The Modified Lindley Distribution Through Convex Combination with Applications in Engineering

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Abstract

This paper introduces a Modified Lindley distribution using a convex combination of exponential and gamma distribution. The fundamental properties of the proposed distribution such as the shapes of the distribution, moments, mean, variance, reliability, hazard rate, moment generating function, stochastic ordering and the distribution of order statistics have been derived. The proposed distribution is observed to be a heavy-tailed distribution and can also be used to model data with upside-down bathtub shape for its hazard rate function. The maximum likelihood estimators of the unknown parameters of the proposed distribution have been obtained. Two numerical examples are given to demonstrate the applicability of the proposed distribution and for the two real data sets, the proposed distribution is found to be superior in its ability to sufficiently model heavy-tailed data than many other models.

Keywords Lindley distribution · Convex combination · Moments · Stochastic ordering · Estimation techniques · Applications

1 Introduction

Finding patterns in data is data science's primary goal. It makes use of a range of statistical methods to uncover the data's patterns. See [1–3] for these strategies. However, data are essentially the manifestations of a random variable or vector. In statistical theory, figuring out their distributions, from whence these data originate, is crucial. Determining the distributions of them from which these data come has an important place in statistical theory. Statistical distributions serve as the fundamental building

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