

Relationship between two-sample test statistics and ROC summary measures

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Abstract

A biomarker is usually used as a diagnostic or assessment tool in medical research. They have become essential tools for proper diagnosis and treatment of a wide range of illnesses, including cancer, diabetes, and infectious diseases. The ROC curve shows the diagnostic accuracy of a biomarker and expresses clinically and statistically the area under the curve (AUC) of the diagnostic power of the biomarker, which corresponds exactly to the Wilcoxon statistic. In fact, this curve essentially provides a distribution-free description of the separation between the diseased and healthy distributions. Therefore, each of the summary measures, as AUC as example, is in a sense a summary of the distance between these two distributions. In this talk, we rewrite some of the most well-known ROC summary measures as a two-sample test. Furthermore, this relationship between two-sample test statistics and ROC summary measures is exploited further to suggest new ROC summary measures from two-sample test statistics.

The simulations show that these ROC summary statistics exhibit much higher power in discriminating between the diseased and healthy distributions and are thus an attractive alternative to classical ROC summary indices. Finally, to illustrate our proposal, we apply the proposed test statistics to assess a diagnostic marker in a real data set.