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SPEAKER/ABSTRACT

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"Bayesian Analysis for one-way MANOVA and a 3-Level Hierarchical Model"

Abstract:
We study a new class of commutative shrinkage priors for two covariance components in multivariate one-way ANOVA models and Normal hierarchical models, respectively. Multivariate one-way ANOVA model is of substantial importance in contemporary statistical theory and application. It could be used to data fusion for analyzing data from different resources. One primary interest is to estimate unknown overall mean and two covariance components (matrices). The usual MLE and moment estimators for some covariance component may not exist. For two covariance components, a new class of commutative priors is also proposed, which is a conjugate class. Propriety and moment existence are derived for both the prior and their posterior. Simulation and real data analysis show the advantages of commutative priors. In addition, we also study the commutative shrinkage priors in normal hierarchical models. Normal hierarchical models are quite important for Bayesian analysis, yet the choice of objective priors to use for hyperparameters is often in a casual fashion. It is common to use a constant prior for higher level variances or covariances, but the constant prior is much too diffuse, requiring twice as many observations to obtain posterior propriety as is logically needed (see Berger et al., 2018), especially when the dimension is high. Using formal priors from non-hierarchical models, such as the Jeffreys-rule or reference prior approach, result in improper posterior distributions if they are used at higher levels of a hierarchical model (Fatti, 1982ï¼› Sun et al., 2001). Berger et al. (1996, 2005, 2018) approached the question of choice of hyperpriors in a 2-level normal hierarchical model from the frequentist notion of admissibility of resulting estimators. We study the commutative shrinkage priors for use in 3-level normal hierarchical models. Our work is based on considerations of posterior propriety, admissibility, ease of implementation (including computational considerations), and performance. This work is joint with Dongchu Sun, James O. Berger, Zhuoqiong He, and William R. Bell.