# Randomness in Complex Analysis & Complex Geometry Workshop

Nesin Mathematics Village
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## Probabilistic Methods in Complex Analysis and Complex Geometry

Turgay Bayraktar
Sabancı University

I will discuss some recent results in complex analysis and complex geometry obtained using probabilistic methods. The aim is to present a few representative examples, with emphasis on the main ideas and techniques rather than technical details.

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## Random Holomorphic Sections under an Asymptotic Prequantization Condition

Afrim Bojnik
Sabancı University

In this talk, I will discuss random holomorphic sections associated with a sequence of positive line bundles over a compact Kähler manifold. Under an asymptotic prequantization condition, I will present results on the asymptotic distribution of zeros, fluctuations, and masses of random sections.

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## Kodaira-Iitaka dimension and multiplicity: an analytic perspective

S Finski
École Polytechnique

We express the Kodaira-Iitaka dimension and the multiplicity of graded linear series in terms of the intersection theory of the plurisubharmonic envelope associated with the linear series, and obtain two refined versions of these formulas at the pointwise and at the metric levels. At the pointwise level, we focus on the weak convergence of the partial Bergman kernel associated with the linear series and a Bernstein-Markov measure. At the metric level, we compute the asymptotic ratio of the volumes of unit balls defined by the sup-norms on the linear series.

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## Central Limit Theorem for Intersection Currents of Random Holomorphic Sections

Bin Guo
Chinese Academy of Sciences

In 2010, Shiffman and Zelditch established a fundamental result in random Kähler geometry: the statistics of random zero sets of a single Gaussian holomorphic section obey a Central Limit Theorem (CLT). We generalize this result by proving the CLT for common zero sets of k independent Gaussian holomorphic sections on compact Kähler manifolds.

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## TBA

Hendrik Herrmann
University of Vienna

TBA

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## On nests and large components of random real algebraic curves

Ali Ulaş Özgür Kişisel
Middle East Technical University

Real algebraic geometry traditionally studies topological properties of algebraic subvarieties of the real projective space from a deterministic perspective, with a special emphasis on extremal ones. For example, a classical result of Harnack and Klein from 150 years ago states that the number of connected components of a real algebraic curve is bounded above by its genus plus one. On the other hand, random real algebraic geometry focuses on the statistical distribution of the aforementioned properties. An example of such a result from the last decade by Gayet and Welschinger states that the expected number of connected components of a Kostlan-random real algebraic plane curve asymptotically grows like the square-root of its genus.

After introducing the probabilistic set-up and some of the main developments and questions in this area, the goal of this talk will be to describe a variant of the "barrier method" in order to address questions about Kostlan random real algebraic plane curves. In particular we will describe how we can prove that the expected number of connected components of the curve of length at least $O\left(\sqrt{d^{-1}\log\log d}\right)$ grows to infinity with $d$, and likewise, the expected number of nests of the curve of depth at least $O(\log\log d)$ grows to infinity with $d$. In another direction, we will discuss how one can adapt an $L^\infty$-norm bound result of Shifmann and Zelditch to subspaces and employ it to obtain a lower bound for the probability that a finite number of points remain all in different components of the complement of a large degree random curve. This talk is based on joint work with Turgay Bayraktar.

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## Arithmetic probability measures

Mayuresh Londhe
Sabancı University

We discuss probability measures arising as weak* limits of normalized counting measures on the Galois conjugates of algebraic integers. Given a compact set in the complex plane, symmetric with respect to the real axis, such measures are recently characterized by Alex Smith. However, not many explicit examples of measures satisfying this characterization are known. In this talk, we give a dense class of examples of probability measures on the given set that can occur in this way. In particular, we study measures on interval with integer endpoints. Our approach uses techniques from logarithmic potential theory. This talk is based on a joint work with Norm Levenberg.

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