RENCONTRE ANR "ALÉATOIRE, DYNAMIQUE ET SPECTRE"

All the lectures will take place in the Salle 3 of the Laboratoire de Mathématiques Jean Leray (Nantes).

November, 12th 2024

- 9:30-10:30 am. **Maxime Ingremeau** (Université Côte d'Azur) – *L^∞ norms of chaotic eigenfunctions*

  A fundamental question in quantum chaos is to understand how localised/delocalised eigenfunctions of the Laplacian can be, in particular on manifolds of negative curvature. One way of addressing the question of delocalisation is to understand how large the L^∞ norms of the eigenfunctions can be. While there are several conjectures on the behaviour of these L^∞ norms, very little has been proved. In this talk, we will show adding small random perturbations to the Laplacian can help to prove L^∞ bounds on the eigenfunctions. This is joint work with Martin Vogel.

- 11:30-12:30 am. **Antoine Julia** (Paris Saclay, CNRS) – *Long time propagation of wave packets for the quantum cat map and the Schrödinger equation on hyperbolic surfaces*

  For quantized classical systems, short time propagation of wave packets is well approximated by the classical dynamical system itself. If this system is hyperbolic, this approximation becomes useless around the Ehrenfest time (which is logarithmic in the semi-classical parameter). For larger times another description of the propagation is needed. We will see how for multiples of the Ehrenfest time, a good description is given by the Birkhoff sums of certain parabolic dynamical systems: linear-skew shifts for the cat map, and the horocycle flow for the geodesic flow on hyperbolic surfaces. This is ongoing work by Jean-Michel Pipeau.

- 12:45 am. Lunch

- 2:30-3:30 pm. **Victor Le Guilloux** (Strasbourg) – *Average counting of eight-shaped geodesics on hyperbolic surfaces*

  Maryam Mirzakhani computed the leading term of the asymptotical behavior at fixed genus of the number of closed geodesics of a given topology, when their length tends to the infinity. After having noticed that the process of average counting of

eight-shaped geodesics shares some links with the convolution of polynomial functions, we shall see how to compute a more detailed asymptotical development of this average counting function when dealing with such geodesics.

- 3:30-4:30 pm. **Julien Moy** (Paris Saclay) – *Spectral statistics of the Laplacian on random covers of negatively curved surfaces*

  In the early 1980s, Bohigas, Giannoni and Schmit formulated a conjecture (BGS) about the spectral distribution of (single particle) quantum systems whose classical limit is chaotic. They proposed that generically, in the high energy limit, such systems should display spectral statistics predicted by Random Matrix Theory (RMT). Although some numerical experiments and heuristic arguments based on trace formulae support the BGS conjecture, little to no progress towards a rigorous proof has been made. Some recent developments have focused on random models of quantum systems, for which one may hope to prove results with high probability, e.g. for 99% of systems. In this talk, I will discuss some results on the spectral distribution of the Laplacian on random covers of a closed negatively curved surface. In the limit of large degree, the (smoothed) counting function of eigenvalues is shown to display fluctuations predicted by RMT.

- 7:30 pm. Dinner at Brasserie Félix (Nantes downtown).

November, 13th 2024

- 9:30-10:30 am. **Shu Shen** (Sorbonne Université) – *Analytic torsion and Anosov flow*

  In this talk, I will explain a construction of a torsion-like invariant for Anosov flows. This invariant is an element in the determinant line of the de Rham cohomology. In family, our invariant is shown to be flat with respect to the Gauss-Manin connection. This is a joint work with J.-M. Bismut (arxiv:202405.14583).

- 11:30-12:30 am. **Lasse Wolf** (Nantes Université) – *Polyhedral bounds on the joint spectrum*

  I will report on a recent project joint with Christopher Lutsko and Tobias Weich where we prove a conjecture of Hee Oh that characterizes the temperedness of locally symmetric spaces. I will introduce the joint spectrum and its connection to temperdness. Furthermore, I will sketch the situation in the non-tempered case and show resulting (poyhedral) bounds on the joint spectrum.

- 12:45 am. Lunch