Séminaire de Probabilités et Statistique

Mardi 20 Avril à 14h00

ZOOM

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Nodal sets variance for Gaussian stationary processes

We study the excursion or level sets of some stationary Gaussian processes at the zero level. In dimension 1, the statistical properties of zeros have been investigated for almost a century, in particular their second order properties as a point process. We show that the variance of the number of points on a large interval is always at least linear with respect to the interval length, and we give a condition which is 'almost sufficient' about the process covariance for the variance to actually be linear. This excludes in particular the possibility for hyperuniform Gaussian zeros in dimension 1, despite the existence of very strongly rigid systems.

We also study the nodal excursion volume of some Euclidean stationary fields with incommensurable finite spectrum. It turns out that the variance behaviour strongly depends on the diophantine properties of spectral atoms ratios. In particular, choosing carefully the atoms, any reasonable variance behaviour can be achieved between quadratic and surface scaling order, in any dimension, achieving all differenty types of hyperuniform behaviour for random sets. Establishing these results requires studying irrational random walks on the torus, and in particular results uniform on the number of steps n.