Colloquium

Friday March 30, 2007

12:30pm Room 08-2130

UNCONSTRAINED MODELS FOR THE COVARIANCE STRUCTURE OF MULTIVARIATE LONGITUDINAL DATA

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The constraint that a covariance matrix must be positive definite presents difficulties for modeling its structure. In a series of papers published in 1999 and 2000, Mohsen Pourahmadi proposed a parameterization of the covariance matrix for univariate longitudinal data in which the parameters are unconstrained. This unconstrained parameterization is based on the modified Cholesky decomposition of the inverse of the covariance matrix into a function of a unique unit lower triangular matrix with no constraints on its nontrivial elements and a unique diagonal matrix with positive diagonal elements on the diagonal. The positiveness constraint is removed by taking logarithms of the diagonal elements. We extend this idea to multivariate longitudinal data. We develop a modified Cholesky block decomposition that provides an unconstrained parameterization for the covariance matrix, and we propose parsimonious models within this parameterization. A Newton-Raphson algorithm is developed for obtaining maximum likelihood estimators of model parameters, assuming that the observations are normally distributed. The results along with penalized likelihood criteria such as BIC for model selection are illustrated using a real multivariate longitudinal dataset and a simulated data set.

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