

Gaussian Variational Approximation for Overdispersed Generalized Linear Mixed Models

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Abstract

In a recent publication by Molenberghs and Demétrio (2011) a general modeling framework was proposed to model non-Gaussian data that are hierarchically structured and are overdispersed in the sense that the distributional mean-variance relationship is not fulfilled. The modeling framework extends the Generalized Linear Models with two random effects, a normally distributed random effect for the hierarchy and a conjugate random effect to account for the overdispersion. The main difficulty with this kind of models is the computational complex estimation due to the intractable multivariate integrals, as is the case for Generalized Linear Mixed Models that involves such integrals with no analytic expression. Different estimation methods for these models were already proposed: estimation using partial marginalization, estimation in the bayesian framework, and an approximate estimation based on pseudo-likelihood. In this manuscript, the use of Gaussian variational approximation methods is investigated as a computationally fast estimation method for the combined model. A range of over-dispersed non-gaussian outcomes mixed models are investigated. It appears to be computationally fast and accurate.

Some Keywords: Gaussian variational approximation; Overdispersion ; Hierarchical models; Weibull Gamma Normal, Poisson Normal; Logistic Normal.

References

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