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# STATISTICS FOR ALL

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## 21. Generalized Poisson Exponential distribution: A discrete model for count data analysis.

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**Abstract:**

In the literature, we come across a number of discrete as well as continuous type of probability distributions and it has been observed that there is a rising interest among researchers to construction new classes of probability models. A number of techniques like discretization, T-X family, and compounding technique are used to construct new probability distributions. In this paper, we propose a new probability model namely Generalized Poisson Exponential distribution and discuss its some properties using compounding technique.

**Keywords:** Poisson distribution, maximum likelihood method, data, Monte Carlo simulation.

**Introduction:**

In the recent decades, it has been seen that there is a rising interest in the construction of new classes of probability models for the sake of analysing many types of data in various fields, such as Medical sciences, Engineering, Insurance etc. These new classes of models provide an increased flexibility in modelling complex data and the results drawn from them seem quite sound and useful. Various well known techniques are used to construct new probability distributions like discretization, T-X family, and compounding technique. These techniques provide a very powerful way to extend common parametric families of distributions to fit data sets not adequately fit by classical distributions. Regarding the compound of probability distributions, the work has been done in this particular area since 1920. It is well known that Greenwood and Yule (1920)[1] established a relationship through compounding mechanism between Poisson distribution and negative binomial distribution by treating the rate parameter $\lambda$ in Poisson distribution as a gamma variate which is more flexible than Poisson distribution, particularly when the requirement of equi-dispersion for Poisson distribution is violated. In 1948, Skellar [2] derived a probability distribution from the binomial distribution by regarding the probability of success as a beta variable between sets of trials. Dubey (1970)[3] derived a compound gamma, beta and F distribution by compounding a gamma distribution with another gamma distribution and reduced it to the beta 1st and beta 2nd kind and to the F distribution by suitable transformations. Gerstenkorn (1993, 1996) proposed several compound distributions, he obtained compound of gamma distribution with exponential distribution by treating the parameter of gamma distribution as an exponential variate and also obtained compound of Pólya with beta distribution [4-5]. Zamani & Ismail (2010) studied a new mixed distribution by mixing negative binomial (r,p) and Lindley (θ) distribution, using re-parameterization technique i.e., $p = e^{\lambda}$ is considered[6]. Ahmad et al. (2018)[7] introduced an advanced count data model which is obtained by mixing generalized negative binomial with Kumaraswamy (1980)[8]. The model has several properties i.e., it can be nested to different existing compound distributions. Altun (2019) introduced a new over-dispersed Poisson Quasi Lindley model. He proposed a regression model by re-parameterization of the distribution [9]. In 2020, Para et al. used compounding technique to obtain a count data model by compounding Poisson distribution with Xgamma distribution and derived its mathematical and statistical properties. Also, parameter estimation using the maximum likelihood method of estimation followed by Monte Carlo simulation was discussed to investigate the behaviour of the ML estimators [10].Poisson Weighted Exponential (PWE) distribution