

STANFORD UNIVERSITY
DEPARTMENT OF STATISTICS
DEPARTMENTAL SEMINAR

4:15 p.m., Tuesday, November 12, 2002
Sequoia Hall Room 200
(Cookies at 3:45 in 1st Floor Lounge)

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Extended likelihood inference applied to a new class of models

Random-effect models require an extension of Fisher likelihood. Extended likelihood (Pawitan) or, equivalently, h-likelihood (Lee & Nelder), provide a basis for likelihood inference applicable to random-effect models. The model class, called hierarchical generalized linear models (HGLMs), is derived from generalized linear models (GLMs). It supports (1) joint modelling of mean and dispersion; (2) GLM errors for the response; (3) random effects in the linear predictor for the mean, with distributions following any conjugate distribution of a GLM distribution; (4) structured dispersion components depending on covariates. Fitting of fixed and random effects, given dispersion components, reduces to fitting an augmented GLM, while fitting dispersion components, given fixed and random effects, uses an adjusted profile h-likelihood and reduces to a second interlinked GLM, which generalizes REML to all the GLM distributions.

A single algorithm can fit all members of the class and does not require either prior distributions or the multiple quadrature needed for methods using marginal likelihood. Model checking also generalizes from GLMs and allows the visual checking of all aspects of the model.

The model class can be extended to cover correlated data expressed by random terms in the model, thus allowing fitting of spatial and temporal models with GLM errors. Correlations can be expressed by transformations of white noise, by structured covariance matrices, or by structured precision matrices. Finally the class can be extended to double HGLMs, which allow random effects in the dispersion model as well as in the mean. This leads, among other things, to a potentially large expansion of classes of models used in finance, the properties of which have still to be investigated.

Joint work with Youngjo Lee, Seoul National Univ., Korea.