NONPARAMETRIC SNAKE TEST FOR MULTIVARIATE SKEWNESS

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The aim of the paper is to propose a new procedure for testing the multivariate skewness. The assymetry can be tested in reference to the mean, mode, median, or any other location parameter. It' estimate is called a starting point. In the first step the nearest neighbor to the starting point should be identified. The segment between these two points is the initial segment of "the snake". It has ends A and B, or "head" and "tail". In the consecutive steps the snake is growing by joining the nearest point to one of its ends. We code A if it grows on head side, and B if it grows on tail side. The sequence of A's and B's is tested for randomness. Runs test seems to be the natural choise of test.

In the paper we present the results of simulation experiments for the variaty of null and alternative hypothesis. The problem of multivariate mode and median estimation is also discussed in order to find a proper starting point for the procedure.

An example application for the real world data is provided as well as the software.

Key words: multivariate skewness, runs test, multivariate mode estimation, multivariate median estimation

[1] K. Mardia, "Measures of multivariate skewness and kurtosis with applications," *Biometrika*, vol. 57, pp. 519–530, 1970.

[2] A. Sokołowski and M. Markowska, "A moment-free measure of multivariate skewness," in *Book of Abstracts: IFCS Conference, Porto, Portugal, July 19-23, 2022.*, p. 94.