"From Kac Polynomials to Complex Geometry: Study of Random Holomorphic Zeros"

Abstract:
The study of random zeros of holomorphic sections lies at the intersection of probability theory, complex geometry and mathematical physics. Classical models, such as Kac polynomials, SU(2)-polynomials and the Gaussian Analytic Function (GAF) in the complex plane, have inspired a more general geometric framework for understanding the statistical behaviour of complex zeros. These investigations have revealed rich and universal asymptotic phenomena, ranging from equidistribution to central limit theorems.

In this talk, I will begin with an overview of the subject, focusing on these classical models and their geometric features. I will then discuss recent progress in the context of complex geometry, particularly with regard to Gaussian holomorphic sections of high tensor powers of positive line bundles, which are linked to Toeplitz matrices and quantization theory. Finally, I will explain the probabilistic aspects of the asymptotic distribution of zeros in the semi-classical regime, including number variances and central limit theorems.