

A novel parametric test for testing two area under the ROC curves based on paired data

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Abstract

Aging population is widespread phenomenon in developed countries in recent years. The medical research has advanced to develop ways to prevent cancer. Many diagnostic tests have been developed to make a disease detection as early as possible. The sensitivity and specificity are often used to measure the accuracy of a diagnostic test when a binary outcome is obtained. However, when the outcome is measured continuously, the receiver operating characteristic (ROC) curve is often plotted and the area under the ROC curve is computed as an accuracy measure of a diagnostic test. When assessing the superiority of two diagnostic tests, a test would be needed. Venkatraman and Begg (1996) and Venkatraman (2000) developed an area test and a permutation test for evaluating two diagnostic tests for two independent samples and paired samples, while under the binormal model, Metz, Wang and Kronman (1984) derived a chi-square test that can be applied to the paired data. This paper proposes a new test for paired data constructing based on the new bivariate binomial distribution proposed by Biswas and Hwang (2002). The asymptotic property of this test is derived. Simulations are conducted to demonstrate the ability to control the Type I error and achieve higher power of the new test.

Keywords: area under ROC curve, binormal model, bivariate binomial distribution, maximum likelihood estimator, McNemar test, ROC curve, sensitivity, specificity