**AML 610 Fall 2014 Homework #10**

**Submit all files to** **smtowers@asu.edu****.**

**Due Mon Dec 1st, 2014 at noon.**

**Please submit with name format hwk10\_<first name>\_<initial of last name> Please provide your R and C++ files, and a Word file that gives the output to your screen, plots, etc.**

**All code must conform to good coding practices, as described in** [**http://sherrytowers.com/2012/12/14/good-programming-practices-in-any-language/**](http://sherrytowers.com/2012/12/14/good-programming-practices-in-any-language/) **and all plots must conform to good plotting practices, as described in** [**http://sherrytowers.com/2013/01/04/good-practices-in-producing-plots/**](http://sherrytowers.com/2013/01/04/good-practices-in-producing-plots/)

**All questions of this assignment are to be performed collaboratively with your project group. This assignment is centered on completing the analysis and write up of your project. Make sure your write up conforms to the standards discussed in** [**http://sherrytowers.com/2014/09/02/how-to-write-a-good-scientific-paper/**](http://sherrytowers.com/2014/09/02/how-to-write-a-good-scientific-paper/) **I am expecting a write up of publication quality in its layout, plots, etc, that also conforms to the Abstract and body word count and format of your chosen journal.**

**Question 1**

a) Write the R code to randomly sample the parameter(s) of your model, calculate the model, and then calculate your chosen goodness-of-fit statistic appropriate to your data. Find the parameter ranges for sampling that include approximately the +/- 3 std dev CI of the parameter(s) (or somewhat more).

b) Make plots of the goodness-of-fit statistic vs the parameter hypotheses, where the y axis limits on the plot are appropriately chosen to only include the parameter hypotheses in the 95% CI.

c) Also include a plot to show the best-fit model overlaid on the data.

**Question 2**

a) write a C++ class that contains your data.

b) Write a C++ program to randomly sample the parameter(s) of your model, calculate the model, and calculate your goodness-of-fit statistic appropriate to your data. Sample the parameters within the ranges determined by your initial fits in R. Output the parameter hypotheses and the goodness-of-fit statistic. Use the tips suggested in the examples shown in class to prevent output file bloat.

c) Run this C++ code on your laptop or general.asu.edu or research2.asu.edu or medusa2.asu.edu for several thousand iterations of the parameter sampling. Read in the output file into R, and make the same plots as in Question 1 to ensure that indeed, your C++ code is working as expected.

d) Once you have verified your C++ code, run a sufficient number of batch jobs on ASURE or XSEDE to get a well populated plot of the goodness of fit statistic vs the parameter hypotheses (such that you can estimate with good precision the optimal values and their 95% CI). Because you are sure to have hiccups in this process (bugs, etc), only run at most 50 parallel programs at the same time. This way you will minimize wastage of our limited supercomputing CPU allocation, which we all have to share.

**Question 3**

Based on the results of Question 1 and Question 2, make a properly labeled attractive plot of the goodness of fit statistic vs parameter hypotheses, and also include a plot of your best-fit-model overlaid on the data, with a legend. Include this plot in your writeup, with reference to it in the text of the Results section. Make sure the plot has a caption, and is labeled as a Figure. In the Results section, talk about your estimates for the best-fit parameter values and their 95% CI’s.

**Question 4**

Finish your project write-up with the Discussion and Summary section, with a discussion of your results and how they are novel (if they are), and how they compare with previously published results (if there are any previously published results… if there aren’t, say so).

**Question 5**

Write a draft of a cover letter to the editors of your chosen journal. Indicate the name of your manuscript, a few sentences motivating the study, and a few sentences briefly summarizing your objective and results. Also include a sentence or two stating why you believe your paper is appropriate for their journal. You can find an example of a cover letter at[**http://sherrytowers.com/2014/09/02/how-to-write-a-good-scientific-paper/**](http://sherrytowers.com/2014/09/02/how-to-write-a-good-scientific-paper/)

**Question 6**

Send me the link to the Instructions for Authors page of your chosen journal