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Normal approximation for statistics of Gibbsian input in geometric probability

Abstract

We consider the asymptotic behaviour of a random variable W_λ resulting from the summation of the functionals of a Gibbsian spatial point process over windows $Q_\lambda \to R^d$, where Q_λ is a window with volume λ. We establish conditions ensuring that W_λ has volume order fluctuations, i.e. they coincide with the fluctuations of functionals of Poisson spatial point processes. We combine this result with Stein's method to deduce rates of a normal approximation for W_λ as $\lambda \to \infty$. Our general results establish variance asymptotics and central limit theorems for statistics of random geometric and related Euclidean graphs on Gibbsian input. We also establish a similar limit theory for claim sizes of insurance models with Gibbsian input, the number of maximal points of a Gibbsian sample, and the size of spatial birth-growth models with Gibbsian input. This is a joint work with J. E. Yukich.