

Some necessary uniform tests for spherical symmetry

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Abstract While spherical distributions have been used in many statistical models for high-dimensional data analysis, there are few easily implemented statistics for testing spherical symmetry for the underlying distribution of high-dimensional data. Many existing statistics for this purpose were constructed by the theory of empirical processes and turn out to converge slowly to their limiting distributions. Some existing statistics for the same purpose were given in the form of high-dimensional integrals that are not easily evaluated in numerical computation. In this paper, we develop some necessary tests for spherical symmetry based on both univariate and multivariate uniform statistics. These statistics are easily evaluated numerically and have simple limiting distributions. A Monte Carlo study is carried out to demonstrate the performance of the statistics on controlling type I error rates and power.

Keywords Goodness-of-fit · Monte Carlo study · Spherical symmetry · Uniformity