STOCHASTIC KÄHLER GEOMETRY AND RANDOM HOLOMORPHIC SECTIONS

TURGAY BAYRAKTAR

Zero distribution of polynomials of high degree with random coefficients naturally appear in the context of "quantum chaotic dynamics". A classical result due to M. Kac and J. Hammersley asserts that if the coefficients are independent Gaussian random variables then zeros of random polynomials tend to accumulate near the unit circle on the complex plane. On the other hand, zeros of SU(2) polynomials are uniformly distributed on the Riemann sphere. While these results are consistent with Random Matrix Theory predictions they provide a new inside for the problem of quantum ergodicity. There are also higher dimensional generalizations of these results which form a relatively new field called "Stochastic Kähler Geometry".

In this talk, I will present several universality principles concerned with zero distribution of random polynomials or more generally random holomorphic sections of high powers $L^{\otimes n}$ of positive line bundle $L \to X$ defined over a projective manifold endowed with a singular Hermitian metric. In one direction, universality phenomenon indicates that under natural assumptions, asymptotic distribution of (appropriately normalized) zeros of random polynomials is independent of the choice of probability law defined on random polynomials. Another form of universality is asymptotic normality of smooth linear statistics of zero currents. Finally, if time permits, I will also describe some recent results on universality of scaling limits of correlations between simultaneous zeros of random polynomials.

Faculty of Engineering and Natural Sciences, Sabanci University