Homework #2 (100 points)

207.547 Seminar in Experimental Psychology: Computational Modeling
Spring 2018
Due: Thursday, Aril 5th, at 11:59 pm

1. **(40 points) Consider these seven models from HW#1. Each of the eight retention models below predicts the probability of correct recall as a function of time interval *t* given model parameters as**

$POW1$: $p(\theta = (b)) = (t+1)^{-b} \quad (0 < b < 3)$

$POW2$: $p(\theta = (a,b)) = a(t+1)^{-b} \quad (0 < a < 1, 0 < b < 3)$

$EXP1$: $p(\theta = (b)) = e^{-bt}$ (0 < b < 3)

$EXP2$: $p(\theta = (a,b)) = ae^{-bt}$ (0 < a < 1, 0 < b < 3)

$EXPOW$: $p\big(\theta = (a,b,c)\big) = ae^{-bt}(t+1)^{-c}$ (0 < a < 1, 0 < b, c < 3)

$HYP1$: $p(\theta = (b)) = \dfrac{1}{1+bt} \quad (0 < b < 1)$

$HYP2$: $p\big(\theta = (a,b)\big) = \dfrac{a}{1+bt} \quad (0 < a < 1, 0 < b < 1)$

with a binomial likelihood function of the following form,
$f(y = (y_1, y_2, \ldots, y_m)|\theta) = \prod_{i=1}^{m} \frac{n!}{(n-y_i)!y_i!}\ p(\theta)^{y_i}(1-p(\theta))^{n-y_i}$

Download two R programs, *model_select.R* and *MLE.R*, from the link provided in the ClassPrep, and modify them to calculate AIC and BIC values for the seven models above.

Attach a single ZIP file that includes copies of your modified R programs and a table summarizing model selection results. Also include one paragraph discussion of the results.

2. **(60 points) Program your own MLE code that estimates parameters of the model presented in class (model name: *ra_prospect*) and compute AIC and BIC values of the ra_prospect model.**

1) For a single subject (subject ID = 2)
2) For all subjects (i.e., estimate a set of parameter values for each subject)
   Use the following parameter bounds

$$0 < \rho < 2$$
$$0 < \lambda < 10$$
$$0 < \beta < 5$$

3) Modify your code so that your code now fit a model without the lambda (loss aversion) parameter. In other words, λ is set to 1 in this model. Compute AIC and BIC values of this model (model name: *ra_noLA*).
4) Based on AIC or BIC values, which model is a better model?