

Engineering Applications with Stress-Strength for a New Flexible Extension of Inverse Lomax Model: Bayesian and Non-Bayesian Inference

Authors	Salem A. Alyami, I. Elbatal, Amal S. Hassan, and Ehab M. Almetwally	
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Abstract: This paper presents the transmuted Topp–Leone inverse Lomax (TTLILo) distribution, a novel extension for modeling engineering time data. The TTLILo distribution features additional shape and transmuted parameters, allowing for various density shapes such as right-skewed and J-shaped. The study examines the distribution's statistical properties, including moments and entropy, and estimates parameters using Bayesian and non-Bayesian methods, with confidence intervals from bootstrap and Bayesian approaches. Applied to engineering datasets—failure times of aircraft air conditioning systems and repair times of communication transceivers—the TTLILo model showed superior fitting compared to other models. The study also addresses estimating the stress-strength parameter $R = P(Z_2 < Z_1) = P(Z_2 < Z_1)$.