Homework #1 (100 points)

207.547 Seminar in Experimental Psychology: Computational Modeling
Spring 2018
Due: Thursday, March 29, at 11:59 pm

Each of the eight retention models below predicts the probability of correct recall as a function of time interval *t* given model parameters as

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

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

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

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

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

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

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

$SINE$: $p(\theta = (a)) = (\sin(at)+1)/2$ $(0 < a < 100)$

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 the R programs, *Parm_Estm.R* and *MLE_LSE.R*, from the link provided in the ClassPrep, and modify them so the maximum likelihood estimates (MLEs) of all models are obtained.

Attach a single ZIP file that includes copies of your modified R programs and a single PDF file of the figure created. The figure must show all best-fit curves. In addition, attach a table summarizing MLE parameter estimates and values of the percent variance accounted for (i.e., r^2). Also include one paragraph discussion of the results.

Bonus (challenge) question (extra 20 points): Program your own code that estimate parameters with least squares estimates (LSEs) of the six models.