Compound Poisson approximation via Stein's method

Aihua Xia

Department of Mathematics and Statistics, the University of Melbourne, VIC 3010, Australia [xia@ms.unimelb.edu.au]

In dependent systems, rare events have a tendency to appear in clusters which make Poisson distribution a less favourable model as approximation errors are too large to use. For such situations, a compound Poisson distribution seems to be a more suitable choice. Stein's method for the compound Poisson approximation was first introduced in Barbour, Chen and Loh (1992) but the approach yields relatively useful estimates for approximation errors only when the approximating compound Poisson distribution $Z = \sum_{j=1}^{\infty} jN_j$ satisfies $j\lambda_j \downarrow 0$ as $j \to \infty$, where $N_j \sim \text{Poisson}(\lambda_j)$, $j \geq 1$ are independent, because under this condition, a Markov immigration-death process with multiple births and unit per capita death rate can be brought in to estimate the Stein factors. In this talk, we present a Stein's equation for compound Poisson approximation using immigration-death processes with multiple births and multiple deaths, and use it to estimate the total variation distance between a compound Poisson distribution and the distribution of the sum of independent integer-valued random variables.