

New statistical test for Gaussian distribution for platykurtic distributed random samples

Agnieszka Wyłomańska

Faculty of Pure and Applied Mathematics, Wrocław University of Science and Technology

Wrocław, Poland

Statistical inference in the form of hypothesis tests and confidence intervals often assumes that the underlying distribution is normal. Similarly, many signal processing techniques rely on the assumption that a stationary time series is normal. As a result, a number of tests have been proposed in the literature for detecting departures from normality. In this research we develop a novel approach to the problem of testing normality by constructing a statistical test based on the Edgeworth expansion, which approximates a probability distribution in terms of its cumulants. By modifying one term of the expansion, we define a test statistic which includes information on the first four moments. We perform a comparison of the proposed test with existing tests for normality by analyzing different platykurtic and leptokurtic distributions including generalized Gaussian, mixed Gaussian, alpha-stable and Student's t distributions. We show for some considered sample sizes that the proposed test is superior in terms of power for the platykurtic distributions whereas for the leptokurtic ones it is close to the best tests like those of D'Agostino-Pearson, Jarque-Bera and Shapiro-Wilk. Finally, we study two real data examples which illustrate the efficacy of the proposed test.