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Improved Asymptotic Formulae for Statistical Interpretation Based on Likelihood Ratio Tests

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In this work, we try to improve the classic asymptotic formulae to describe the probability distribution of likelihood-ratio statistical tests. The idea is to split the probability distribution function into two parts. One part is universal and described by the asymptotic formulae. The other part is case-dependent and estimated explicitly using a 6-bin model proposed in this work. The latter is similar to doing toy simulations and hence is able to predict the discrete structures in the probability distributions. The new asymptotic formulae provide a much better differential description of the test statistics. The better performance is confirmed in two toy examples.

Primary authors: XIA, LIGANG (Nanjing University);   ZHANG, yan (南京大学)

Presenter: ZHANG, yan (南京大学)

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