

## A NEW CLASS OF TAN-G FAMILY OF DISTRIBUTIONS WITH PROPERTIES AND APPLICATIONS

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**Abstract:** This research article is dedicated to the exploration of a novel family of distributions that is based on a tangent transformation. The new class of distributions, which we have named the new class tan-G (NCT-G) family, has been developed using the ratio of the cumulative distribution function (CDF)  $G(x)$  and  $1+G(x)$  of a baseline distribution. We provide an overview of the general properties of this family of distributions. To demonstrate the applicability of the NCT-G family, we have utilized the inverse Weibull distribution as a baseline and introduced a new member of the suggested family. This new distribution exhibits a reverse-J, increasing, or inverted bathtub-shaped hazard function. We have also explored some statistical properties of this distribution, as well as its associated parameters estimated through maximum likelihood estimation (MLE). To evaluate the accuracy of the estimation procedure, we have conducted a Monte Carlo simulation. We found that even for small sample sizes, biases and mean square errors decrease as the sample size increases. Additionally, we have applied the NCT-IW distribution to two real data sets. By using model selection criteria and goodness of fit test statistics, we empirically proved that our suggested model outperforms other existing models, most of which have a greater number of parameters.

**Keywords and Phrases:** Inverse Weibull distribution, Tan-G class, Mean residual life, Lorenz curve, Entropy.

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