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Tricube Exponential Distribution

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Extended Abstract

A new continuous distribution, termed the Triweight Exponential Distribution (TWED), has been proposed by combining the Triweight kernel function with the exponential distribution. This novel distribution enhances the flexibility and applicability of traditional exponential distributions, particularly in modeling data with varying hazard rates.

The properties of the TWED were comprehensively investigated, including its moments, moment-generating function, and cumulative distribution function. These properties were analyzed to understand the distribution's behavior and potential applications. Simulation studies were conducted to compute the mean and standard deviation of the TWED, providing insights into its central tendency and variability. Additionally, the behavior of Maximum Likelihood Estimation (MLE) for parameter estimation within the TWED framework was examined, ensuring consistency and reliability of the estimates.

In practical applications, the TWED was applied to a real-world dataset to assess its performance compared to the traditional exponential distribution. The results demonstrated the TWED's superior flexibility and adaptability, highlighting its potential for modeling complex data patterns more effectively.

Kernel functions play a crucial role in nonparametric estimation by assigning weights to neighboring data points, thus enabling flexible modeling. The Triweight kernel function, known for its versatility in data analysis tasks, is one such function that has been extensively studied for accurate and unbiased estimations [1]. The integration of the Triweight kernel with the exponential distribution to form the TWED is an innovative approach that contributes significantly to the field of probability distributions and their generalizations.

This research adds to the growing body of work on kernel-based generalized distributions. Previous studies have introduced various generalizations, such as the generalized exponential distribution [2], beta-exponential distribution [3], and beta-generalized exponential distribution [4], each offering unique properties and applications. For instance, Qiu et al. (2023) developed a generalized exponential distribution with versatile hazard curves [5], while El-Sayed and Eid (2018) introduced the beta-logistic distribution for applications in finance and environmental sciences [6].

The proposed TWED represents a valuable extension to the family of exponential-type distributions, providing both theoretical advancements and practical benefits. Its application in fields such as reliability engineering, survival analysis, and financial modeling underscores its potential for diverse real-world applications. Future research could explore further applications and potential generalizations of the TWED, contributing to the continuous development of probability models with enhanced flexibility and applicability.

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