

**BIST 8157: Analysis of Longitudinal Data**  
**Homework #4**  
**Due Nov. 24**

**Question 1:**

On the course notes, the `glmer()` in the `lme4` package is reviewed as a means to fitting generalized linear mixed models. In this question you are going to create your own function in R to fit a logistic random intercepts GLMM for binary response data, using Gauss-Hermite quadrature. Your function should have the same inputs as those given in slide 367, with the exception of the ‘family’ input. Together with the primary function for fitting the model, create `print` method that outputs the results in a way that is similar to the output from the summary method for `glmer()`. As part of this output include, at least, a title for the fit, information on the overall fit (i.e. the maximized log-likelihood), results regarding the variance components and results regarding the fixed effects. Finally, apply the function to the ICHS data specifically to replicate the results presented on slide 369 of the notes. As you hand in your solution, send your code to the TAs. Please make sure to clean and annotate your code in a way that makes it easy for the TAs (or any reader) to understand the various steps.

**Question 2 (optional):**

In collaborative settings in which the data are either cluster-correlated or longitudinal, a very common question is whether one should proceed using a marginal model, with estimation/inference via GEE, or with a GLMM with likelihood-based estimation inference. In this question you are going to consider a series of questions that can help guide those decisions. For each of the following, create a series of bullet points that could be folded into a talk that you give on the topic or into a set of slides that you could use with your collaborator:

**Q:** Features shared by both frameworks?

**Q:** Reasons to use marginal models?

**Q:** Reasons not to use marginal models?

**Q:** Reasons to use mixed models?

**Q:** Reasons not to use mixed models?