Multivariate Grass Ordering and Pairwise Optimization Criterion

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Multivariate order relations are generated from closed convex cones, the order-generating cones. Matrices with columns in orderings are confined to closed convex cones, the order-restricted cones. In MANOVA, the restricted MLE of the mean matrix in an ordering is the projection of the unrestricted MLE onto the order-restricted cone. This talk introduces a general grass ordering. By applying a pairwise optimization criterion summarized from cases where the restriction is only on two columns, a dynamic subset of the order-restricted cone for grass ordering is obtained. Based on the study of the matrix projections onto this subset, the projection of MLE onto the subset is proposed to be used as an estimator for the order-restricted mean matrix. This estimator is shown to be strongly consistent. Making use of this estimator in testing the homogeneity of the mean matrix leads to an ad hoc test. The test statistic of the test is shown to have a unique null distribution. The algorithm developed for the matrix projection onto the subset converts the problem of matrix projections to that of vector projections and can produce results in finite steps. A simulation study on the errors of the proposed estimator is conducted. The Monte Carlo method for computing the α-level critical values for the test statistic is discussed and illustrated.

A Partially Collapsed Gibbs Sampler for Bayesian Longitudinal Quantile Regression

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Bayesian quantile regression for longitudinal data typically relies on the asymmetric Laplace distribution (ALD) working likelihood combined with Gibbs sampling via its normal-exponential mixture representation. However, the standard Gibbs sampler can suffer from slow mixing and poor convergence, particularly when the within-subject sample size or random-effect variance is large. We propose a Partially Collapsed Gibbs (PCG) sampler that replaces the standard full conditional with the marginalized conditional. A key ingredient is a ξ-reparameterization that decouples the scale parameter from the augmented-data covariance, yielding a closed-form inverse-gamma full conditional for the marginalized step. In an extensive simulation study, the proposed sampler achieves substantial gains in effective sample size per second over the standard Gibbs sampler, with the advantage growing sharply as within-subject sample size and variance increase. In several configurations, the standard Gibbs sampler exhibits catastrophic convergence failure, whereas the PCG sampler remains stable. The methodology is illustrated with an application to CD4 cell count data from an HIV/AIDS clinical study.

Bayesian Adaptive LASSO for Simultaneous Quantile Estimation and Variable Selection in Longitudinal Data

Sarah Ghazawneh, Wichita State University

Quantile regression offers a flexible way to study covariate effects across the full distribution of a response, but in longitudinal and high-dimensional settings, estimating the quantile level and selecting relevant covariates at the same time remains a challenge. We propose a Bayesian adaptive LASSO (BAL) framework that jointly estimates the quantile parameter tau and performs variable selection within a single model, built on the asymmetric Laplace mixture representation for Bayesian quantile regression. To address variable selection in high-dimensional settings, we incorporate a clustering-based shrinkage approach that groups regression coefficients according to their estimated effect sizes, allowing the model to adaptively distinguish between relevant and negligible covariates. We evaluate the method through simulation studies, examining its variable selection performance relative to fixed quantile alternatives. We also apply the method to real longitudinal datasets, including a low-dimensional economic application and a high-dimensional genomic application. We discuss how jointly estimating the quantile level and selecting variables through this clustering-based approach can improve both estimation accuracy and variable selection in longitudinal data analysis.

High-dimensional Proportional Hazards Model with the Horseshoe+ Prior

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In this talk, we discuss the use of horseshoe+ prior to the high-dimensional proportional hazards (PH) model for analyzing right-censored data. This work represents the first attempt to apply a continuous shrinkage prior in the setting of high-dimensional survival models and to compute the maximum a posteriori (MAP) estimator. Since the objective function is highly nonconcave, direct optimization of the posterior is infeasible. To address this challenge, we propose a hybrid minorize–maximize (MM) algorithm for optimizing the model parameters, which are partitioned into blocks containing nonoverlapping parameters. This decomposition, together with the careful construction of the minorizing function and the componentwise log-concavity of the objective function, greatly simplifies the maximization problem. Simulation studies demonstrate the effectiveness of the proposed algorithm, with favorable comparisons to several popular methods for high-dimensional survival models. Moreover, a near-optimal posterior contraction rate for the high-dimensional PH model is established, and a convergence rate for the MAP estimator is provided. Finally, we illustrate the practical utility of the proposed approach by identifying significant genetic biomarkers in an ovarian cancer study.