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Methods for Diagnostic Tests and Biomarkers

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Editorial

ZHOU XiaoHua, Guest Editor

I am pleased to accept an invitation from Professor Qihua Wang at Chinese Academy of Sciences to serve as a guest editor for a special issue on statistical methods for evaluation of diagnostic tests and biomarkers in SCIENCE CHINA Mathematics.

Diagnostic tests and biomarkers play an important role in medicine. They can be used not only as diagnostic tools for the diagnosis of a particular disease but also as companion tools for therapeutic purpose. Traditionally, diagnostic tests and biomarkers are used for the diagnosis of the presence or absence of a disease. In recent years, great efforts have been devoted to evaluate the diagnostic accuracy of a test when the disease status is ordinal or time-dependent and to evaluate the predictive ability of a biomarker for predicting the response of a patient to a particular treatment. The second question is directly related to the latest development of medicine, called personalized medicine, a new medical model for tailoring a particular treatment to a particular patient, using patient's genetics and other information.

In this special issue, the four peer-reviewed papers present some new developments in these exciting areas. In Zhou and Ma, the authors have proposed a new and important concept for measuring the predictive ability of a biomarker to select an optimal treatment for a patient, using the biomarker adjusted treatment effect (BATE) curve. The authors have also proposed estimation methods for estimating and comparing the BATE curves. This kind of work is very important in personalized medicine research, which aims to find a best treatment for an individual patient, based on the genetic profile of the patient. In Yang and Qin, the authors have proposed a new empirical likelihood method for regression models for the receiver operating characteristic (ROC) curve and area under the ROC curve, which are two commonly used accuracy measures for diagnostic tests. Empirical likelihood is a popular non-parametric method in the traditional statistics, but its use in diagnostic medicine was only proposed ten year ago. There is still a room to further develop empirical likelihood-based methods in diagnostic medicine. In Li and Gatsonis, the authors have proposed a new way to use biomarkers to dynamically and optimally monitoring disease recurrence. It is costly and important to monitor disease recurrence for patients with chronic diseases. This paper answered an important question on the disease monitoring on when patients should be come back for follow-up visits after initial treatment using biomarkers as a tool. In Li et al., the authors have extended the concept of the ROC curve to the surface ROC curve regression to deal with an ordinal-scale disease status. In the real practice of diagnostic medicine, many diseases are not binary, but ordinal-scale, for better choosing a treatment. However, the traditional ROC curve cannot be used when the disease status is ordinal. The surface ROC curve is more appropriate to represent the accuracy of a diagnostic test when the true disease status is ordinal. In Li et al., the authors have developed new regression models for the surface ROC curves and their volumes, which represent an important advance in the ROC methodology.

The methods proposed on these four papers represent some new methodology developments in the area of diagnostic testing and biomarkers. I hope that this special issue is interesting to readers of SCIENCE CHINA Mathematics and will generate some new ideas for future research in statistical evaluation of diagnostic tests and biomarkers. Finally, I would like to thank authors of this special issue to submit

their latest works to SCIENCE CHINA Mathematics and successfully revise them, according to reviewers' comments. I would also like to thank anonymous reviewers for devoting their time and efforts to review the articles in this special issue.

Guest Editor Biography

Xiao-Hua Andrew Zhou is Professor in the Department of Biostatistics and Affiliated Professor in the Department of Psychiatry and Behavioral Sciences at University of Washington. He is also Director of Biostatistics Unit in the VA Seattle Medical Center. He received a Research Career Scientist award from the U.S. Federal Government Department of Veterans Affairs and a Distinguished Overseas Young Scientist award from National Natural Science Foundation of China. He is also a recipient of Mitchell Prize from International Society for Bayesian Analysis and Section on Bayesian Statistical Sciences of American Statistical Association and an Advisory Committee Service Award from U.S. Federal Government Food and Drug Administration (FDA). He is a Fellow of the American Statistical Association. He is currently a member of an Advisory Committee in Center for Devices and Radiological Health of U.S. FDA. He served as an associate editor for Biometrics and Statistica Sinica and is currently an associate editor for Statistics in Medicine. Along with his two colleagues, he has published the first comprehensive textbook on statistical methods in diagnostic medicine in 2002 by Wiley & Sons. For more information, please visit his website at http://faculty.washington.edu/azhou/.