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Abstract

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Multivariate normal approximation for statistics in geometric probability

Joint with Matthias Schulte

We employ stabilization methods in the context of Malliavin-Stein theory to establish rates of multivariate normal convergence for a large class of vectors

$$(H_s^{(1)}, \ldots, H_s^{(m)}), \qquad s \geq 1,$$

of marked Poisson point processes in Euclidean space, as the intensity parameter $s \to \infty$. The rates are in terms of the d_2 and d_3 distances, a generalized multivariate Kolmogorov distance, as well as in terms of the convex distance defined in terms of indicators of convex sets. In general the rates are unimprovable. We use the general results to deduce presumably optimal rates of multivariate normal convergence for statistics arising in random graphs and topological data analysis as well as for multivariate statistics used to test equality of distributions.