

Analytical Distributions for Functions of Independent Rician Random Variables: Application to Wireless Communications

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Abstract

This paper presents two analytical formulations for the distribution of the square of a sum of products involving independent Rician random variables. The expressions are derived through the application of the central limit theorem (CLT) and Laguerre series. To assess their accuracy, the derived expressions are compared with the empirical distribution acquired through a comprehensive simulation study. The comparison is made based on the Kolmogorov-Smirnov, Anderson-Darling, and Cramer-von Mises statistics, supplemented by information criteria such as AIC and BIC as indicators of goodness of fit. Finally, an application in wireless communications is presented to illustrate the importance of the proposed work. As a conclusion, it is shown that the expression obtained by Laguerre expansion method is more accurate and simpler than the one obtained by CLT.