Mixed Effects Models with Censored Response

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(Bldg #314 on campus map)

In this talk we discuss inference for linear and non-linear mixed effects models with censored response. In a parametric framework, the computation of the maximum likelihood and restricted maximum likelihood for linear and non-linear mixed effects models with censored response is frustrated by the double integral in the likelihood over the random effects and over the censored response. In previous work we studied a Monte Carlo EM algorithm (Vaida, Fitzgerald and DeGruttola, 2007). Here we propose two new methods: 1) A version of the EM algorithm which in contrast with previous developments uses closed-form expressions at the E-step, as opposed to Monte Carlo simulation. These expressions rely on formulas for the mean and variance of a truncated multinormal distribution, and can be computed using available software. This leads to an improvement in the speed of computation of up to an order of magnitude. 2) A penalized likelihood approach using a Laplace approximation of the double integral. With no censoring this yields the exact maximum likelihood.

A wide class of mixed effects models is considered, including the Laird-Ware model, and extensions to different structures for the variance components, heteroscedastic and autocorrelated errors, and multilevel models. In addition to normal distribution for errors and random effects we consider a more general class, the scale mixture of normals, which includes the multivariate Student’s t as a particular case. We apply the methodology to two case studies from our own biostatistical practice, involving the analysis of longitudinal HIV viral load in two recent AIDS studies.

For directions please refer to http://www.ics.uci.edu/about/visit/
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