Frontiers in Analysis and Probability
8th Strasbourg / Zurich - Meeting
Université de Strasbourg and University of Zurich

Abstracts

Place: University of Zurich,
Main Building KOL-G-212, Rämistrasse 71, 8006 Zürich

November 28 - November 29, 2019

Thursday, November 28, 2019, 14:00 - 14:50 h

On the geometry of random and deterministic locally symmetric manifolds
by Tsachik Gelander, Weizmann Institute

Abstract: I will discuss problems and results concerning the geometry of arithmetic manifolds, random locally symmetric manifolds as well as manifolds of infinite volume.

Thursday, November 28, 2019, 15:00 - 15:50 h

Action convergence of random graphs and matrices
by Ágnes Backhausz, Eötvös Loránd University and Alfréd Rényi Institute of Mathematics

Abstract: The goal of the talk is to present the notion of action convergence of operators, together with its connections to graph limit theory and to the eigenvectors of random graphs and random matrices. The theory of graph limits had already had several applications about the spectral properties of random graphs. In order to extend these techniques to other random structures, such as dense non-symmetric random matrices, we proposed a new limit notion. This unifies several already known concepts of graphs limits, and it goes beyond the already known cases; for example, limit objects of hypercubes can be nicely defined. The main ideas of this notion and its relation to random graphs and matrices will be presented in the talk.
Joint work with Balázs Szegedy.

Thursday, November 28, 2019, 16:30 - 17:20 h

Extreme eigenvalue distributions of sparse random graphs
by Jiaoyang Huang, Harvard University

Abstract: I will discuss the extreme eigenvalue distributions of adjacency matrices of sparse random graphs, in particular the Erdős-Rényi graphs $G(N, p)$ and the random d-regular graphs. For Erdős-Rényi graphs, there is a crossover in the behavior of the extreme eigenvalues. When the average degree Np is much larger than $N^{1/3}$, the extreme eigenvalues have asymptotically Tracy-Widom fluctuations, the same as Gaussian orthogonal ensemble. However, when $N^{2/9} \ll Np \ll N^{1/3}$ the extreme eigenvalues have asymptotically Gaussian fluctuations. The extreme eigenvalues of random d-regular graphs are more rigid, we prove on the regime $N^{2/9} \ll d \ll N^{1/3}$ the extremal eigenvalues are concentrated at scale $N^{-2/3}$ and their fluctuations are governed by the Tracy-Widom statistics. Thus, in the same regime of d, 52% of all d-regular graphs have the second-largest eigenvalue strictly less than $2\sqrt{d-1}$.
These are based on joint works with Roland Bauerschmids, Antti Knowles, Benjamin Landon and Horng-Tzer Yau.

Friday, November 29, 2019, 09:00 - 09:50 h

Big mapping class groups acting on homology
by Federica Fanoni, University Paris-Est Créteil - CNRS

Abstract: To try and understand the group of symmetries of a surface, its mapping class group, it is useful to look at its action on the first homology of the surface. For finite-type surfaces this action is fairly well understood. I will discuss joint work with Sebastian Hensel and Nick Vlamis in which we deal with infinite-type surfaces (i.e. whose fundamental group is not finitely generated).

Friday, November 29, 2019, 10:30 - 11:20 h

Topological algorithms for graphs on surfaces, with some random aspects
by Éric Colin de Verdière, CNRS, LIGM, Université Paris-Est Marne-la-Vallée

Abstract: Topological algorithms for graphs on (metric) surfaces have flourished since the 2000s. Basic questions include computing shortest non-contractible or non-separating closed curves, shortest topological decompositions (e.g., shortest cut graphs, whose removal leaves a disk), shortest homotopic curves, etc. Related questions include bounds on the length of such curves or decompositions. Computer science implications include more efficient algorithms for standard graph problems (e.g., minimum multicut) in the case where the input graph is embedded in a low-genus surface.
I will survey some of these results, also emphasizing a few aspects for which random graphs (expanders) or random surfaces (obtained by gluing triangles randomly) play a role.

Friday, November 29, 2019, 11:30 - 12:20 h

Geometry and spectrum of random hyperbolic surfaces
by Laura Monk, Université de Strasbourg

Abstract: Studying random graphs or surfaces is a way to prove properties true typically, but not systematically. This approach has been proven to be successful for the spectrum of large regular graphs by Alon-Friedman's theorem for instance. The Weil-Petersson volume provides us with a natural model of random hyperbolic surfaces. On the one hand, Mirzakhani established a very effective method to learn about their geometry. On the other hand, the Selberg trace formula connects their length spectrum and the spectrum of their Laplacian operator. Building on these results, I will give a topological bound of the number of small eigenvalues and a Weyl-like law inside the bulk spectrum, both true with high probability.

Friday, November 29, 2019, 14:45 - 15:35 h

Single eigenvalue fluctuations of sparse Erdős-Rényi graphs
by Yukun He, University of Zurich

Abstract: I will first review some universality results for Wigner matrices and sparse Erdős-Rényi graphs, and then talk about some recent development on the fluctuation of individual eigenvalues of these models.

Friday, November 29, 2019, 15:45 - 16:35 h

Resonances and spectral gap for random covers of hyperbolic surfaces
by Frédéric Naud, Institut Mathématique de Jussieu, Sorbonne Université Paris

Abstract: After some necessary background on the notion of scattering resonances for hyperbolic surfaces of infinite volume, we will define a random family of covers (above any infinite area convex co-compact surface) and show how one can prove some a.a.s. explicit spectral gap results, in the large degree regime.
Joint work with Michael Magee from Durham University.

November 12, 2019