A Simple Two-Sample Bayesian Hotelling's T^2 for Equality of Means

Zhuanzhuan Ma, The University of Texas Rio Grande Valley

We propose an explicit Bayes factor for comparing the mean vectors of two populations in multivariate hypothesis testing. The proposed approach could be viewed as a natural Bayesian counterpart to the classical Hotelling's T^2 test, thereby connecting Bayesian and frequentist perspectives. A notable advantage of the present procedure is that it depends on the observed data only through the Hotelling's T^2 statistic, which leads to computational simplicity and intuitive interpretation, and makes it particularly suitable for inclusion in multivariate analysis courses that emphasize Bayesian thinking. We then investigate the desiderata of the proposed Bayesian procedure: information consistency and predictive matching, and also study its model selection consistency under two different asymptotic scenarios: when the number of units tends to infinity and when the number of observations per unit tends to infinity. Simulation studies and a real-data application are provided to illustrate the finite-sample performance of the proposed method.

A Consecutive Bayesian Hypothesis Test for the One-Way Random Effects Model

Mai Dao, Wichita State University

In this talk, we discuss an objective Bayesian hypothesis testing procedure within the framework of one-way random effects models. Objective Bayesian methods typically rely on objective improper priors, which can lead to an undefined Bayes factor due to arbitrary constants. A common solution averages Bayes factors over all possible minimum training samples (MTS) to eliminate this constant, but incurs high computational costs when MTS combinations are large. To overcome this, we introduce a consecutive MTS size strategy to derive the consecutive Bayes factor (CBF), providing a simple, closed-form, and computationally efficient expression. The proposed CBF facilitates the computation of consecutive posterior probabilities, enabling an objective quantification of evidence against the null hypothesis. Furthermore, we examine the model selection properties of the CBF under two asymptotic scenarios: (i) as the number of units tends to infinity, and (ii) as the number of observations per unit tends to infinity. Simulation studies and real-data applications demonstrate the effectiveness of the proposed method.

Bayesian Modeling of Dependent Best-Worst Choices Using INLA

Nadeesha Jayaweera, The University of Akron

We propose a Bayesian framework for analyzing highly dependent best-worst (BW) choice data in discrete choice experiments. To capture dependence between best and worst selections, BW outcomes are modeled as directed transitions between latent preference states. Transition counts are analyzed using a Poisson log-linear model with pair-specific random effects to account for heterogeneity and cross-alternative dependence. Bayesian inference is conducted using Integrated Nested Laplace Approximation (INLA), providing fast and scalable estimation without requiring Markov chain Monte Carlo (MCMC). The proposed approach is evaluated through simulation studies and a quality-of-life case study based on Flynn et al. and compared with existing copula-based transition models. Results demonstrate improved model fit, stability across different sample sizes, and reliable estimation of latent utilities based on DIC and WAIC criteria. Overall, this framework provides a flexible, interpretable, and computationally efficient approach for analyzing complex preference data with applications in health, marketing, and social sciences.

Online Estimation of Spatially Varying Coefficient Models for Streaming Data over Complex Domains

Jingru Mu, Kansas State University

Spatial data analysis has attracted considerable interest; however, it faces new challenges due to the increasing volume of spatial data streams. In this paper, we develop a novel online nonparametric method to update the estimates of coefficient functions in spatially varying coefficient models (SVCMs). The updated estimation process is based on dynamic bivariate penalized splines over triangulations. The proposed approach features a gradient-magnitude-driven vertex insertion strategy that dynamically refines the triangulation over the complex domain following the Delaunay criterion, thereby periodically introducing more Bernstein basis functions to enhance the approximation of the online estimators as new data continuously flow in. Meanwhile, we design an efficient sequential updating algorithm that relies only on summary statistics and newly observed data to implement the proposed online estimation. Under mild regularity conditions, we establish the optimal L_2 convergence rate of the proposed online estimators. Furthermore, we construct multiplier-bootstrap-based online pointwise confidence intervals for the coefficient functions in the SVCMs. Simulation studies and an empirical example demonstrate that the proposed online method performs nearly as efficiently as the classical methods that have access to the historical dataset.