A new test for the Poisson distribution

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Abstract

We consider the problem of testing whether a sample of observations comes from a single Poisson distribution. Of particular interest is the alternative that the observations come from Poisson distributions with different parameters. Such a situation would correspond to the frequently discussed situation of overdispersion.

We propose a new test for this problem that is based on Anscombe’s variance stabilizing transformation. There are number of tests commonly proposed, and we compare the performance of these tests under the null hypothesis with that of our new test. We find that the performance of our test is competitive with the two best of these. The asymptotic distribution of the new test is derived and discussed.

We also describe how to compute Minimum Bayes Factors for our test and the various alternative tests.

Use of these tests is illustrated through two examples of analysis of call-arrival times from a telephone call center. The example facilitates careful discussion of the performance of the tests for small λ and moderately large n.

Key words: Poisson variables, Anscombe’s transformation, likelihood ratio test, Chi-squared test, overdispersion

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