

Random Effects, Mixtures, and NPMLE

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The use of mixed models with normally distributed response and random effects is well worked out and available in many software packages. For non-normal response data the situation is less clear and there are many different approaches being studied. Within the framework of generalized linear models, one natural way of proceeding is to include additive random effects in the linear predictor. These random effects can be used to account for an additional level of individual variability (overdispersion); a shared random effect for the additional variance component in two-stage sample designs; longitudinal dependence in repeated measures designs; spatial dependence in disease mapping; etc. A common assumption for the random effects is that they are normally distributed, giving the generalized linear mixed model, where maximum likelihood estimates can be obtained using the EM algorithm and essentially fitting a mixture model. By a simple extension of this approach, it is possible to relax the assumption of normality and obtain a nonparametric maximum likelihood estimate for the random effects distribution.

These techniques are described in Aitkin et al. (2005) and are currently being implemented in R, see Einbeck and Hinde (2005). In this talk we will give a brief introduction to the methodology and discuss several illustrative examples.

References

- Aitkin, M., Francis, B. and Hinde, J. (2005) *Statistical Modelling in GLIM4*. Oxford University Press, Oxford.
- Einbeck, J. and Hinde, J. (2005) NPML estimation in R.
<http://www.nuigalway.ie/mathsjeh/npml.html>

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