What does a Point Process Outside a Domain tell us about What's Inside?

Subhro Ghosh
University of California, Berkeley

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Abstract

In a Poisson point process we have independence between disjoint spatial domains, so the points outside a disk give us no information on the points inside. The story gets a lot more interesting for spatially correlated processes. We focus on the two main natural examples of repulsive point processes on the plane - the Ginibre ensemble (arising from eigenvalues of random matrices) and zero ensembles of certain Gaussian power series. We show that here the outside points actually tell us a lot—they determine almost surely the "mass" or the "centre of mass" of the inside points (as the case may be), and that they determine "nothing more".

This gives us a glimpse into a hierarchy of point processes based on their rigidity, of which we know only the simplest examples.

Time permitting, we will also look at several interesting consequences of our results, with applications to continuum percolation, reconstruction of Gaussian entire functions, completeness of random exponentials, and others.