

## Investigating the Effects of Data Transformations on a Bi-Dimensional Chi-Square Test

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**Abstract :** In this research, we conduct a Monte Carlo analysis on a two-dimensional  $\chi^2$  test, which is used to determine the minimum distance required for independent sampling in the context of chaotic signals. We investigate the impact of transforming initial data sets from any probability distribution to new signals with a uniform distribution using the Spearman rank correlation on the  $\chi^2$  test. This transformation removes the randomness of the data pairs, and as a result, the observed distribution of  $\chi^2$  test values differs from the expected distribution. We propose a solution to this problem and evaluate it using another chaotic signal.

**Keywords :** chaotic signals, logistic map, Pearson's test, Chi Square test, bivariate distribution, statistical independence

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