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Joint Modeling of Hierarchically Clustered Non-Gaussian Continuous Outcomes via the Gaussian Copula

In many biomedical studies, researchers simultaneously record multiple outcomes. With non-Gaussian continuous responses with disparate distributions, joint analysis is rendered complicated by the lack of multivariate analogue to the multivariate normal distribution. We propose a copula-based approach to joint modeling of non-Gaussian clustered continuous outcomes. We use Gaussian copula to glue multiple outcomes and adopt GLMMs for the marginal models of the outcomes. The approach does not assume conditional independence of outcomes unlike in conventional GLMMs. It is thus able to capture all relevant associations in the data. The proposed methodology is illustrated using data from a comet assay.