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Computation and inversion of some cumulative distribution functions

Some special functions hold particular importance in Applied Probability and Statistics. Notably, the incomplete gamma and beta functions serve as (with normalization factors) the cumulative central gamma and beta distribution functions, respectively. Additionally, the corresponding noncentral distributions—like the Marcum-Q function and the cumulative noncentral beta distribution function—play significant roles across various applications. These functions' inversion proves valuable in hypothesis testing and random sample generation following the respective probability density functions.

In this talk we describe developments in the asymptotic and numerical computation and inversion of the beta cumulative distribution function (both central and non-central). The effectiveness of these methods will be demonstrated through numerical examples.

Joint work with Javier Segura and Nico M. Temme.