Applications of Mixed-Effect Models in the Health Sciences

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SUNIL RAO, University of Miami
Classified Mixed Model Prediction

Mixed model prediction (MMP) has a fairly long history starting with Henderson's early work in animal breeding (Henderson 1948). Nowadays, new and challenging problems have emerged, to which methods of MMP are potentially applicable, but not without further methodological and computational developments. Often problems occur when interest is at subject level (e.g., personalized medicine), or (small) sub-population level (e.g., community, center). The challenges have to do with better prediction of a mixed effect, or a future observation, by identifying the class that a new subject belongs to. We propose a new method, called classified mixed model prediction (CMMP), to solve this problem. We develop a theory for CMMP and investigate its empirical performance through simulation studies and a real-data application.

CINDY FENG, University of Saskatchewan
Zero Modified Models for Modeling Length of Hospital Stay for patients with Ischaemic Heart Disease

Length of stay (LOS) in hospital is often used as an indicator of hospital efficiency and a proxy of resource consumption, which may be characterized as zero-inflated if there is an over-abundance of zeroes, or zero-deflated if there are fewer zeroes than expected under a standard count model. Such data may also have a highly right-skewed distribution for the nonzero values. We developed and compared a series of zero modified models with various configurations of fixed and random effects, as well as allowing analysis of nonlinear effects of time, spatially structured variation and unstructured heterogeneity. Modeling and inference use the fully Bayesian approach via Markov Chain Monte Carlo (MCMC) simulation techniques.

MAHMOUD TORABI, University of Manitoba
Multivariate Mixture Spatial Generalized Linear Mixed Models

Disease mapping has been widely studied with considering only one disease in the estimated models. Simultaneous modeling of related diseases can also be a valuable tool both from the epidemiological and from the statistical point of view. In particular, when we have several measurements recorded at each spatial location, we need to consider multivariate models in order to handle the dependence among the multivariate components as well as the spatial dependence between locations. In many circumstances, it is a very strong assumption to have the same underlying distribution for all regions of population study. In this talk, we consider the multivariate mixture spatial models for areal data for Normal and non-Normal responses in the class of generalized linear mixed models.