

Multivariate t Nonlinear Mixed Models for Analyzing Multivariate Longitudinal Data with Possible Missing Values

Tsung-I Lin

Institute of Statistics, National Chung Hsing University,
Taichung, Taiwan
e-mail: tilin@nchu.edu.tw

Abstract

The multivariate nonlinear mixed model (MNLMM) has been exploited as an effective tool for modelling multi-outcome longitudinal data following nonlinear growth patterns. In the framework of MNLMM, the random effects and within-subject errors are routinely assumed to be normally distributed for mathematical tractability and computational simplicity. However, a serious departure from normality may cause lack of robustness and subsequently make invalid inference. In this talk, I introduce a robust extension of the MNLMM by considering a joint multivariate t distribution for the random effects and within-subject errors, called the multivariate t nonlinear mixed model (MtNLMM). Moreover, a damped exponential correlation (DEC) structure is employed to capture the extra serial correlation among irregularly observed multiple repeated measures. An ECM procedure coupled with the first-order Taylor approximation is developed for estimating model parameters. The techniques for estimation of random effects, imputation of missing responses and identification of potential outliers are also investigated. The methodology is applied to a real data example on 161 pregnant women coming from a study in a private fertilization obstetrics clinic in Santiago, Chile. An extension of MtNLMM to accommodate censored responses is briefly discussed.

(Joint work with Dr. Wan-Lun Wang, Feng Chia University, Taiwan)

Key words: Damped exponential correlation, ECM algorithm, Imputation, Multivariate longitudinal data, Outlier detection.