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A Bivariate Inverse Generalized Exponential Distribution and Its Applications in Dependent Competing Risks Model

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Abstract : The aim of this paper is to introduce a bivariate inverse generalized exponential distribution which has a singular component. The proposed bivariate distribution can be used when the marginals have heavy-tailed distributions, and they have non-monotone hazard functions. Due to the presence of the singular component, it can be used quite effectively when there are ties in the data. Since it has four parameters, it is a very flexible bivariate distribution, and it can be used quite effectively for analyzing various bivariate data sets. Several dependency properties and dependency measures have been obtained. The maximum likelihood estimators cannot be obtained in closed form, and it involves solving a four-dimensional optimization problem. To avoid that, we have proposed to use an EM algorithm, and it involves solving only one non-linear equation at each `E'-step. Hence, the implementation of the proposed EM algorithm is very straight forward in practice. Extensive simulation experiments and the analysis of one data set have been performed. We have observed that the proposed bivariate inverse generalized exponential distribution can be used for modeling dependent competing risks data. One data set has been analyzed to show the effectiveness of the proposed model.

Keywords : Block and Basu bivariate distributions, competing risks, EM algorithm, Marshall-Olkin bivariate exponential distribution, maximum likelihood estimators
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