

A Nonparametric Multivariate Multisample Test

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Abstract

In this talk, we shall consider a family of nonparametric multivariate multisample tests based on depth rankings. These tests are of Kruskal-Wallis type in the sense that the samples are variously ordered. However, unlike the Kruskal-Wallis test, these tests are based upon a center-outward ranking using a statistical depth function such as the halfspace depth or the Mahalanobis depth, etc. Unlike the univariate case, multivariate data sets can be ordered using many different depth-based orderings. The types of tests we propose are adapted to the depth function that is most appropriate for the application. Under the null hypothesis that all samples come from the same distribution, we show that the test statistic asymptotically has a chi-square distribution. In addition, for small sample sizes, the test statistic is exactly distribution-free. Some comparisons of power are made with the Hotelling T^2 , and the test of Choi and Marden (1997). Our test is particularly recommended when the data are of unknown distribution type where there is some evidence that the density contours are not elliptical. However, when the data are normally distributed, we often obtain relative power over 95%.