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Exact inference for the Youden index to discriminate individuals using two-parameter exponentially-distributed pooled samples

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It has become increasingly common in epidemiological studies to pool specimens across subjects as a useful cost-cutting technique to achieve accurate quantification of biomarkers and certain environmental chemicals. The data collected from these pooled samples can then be utilized to estimate the Youden Index (or Youden Statistic) developed by Youden (Youden WJ. Index for rating diagnostic tests. *Cancer* 1950;3(1):32–35.), which measures biomarker's effectiveness and aids in the selection of an optimal threshold value, as a summary measure of the Receiver Operating Characteristic (ROC) curve. The aim of this paper is to make use of generalized approach due to Tsui and Weerahandi (Tsui K, Weerahandi, S. Generalized p-values in significance testing of hypotheses in the presence of nuisance parameters. *J. Amer. Statist. Assoc.* 1989;84(406):602–607.) to estimate and testing of the Youden index. This goal is accomplished by the comparison of classical and generalized procedures for the Youden Index with the aid of pooled samples from the shifted-exponentially distributed biomarkers for the low-risk and high-risk patients. These are juxtaposed using confidence intervals, p-values, the power of the test, the size of the test and coverage probability with a wide-ranging simulation study featuring a selection of various scenarios. In order to demonstrate the advantages of the proposed generalized procedures over its classical counterpart, an illustrative example is discussed using the Duchenne Muscular Dystrophy (DMD) data available at <http://biostat.mc.vanderbilt.edu/wiki/Main/DataSets> or <http://lib.stat.cmu.edu/datasets>.

Biography

Sumith Gunasekera received the (Special Bachelor of Science) B.Sc.(Sp.) degree in Physics in 1995 from the University of Colombo, Colpetty, Colombo 03, District of Colombo, Western province, Democratic Socialist Republic of Sri Lanka (DSRSL) (formerly known as Ceilão (in Portuguese under their rule), Seylon (by Dutch under their rule) and Ceylon (by British under their rule) and the (Doctor of Philosophy) Ph.D. degree in Statistics in 2009 from the University of Nevada at Las Vegas (UNLV), Las Vegas, NV, United States of America (USA). Sumith joined the Department of Mathematics at The University of Tennessee at Chattanooga, Chattanooga TN, the USA in 2009 and has been an Associate Professor of Statistics since 2015. He is the author of many seminal statistical articles and is the recipient of several grants and awards. His research interests include statistical inference, reliability, survival analysis, the design of experiments under classical, Bayesian and generalized frameworks.

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