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Abstract

Generalized linear mixed models (GLMMs) are useful for modelling longitudinal and clustered data, but parameter estimation is very challenging because the likelihood may involve high-dimensional integrals that are analytically intractable. Gauss-Hermite quadrature (GHQ) approximation can be applied but is only suitable for low-dimensional random effects. Based on the Quasi-Monte Carlo (QMC) approximation, a heuristic approach is proposed to calculate the maximum likelihood estimates of parameters in the GLMM. The QMC points scattered uniformly on the high-dimensional integration domain are generated to replace the GHQ nodes. Compare to the GHQ approximation, the proposed method has many advantages such as its affordable computation, good approximation and fast convergence. Comparisons to the penalized quasi-likelihood estimation and Gibbs sampling are made using a real dataset and a simulation study. The real dataset is the salamander mating dataset whose modelling involves six 20-dimensional intractable integrals in the likelihood.

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