Advancements in Power Inverse Rayleigh Modeling: Exploring Applications in Environmental and Medical Domains

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Abstract

In this manuscript, a novel probability distribution, known as the *MTI* inverse power Rayleigh distribution (*MTI-IPRD*), is obtained through the use of the *MTI* transformation. This new distribution fits data better than many existing models. A number of statistical features are examined in detail. The maximum likelihood estimation (*MLE*) procedure is employed to estimate the unknown parameters. An extensive simulation study is carried out to illustrate the behaviour of *MLE*s on the basis of mean square errors. In addition, the suggested distribution's flexibility and importance are assessed in comparison to existing probability distributions using three real data sets.

Key words: MTI transformation; Rayleigh distribution; Moments; Renyi entropy; Stress strength reliability; Maximum likelihood estimation.

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1. Introduction

Lifetime phenomena modelling and analysis are essential components of statistical work in many scientific and technological fields. Lifetime data analysis has had tremendous growth and progress in terms of theory, applications, and technique. Various generalisation or transformation techniques together with continuous probability distributions have been presented to simulate real-life situations. The model's acceptability and applicability are enhanced by these generalisations for a variety of uses. These can be achieved by altering the distribution's functional form or by including one or more shape factors.

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