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Statistical Methods in Medical Research

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Abstract

The multivariate locatic e problem is the Hotelling test. When th timal. Unfortunately, in practice the distribut assuming normality the finite sample unbiasedness of the Hotelling test is not guaranteed. Moreover, high-dimensional data are increasingly encountered when analyzing medical and biological problems, and in these situations the Hotelling test performs poorly or cannot be computed. A test that is unbiased for non-normal data, for small sample sizes as well as for two-sided alternatives and that can be computed for high-dimensional data has been recently proposed and is based on the ranks of the interpoint Euclidean distances between observations. Five modifications of this test are proposed and compared to the original test and the Hotelling test. Unbiasedness and consistency of the tests are proven and the problem of power computation is addressed. It is shown that two of the modified interpoint distance-based tests are always more powerful than the original test. Particularly, the modified test based on the Tippett criterium is suggested when the assumption of normality is not tenable and/or in case of high-dimensional data with complex dependence structure which are typical in molecular biology and medical imaging. A practical application to a case-control study where functional magnetic resonance imaging is used is discussed.

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