Foreword

RECENT ADVANCES IN

STATISTICAL SCIENCE AND ITS APPLICATIONS

This special issue of Statistica Sinica honors the outstanding career of Professor Tze Leung Lai, who celebrated his 75th birthday in 2020. Professor Lai has made many seminal contributions to statistical science and its applications since 1971 when he received his Ph.D. in statistics from Columbia University; see the article "A conversation with Tze Leung Lai" by Lu, Small and Ying in Statistical Science **36**, 158-167 (2021). The scope of his research activities covers a breathtakingly wide spectrum of areas in statistics and its interface with other disciplines. At age 75, he is still a leading figure in and actively making major contributions to some of the most actively pursued topics, as reflected in the references (below) to his recent and forthcoming publications as well as in the 9 articles of this special issue that cover Stochastic Regression and Variable Selection in High-dimensional Time Series; Contextual Multi-armed Bandits with Applications to Medicine, Healthcare, Clinical Trials and Recommender Systems; Latent Variable Models in Multidimensional Item Response Theory; Sensitivity Analysis of Causal Inference in the Presence of Interactions between Observed and Unobserved Covariates; Cryogenic Electron Microscopy Image Analysis; Nature-inspired Meta-heuristic Optimization Algorithms with Applications to Optimal Sequential Design of Dose-finding Trials. Professor Lai was one of the founding editors of this journal and served on the Advisory Board of the Institute of Statistical Science of Academia Sinica from 1992 to 2018. He is the recipient of the 1983 COPSS Presidents' award and an elected member (Academician) of Academia Sinica.

Yi-Ching Yao[1]
Zhiliang Ying[2]
Guest Editors for this Special Issue

1. Academia Sinica
2. Columbia University

References

Baumgartner, R., Chen, J. and Lai, T. L. (2021). *Real World Data and Evidence: Application to Precision Medicine and Healthcare.* Chapman & Hall/CRC, Boca Raton, FL.

Chen, J, Heyse, J. and Lai, T. L. (2019). *Medical Product Safety Evaluation: Biological Models and Statistical Methods.* Chapman & Hall/CRC, Boca Raton, FL.

Choi, A. L, Kim, D and Lai, T. L. (2021). *Personalized Recommendation Technology: Contextual Bandits and Healthcare Applications.* Cambridge University Press, Cambridge, UK.

Lai, T. L., Choi, A. L. and Tsang, K. W. (2019). Statistical science in information technology and precision medicine. *Ann. Math. Sci. Appl.* **4**, 413–418.

Lai, T. L., Lavori, P. W. and Sklar, M. B. (2021). *Innovation clinical Trials in the Era of Precision Medicine and Personalized Healtcare: Design and Analysis.* Chapman & Hall/CRC, Boca Raton, FL.

Lai, T. L., Wang, S. H., Yao, Y. C., Chung, S. C., Chang, W. H. and Tu, I. P. (2020). *Cryo-EM: Breakthroughs in Chemistry, Structural Biology and Statistical Underpinnings.* Tech. Report, Department of Statistics, Stanford University.

Lai, T. L. and Xing, H. (2022). *Data Analytics and Risk Management in Finance and Insurance.* Chapman & Hall/CRC. Boca Raton, FL.

Lai, T. L. and Yuan H. (2021). Stochastic approximation: From statistical origin to big-data, multidisciplinary applications. *Statistical Science* **36**, 291–302.

Lai, T. L., Sklar, M. B. and Weissmuller, N.T. (2021). Novel clinical trial designs and statistical methods in the era of precision medicine. *Statistics in Biopharm. Res.* **13**, 133–146.

Lai, T. L., Sklar, M. B. and Xu, H. (2021). Bandit and covariate processes with finite or non-denumerable set of arms. *Stoch. Process & Appl.*, to appear.

Lai, T. L., Lu, Y. and Liu, C. (2021). *Novel Applications and Statistical Models of Latent Trait in Item Response Theory.* Tech. Report, Department of Statistics, Stanford University.

Lai, T. L., Liu, C., Pagliara, R. and Gordon, D. M. (2021). *The Role of Individual Variation in Forager Response to Interactions and Current Humidity: Experimental Design and Data Analysis Using Item Response Theory.* Tech. Report, Department of Statistics, Stanford University.