Functional Response Models: A Unified Paradigm for Between- and Within-subject Attributes

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Abstract

Statistical methods have become increasingly popular in research and practice. However, as research questions and study designs become more sophisticated, the predominant statistical paradigm is found to be increasingly at odds with modern applications in terms of their unrealistic assumptions and constraints. At a fundamental level, many relationships of interest in the age of the internet and mobile technology involve variables measuring between-subject attributes such as human interaction and such attributes are not amenable to treatment by conventional statistical models. In this talk, we discuss a class of functional response models (FRM) to address this fundamental limitation in the current statistical paradigm. The between-subject attribute is not a concept unique to timely issues such as modeling human interaction, but is actually a fundamental barrier to understanding many classic statistical methods in order to extend them to address their limitations when applied to cutting-edge statistical problems in clinical and translational research. We will illustrate the FRM using a wide range of topics with both real and simulated data, including reliability coefficients, rank regression and causal inference as well as their applications to mental health research.

Brief Bio

Research Interests

Xin Tu (Ph.D.) is Professor of Biostatistics and Psychiatry in the Department of Biostatistics and Computational Biology and Department of Psychiatry. He is the Director of the Statistical Consulting Center and the Director of the Psychiatric Statistics Division within the Department of Biostatistics and Computational Biology.

Dr. Tu has done important work in the areas of U-statistics, longitudinal data analysis, survival analysis with interval censoring and truncation, and pooled testing, and has successfully applied his novel development to addressing important methodological problems in HIV/AIDS, mental health and

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[1] The PI Biostatistics Seminar Series is held on Tuesdays at New York State Psychiatric Institute. If you are interested in receiving regular announcements for our seminars in the future, or if you need further information, please contact Jina James (jamesji@nyspi.columbia.edu, (646)774-7929.

psychosocial research. In recent years, he and his group have been focusing on issues arising in research on accuracy of proxy outcomes, causal treatment effects from group-based and multi-layered psychosocial interventions, and interpersonal interactions and their effects on individual behavior and health outcomes in the social network context. They have been successfully addressing all these issues using the functional response models (FRM). For example, their most recent work on causal inference using rank-based methods such as the Mann-Whitney-Wilcoxon rank sum test using the FRM has been published as a feature article in the April Issue of Statistics in Medicine (*Wu, Han, Chen and Tu, X.M. Statistics in Medicine, 33(8): 1261-1271, 2014*).

Dr. Tu has co-edited two books, Modern Clinical Trial Analysis (2012, Springer Science) and Social Networking: Recent Trends, Emerging Issues and Future Outlook (2013, Nova Science), and co-authored two books, Modern Applied U-Statistics (2007, Wiley) and Applied Categorical and Count Data Analysis (2012, CRC),10 book chapters, and over 170 peer-reviewed publications. His methodological research covers a broad range, including his earlier work on censored- and truncated-data analysis, pooled testing, power analysis, and instrumentation, and his more recent work on causal inference, mediation models and social network data analysis. He has mentored 5 PhD, 3 postdoctoral and numerous Master's-level students in biostatistics. The PhD and postdoctoral students all have successfully secured faculty and research positions at major research universities and firms, including the Johns Hopkins and Cornell Universities. Dr. Tu has been consulting and collaborating with a large number of trans-disciplinary investigators to provide support for their statistical designs, methods and reporting questions needs. His consulting and collaborative roles in numerous studies have made significant contributions to a number of fields of research and practice.