ROC Surfaces in the Presence of Verification Bias

Yueh-Yun Chi
Department of Biostatistics, University of Washington, Seattle, WA 98101, USA

In diagnostic medicine, the Receiver Operating Characteristic (ROC) surface is one of the established tools for assessing the accuracy of a diagnostic test in discriminating three disease states, and the volume under the ROC surface has served as a summary index for diagnostic accuracy. In practice, the selection for definitive disease examination may be based on initial test measurements, and induces verification bias in the assessment. We propose here a nonparametric likelihood-based approach to construct the empirical ROC surface in the presence of differential verification, and to estimate the volume under the ROC surface. Estimators of the standard deviation are derived by both the Fisher's Information and Jackknife method, and their relative accuracy is evaluated in an extensive simulation study. The methodology is further extended to incorporate discrete baseline covariates in the selection process, and to compare the accuracy of a pair of diagnostic tests. We apply the proposed method to compare the diagnostic accuracy between Mini-Mental State Examination and clinical evaluation of dementia, in discriminating among three disease states of Alzheimer's disease. This is joint work with Xiao-Hua Andrew Zhou.

[Yueh-Yun Chi, 4311 11th Avenue NE, Suite 300, Seattle, WA 98105; yychi@u.washington.edu]