The 2018 Beijing Workshop on Linear Models

Contents

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by

School of Statistics and Mathematics

Central University of Finance and Economics

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Venue

Shahe Main Building 111
Central University of Finance and Economics
Shahe University Park, Changping District, 102206 Beijing, China

Date

Saturday, May 05, 2018, 08:00-12:15

Invited Speakers

Dietrich von Rosen, Swedish University of Agricultural Sciences

Yongge Tian, Central University of Finance and Economics

Chengcheng Hao, Shanghai University of International Business and Economics

Xiaodi Wang, Central University of Finance and Economics

Contact Us

No registration fee is charged for all participants, If you have any questions, please contact the workshop organizer Feng Li <Email: feng.li@cufe.edu.cn>

Program

08:00-09:50 Keynote Lecture I

Title: The likelihood ratio test in bilinear models

Speaker: Dietrich von Rosen, Swedish University of Agricultural Sciences and Linköping University

Abstract

Let W_{H_0} and W_{H_1} be two independently distributed Wishart matrices which build up Wilks Λ, i.e.

$$\Lambda = \frac{|W_{H_0} + W_{H_1}|}{|W_{H_1}|}.$$

The matrices appear when testing H_0: $BG = 0$ versus H_1: B unrestricted in a MANOVA model, i.e.

$$X = BC + E,$$

X is a random matrix which represents the observations, C and G are known matrices, and $E \sim N_{p,n}(0, \Sigma, I)$, where B and Σ are unknown parameter matrices. The distribution of Λ equals a product of independent beta-distributed variables. When approximating the distribution several approaches are available, where the most commonly applied uses approximations of the gamma-function.

Let the GMANOVA model be given by

$$X = ABC + E,$$

where in addition to the MANOVA model a known matrix A has been introduced.

Remarkable is an old classical result which states that the likelihood ratio test for testing in a GMANOVA model H_0: $FBG = 0$, where F and G are known, versus H_1: B unrestricted also follows a Wilks Λ distribution.

It is remarkable since the maximum likelihood estimators in the MANOVA and GMANOVA are very different. The talk will derive the distribution in a somewhat different way than what usually is applied which also sheds some light on some conditional arguments.

Dietrich von Rosen graduated (1986) from Stockholm University, Stockholm, Sweden as a mathematical statistician. He is currently Professor in statistics at the Swedish University of Agricultural Sciences, Uppsala, Sweden. Von Rosen's main interest is multivariate statistical analysis, in particular spatial-temporal models and high-dimensional statistical analysis. Moreover, von Rosen has experiences from complicated data analyses as well as advanced modeling, including spatial-temporal environmental data and EEG analysis of depressed patients. Von Rosen has more than 100 publications in peer-reviewed journals and is a coauthor (with T. Kõllo, Tartu University) of a book on advanced multivariate analysis. Recent research projects include projects supported by the Swedish Natural Research Council, the Swedish Institute, the Foundation for Strategic Environmental Research, Linneaues Centre for Bioinformatics, and others. Von Rosen is Associate Editor of the Journal of Statistical Planning and Inference, Statistical papers, Journal of Multivariate Analysis, and Acta et Commentationes Universitatis Tartuensis de Mathematica.

10:00-10:45 Keynote Lecture II

Speaker: Yongge Tian, Central University of Finance and Economics

Titile: Multilevel statistical models, least-squares estimators, and reverse-order laws for generalized inverse

Abstract: A linear statistical model may involve unknown parameters that vary at more than one level. In such a case, multilevel statistical modeling is an analytical technique for estimating regression and related models with data that have a hierarchical structure. In this talk, I introduce some fundamental estimation problems on multilevel linear models , including two kinds of ordinary least-squares estimators (OSLEs) under multilevel linear models, and describing the equivalence of these estimators by using various matrix identities composed by generalized inverses of matrices. I also present a family of equivalent statements for the matrix identities to hold by using some analytical matrix rank optimization methods. This work shows many facts and results in mathematics have certain essential interpretation in statistics and can be used to solve many fundamental problems in the theory of statistical inference.

10:50-11:30 Regularized estimation of Kronecker structured covariance based on modified Cholesky decomposition

Speaker: Chengcheng Hao, Shanghai University of International Business and Economics

Abstract: This paper is to study regularized covariance estimation problems for

matrix-valued data. Based on the connection between tensor's multilinear subspace projection and Kronecker-product structured covariance, we shall propose a inverse covariance estimator for matrix-valued data from penalized matrix normal likelihood. Modified Cholesky decomposition will be utilized to construct such penalized likelihood estimator. The method can be used for identify parsimony and for producing a statistically efficient estimator of a large covariance matrix of matrix-valued data. Simulation results are illustrated.

11:35-12:15 Symmetrical design for symmetrical global sensitivity analysis of model output

Speaker: Xiaodi Wang, Central University of Finance and Economics

Abstract: Symmetrical global sensitivity analysis (SGSA) can help practitioners focusing on the symmetrical terms of inputs whose uncertainties have an impact on the model output, which allows reducing the complexity of the model.However, there remains the challenging problem of finding an efficient method to get symmetrical global sensitivity indices (SGSI) when the functional form of the symmetrical terms is unknown, including numerical and non-parametric situations. In this study, we propose a novel sampling plan, called symmetrical design, for SGSA. As a preliminary experiment for model feature extracting, such plan offers the virtue of run-size economy due to its closure respective to the given group. Using the design, we give estimation methods of SGSI as well as their asymptotic properties respectively for numerical model and non-parametrical model directly by the model outputs, and further propose a significance test for SGSI in non-parametric situation. A case study for a benchmark of GSA and a real data analysis show the effectiveness of the proposed design.