Introduction to the vol. 48, no. 1, 2021

Maomi Ueno¹

Published online: 15 February 2021
© The Behaviormetric Society 2021

Welcome to the Vol. 48, No. 1, 2021 of Behaviormetrika. In this issue, we have the following one invited paper, five original papers, one note, and two shot notes.

The invited paper “WAIC and WBIC for Mixture Models” is presented by Watanabe (2021). This paper introduces mathematical foundation and computing methods of WAIC and WBIC in a normal mixture which is a typically singular statistical model, and discuss their properties in statistical inference. Also this paper demonstrates the case that samples are not independently and identically distributed, for example, they are conditional independent or exchangeable.

The original paper “Monte Carlo detection of examinees with item preknowledge” by Dmitry Belov develops a new Monte Carlo approach for detecting examinees with Item Preknowledge (IP) by estimating mean of a performance gain on a random sample of items (drawn from the administered test) relative to another random sample (Belov 2021). Two samples are constructed such that for an examinee without IP, the gain should be low; meanwhile, for an examinee with IP, if the first sample has more compromised items than the second sample, the gain should not be low. Comparison study with the previous studies using data simulating the general case of IP demonstrated a dramatic improvement of detection rates (over five times on average) when using the Monte Carlo approach. Even higher improvement (over 25 times) was observed in experiments with two publicly available real datasets. Recommendations for practitioners and extensions of the Monte Carlo approach are provided.

The original paper “Small and Negative Correlations Among Clustered Observations: Limitations of the Linear Mixed Effects Model” by Natalie M. Nielsen, Wouter A. C. Smink, and Jean-Paul Fox addresses the linear mixed effects model (Nielsen et al. 2021). Random effects in a mixed effects model can model a positive correlation among clustered observations but not a negative correlation. As negative clustering effects are largely unknown to the sheer majority of the research community, they conducted a simulation study to detail the bias that occurs when analyzing negative clustering effects with the linear mixed effects model. They also demonstrate that ignoring a small negative correlation leads to deflated Type-I

✉ Maomi Ueno
ueno@ai.is.uec.ac.jp

¹ University of Electro-Communications, Tokyo, Japan

errors, invalid standard errors and confidence intervals in regression analysis. When negative clustering effects are ignored, mixed effects models incorrectly assume that observations are independently distributed. This paper highlights the importance of understanding these phenomena through analysis of the data from Lamers et al. (2015). This paper concludes with a reflection on well-known multilevel modeling rules when dealing with negative dependencies in a cluster: negative clustering effects can, do and will occur and these effects cannot be ignored.

The original paper “Social capital in the creation of AI perception” by Yoji Inaba and Kazunari Togawa provides questionnaire survey on the relationship between social capital (SC) and information and communication technology (ICT) (Inaba and Togawa 2021). This survey focused on seven items, namely whether AI will make us happier, strengthen or weaken human relations, enhance or control our lives, free us from hard work or make us poor, enhance or deprive us of our creativity, make our society crime free or place it under heavier surveillance, and decrease or increase economic inequality. Surprisingly, most respondents ($n=5000$) offered negative views on all seven items except for one, namely the availability of information. Four out of five respondents expected economic inequality to increase. In light of these results, it seems important to mitigate these pessimistic views by enhancing the social acceptance of AI prior to its implementation in society.

The original paper “K-means generalized maximum entropy estimation for structural equation modeling” by Thi Binh An Duong, Jun Tsuchida, and Hiroshi Yadohisa provides an adjusted method of structural equation modeling using the generalized maximum entropy estimation method (GME-SEM) (Duong et al. 2021). The adjusted method, called *K*-means-GME-SEM, can reduce the volume of calculation using *k*-means centroids as a representative for data in consistency constraints. Moreover, the simulation results also show that the new method improves appropriate goodness of fit in the sense of pseudo-R². From a real-data example, we demonstrate how the proposed method is useful when the number of observation is small.

The original paper “Differences in the determinants of purchase intention through advertisements and advertising recognition among product types” by Tatsuya Kawahara investigates the differences in effective advertising creative (intended to communicate a company’s message to consumers) among product types (Kawahara 2021). Using survey data on consumer responses to 2525 TV advertisements in Japan, this study investigates the differences in the determinants of purchase intention through advertisements and advertising recognition among product types defined on the basis of consumers’ perceived risk and product knowledge. An empirical analysis using advertising likability and advertising perceptual scale constructs as factor-side variables reveals the heterogeneity in the determinants of purchase intention—the pattern of which is not predicted by the elaboration likelihood model—and the homogeneity in the determinants of advertising recognition. Furthermore, this study finds that advertising likability does not fully moderate the influence of advertising perceptual scale constructs, which suggests that it is an insufficient indicator to represent various perceptual dimensions of advertising.

The Note “Standard error estimates for rotated estimates of canonical correlation analysis: An implementation of the infinitesimal jackknife method” is

presented by Gu (2021). In applications of canonical correlation analysis (CCA), rotation of the canonical loadings is recommended to facilitate the interpretation of canonical variates. Based on the COSAN modeling approach to CCA proposed by (Gu et al. 2019), we describe the infinitesimal jackknife (IJ) method in modified COSAN-CCA models to obtain the IJ estimates of standard errors for rotated CCA estimates. Specifically, given two CCA rotation strategies (i.e., concurrent and separate) and two types of rotation method (i.e., orthogonal and oblique), our descriptions of the modified COSAN-CCA models and IJ method cover four rotation strategy-method combinations: concurrent-orthogonal, concurrent-oblique, separate-orthogonal, and separate-oblique. Simulation studies are used to evaluate the IJ estimates of standard errors, and a real-data example is analyzed for illustration. We conclude that the IJ method is a trustworthy method for standard error estimation for rotated CCA estimates.

The short note “Increase of reliability by incorporating response time into the paired-comparison psychological measurement is presented by Okada and Bunji (2021). Under some realistic conditions, the simulation experiments reveal a practically relevant (but not very large) degree of increase. The same type of increase is also found during the analysis of a real psychological dataset containing measurements for the Big Five traits. As such, this study produces evidence supporting the collection and utilization of response time when conducting paired-comparison psychological measurement.

The short note “A Bayesian nonparametric topic model for repeated measured data” by Tasuku Okui proposes a topic tracking model (TTM) with offline learning and a Bayesian nonparametric TTM (BNPTTM) for time-series data sets where data from individual subjects are repeated measures (Okui 2021). The performance of the proposed topic model is evaluated using an actual prescription data set. The results suggest that the TTM with offline learning has better predictive ability than the existing TTM, and the BNPTTM can deduce the number of topics from a given data set.

References

- Belov D (2021) Monte Carlo detection of examinees with item preknowledge. *Behaviormetrika* 48(1)
- Duong TBA, Tsuchida J, and Yadohisa H (2021) *K*-means generalized maximum entropy estimation for structural equation modeling. *Behaviormetrika* 48(1)
- Gu F (2021) Standard error estimates for rotated estimates of canonical correlation analysis: an implementation of the infinitesimal jackknife method” is presented. *Behaviormetrika* 48(1)
- Gu F, Yung Y-F, Cheung MW (2019) Four covariance structure models for canonical correlation analysis: a COSAN modeling approach. *Multivar Behav Res* 54(2):192–223
- Inaba Y, Togawa K (2021) Social capital in the creation of AI perception. *Behaviormetrika* 48(1)
- Kawahara T (2021) Differences in the determinants of purchase intention through advertisements and advertising recognition among product types. *Behaviormetrika* 48(1)
- Lamers SMA, Bohlmeijer ET, Korte J, Westerhof GJ (2015) The efficacy of life-review as online-guided self-help for adults: a randomized trial. *J Gerontol B Psychol Sci Soc Sci* 70(1):24–34
- Nielsen NM, Smink WAC, Fox JP (2021) Small and negative correlations among clustered observations: limitations of the linear mixed effects model. *Behaviormetrika* 48(1)

- Okada K, Bunji K (2021) Increase of reliability by incorporating response time into the paired-comparison psychological measurement is presented. *Behaviormetrika* 48(1)
- Okui T (2021) A Bayesian nonparametric topic model for repeated measured data. *Behaviormetrika* 48(1)
- Watanabe S (2021) WAIC and WBIC for mixture models. *Behaviormetrika* 48(1)

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.