



Comparing Optimization Algorithms in the Fitting of Linear Mixed Models: Evaluating Speed and Accuracy using lme4 in R and lmm in Julia

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Abstract

The **Timings** package allows for the comparison of several optimizers, in both R and Julia, used in the fitting of various linear mixed models. In R the optimizers are called by lmer from the **lme4** package (version 1.1-8). In Julia the optimizers are called by lmm from **MixedModels** package. From the **Timings** package, conclusions regarding an optimizers relative speed, accuracy and general effectiveness of different optimizers paired with different types of models (ranging from simple to complex) can easily be drawn and interpreted.

There are differences in the model formulations in **lme4** and in **MixedModels**. The numerical representation of the model in **lme4** and the method of evaluating the optimizers, described in this paper, is the same for all models. In **MixedModels** there are specialized representations for some model forms, such as models with a single grouping factor for the random effects. Some of the specialized representations allow for evaluation of the gradient of the objects, which can enhance convergence (but, interestingly, sometimes can impede convergence).

Keywords: optimizers, mixed models, linear mixed models, lme4, lmm, R, Julia.

1. Introduction

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2. Methods

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3. Results

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3.2. Reliability

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4. Conclusions

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