Likelihood$: $k_i \sim Bin(\theta, n_i),\ (i = 1, \ldots, 6)$

Data: k[i] = {11, 18, 15, 39, 32, 43}
n[i] = {20, 25, 30, 55, 45, 57}

(1) Draw a graphical representation of the model.
(2) Using Stan, find the following:
(2a) The posterior distribution of the parameter.
(2b) The 95% Highest Density Interval for the parameter.

Attached your Stan program and outputs.

2. (50 pts). Modify ra_prospect_stan_singleSubj.R and ra_prospect_stan_singleSubj.stan codes so that

(1) Your code will calculate posterior distributions of all 5 subjects (Hint: use a for loop)
(2) Calculate posterior means of 5 subjects (Hint: mean(…))
(3) Compare MLE estimates (from HW2) and posterior means by plotting them in x- and y-axes.

Bonus Question 1 (+20 pts)

(1) Based on lecture materials and chapters from John Krushcke's book, use grid approximation (instead of MCMC) and calculate posterior distributions of the ra_prospect model. Use 10 grids per parameter. Plot and attach your posterior distributions. Attach your R (or Python/Matlab) code.
(2) Use 30 grids per parameter. Plot and attach your posterior distributions. Attach your R (or Python/Matlab) code.

Bonus Question 2 (+ 10 pts)

Perform posterior predictive checks by extracting `y_pred`. For each subject, plot actual and predicted choice behaviors on a single plot and check if the model mimics the actual choice patterns.