

ICRAMCS 2026

THE EIGHTH EDITION OF THE INTERNATIONAL CONFERENCE ON
RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE

April 23-24-25, 2026 | Marrakech, Morocco



Distributional Properties and Modeling to Radiation Data for a New Flexible Odds-Based Ghareeb–G Family

Communication Info

Authors:

ALI M. MAHNASHI¹

¹ Department of Mathematics,
College of Science,
Jazan University,
Jazan,
Saudi Arabia.

Keywords:

- (1) Ghareeb–G family
- (2) Ghareeb Log-Logistic distribution
- (3) Odds-based generator
- (4) Lifetime distributions
- (5) Hazard rate function
- (6) Maximum likelihood
- (7) Survival analysis

Abstract

This paper introduces a new and parsimonious family of lifetime distributions, referred to as the Ghareeb–G family, constructed via a novel odds-based transformation of a baseline model. The proposed generator incorporates a single additional shape parameter, allowing for substantial flexibility in modeling tail behavior and hazard rate shapes while maintaining analytical tractability. A particular member of this family, the Ghareeb Log-Logistic (GLL) distribution, is studied in detail. Closed-form expressions are derived for the cumulative distribution function, probability density function, quantile function, and ordinary moments, with several properties expressed in terms of the Beta function. Measures of uncertainty, including Shannon and Rényi entropies, are obtained. The hazard rate function of the GLL model is analyzed and shown to accommodate decreasing, increasing, and unimodal shapes. Parameter estimation is carried out using maximum likelihood methods, and interval estimation is performed via a parametric bootstrap approach. The finite-sample performance of the estimators is investigated through a Monte Carlo simulation study. A real medical survival dataset related to radiation-treated cancer patients is analyzed to illustrate the practical applicability of the proposed model. The GLL distribution is compared with several well-established extensions of the Log-Logistic model, and the results indicate superior performance in terms of standard goodness-of-fit measures and information criteria. Overall, the findings demonstrate that the Ghareeb–G family provides a flexible and effective framework for modeling complex lifetime and survival data.

© ICRAMCS 2026 Proceedings ISSN: 2605-7700

References

- [1] Alzaatreh, A., Lee, C., & Famoye, F., A new method for generating families of continuous distributions. *Metron*, 71, 2013, 63–79.
- [2] Aryal, G. R., & Tsokos, C. P., On the transmuted extreme value distribution with applications. *Nonlinear Analysis: Theory, Methods & Applications*, 71, 2009, e1401–e1407.
- [3] Cordeiro, G. M., & de Castro, M., A new family of generalized distributions. *Journal of Statistical Computation and Simulation*, 81, 2002, 883–898.
- [4] Eugene, N., Lee, C., & Famoye, F. Beta-normal distribution and its applications. *Communications in Statistics—Theory and Methods*, 31, 2002, 497–512.
- [5] Hassan, A. S., & Abdelghafar, A. A. A new sine-modified Lomax distribution with applications to lifetime data. *Journal of Applied Probability and Statistics*, 18, 2023, 1–20.