

ICRAMCS 2026

THE EIGHTH EDITION OF THE INTERNATIONAL CONFERENCE ON
RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
April 23-24-25, 2026 | Marrakech, Morocco



New Fox's H-Function Approximation for the Sum of Independent Log-Normal Random Variables with Application

Communication Info

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Keywords:

- (1) Approximation
- (2) Fox's H-function
- (3) Log-Normal distribution
- (4) moment generating function

Abstract

The sum of independent and identically distributed (i.i.d) Log-normal random variables (LN-RVs) is a fundamental problem in probability theory, with significant applications across various scientific and technical domains [1]- [2]. In this work, we propose novel and highly accurate approximation for the moment-generating function (MGF) of the sum of i.i.d LN-RVs, expressed in terms of univariate Fox's H-function [3]. Leveraging a function type that exhibits equivalent graphical characteristics to the MGF, we subsequently derive closed-form expressions for both the probability density function and the cumulative distribution function. The derived results are then used to analyze the performance of a wireless communication system. Especially for maximal-ratio and equal-gain combining techniques [4]- [5]. Monte Carlo simulations are used to validate our analytical findings.

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