Graduate Talk

Zeros of random complex analytic functions

We begin by introducing the concept of Gaussian random analytic functions on domains in the complex plane. We then discuss the Edelman-Kostlan-Sodin formula for the average number of zeros of random functions. We conclude with a survey of some recent results based on this formula, such as the variance of the number of zeros in a domain, correlations of random zeros, equilibrium distribution of zeros, and "hole probabilities."

The talk will be self-contained and require only basic measure theory and (one-variable) complex analysis.

Colloquium I

Random zeros of holomorphic functions on complex manifolds

We now discuss random functions of several complex variables, in particular, polynomials of several complex variables, entire functions on $\mathbf{C}^n$, and more generally, holomorphic sections of positive line bundles. We begin with the "probabilistic Poincare-Lelong formula" for the expected zero divisor (or current) of a random holomorphic section. We generalize the results of the Graduate Talk to describe random simultaneous (discrete) zeros of n functions or sections in n dimensions (and more generally, zeros in arbitrary codimension). Topics include: equilibrium distribution of random zeros with respect to the pluri-complex Green's function on $\mathbf{C}^n$, the variance of the number of zeros in a domain, and scaling limit correlations of zeros.

Colloquium II

Random zeros and critical points on complex manifolds: geometrical aspects

In this talk, we explore the relationship of random functions with complex and algebraic geometry. Topics include the distribution of zeros of random polynomials with given Newton polytopes and its relation to toric varieties, the distribution of critical points of random sections and its connection to extremal metrics and to string theory.