Avignon-Marseille Dynamical Systems day, 2021

Thermodynamic formalism.

Detailed Program

Charles Fougeron (Université de Paris)

Title : **Dynamics of simplicial systems and multidimensional continued fraction algorithms.**

Abstract : Motivated by the richness of the Gauss algorithm which allows to efficiently compute the best approximations of a real number by rationals, many mathematicians have suggested generalisations to study Diophantine approximations of vectors in higher dimensions. Examples include Poincaré's algorithm introduced at the end of the 19th century or those of Brun and Selmer in the middle of the 20th century. Since the beginning of the 90's to the present day, there has been many works studying the convergence and dynamics of these multidimensional continued fraction algorithms. In particular, Schweiger and Broise have shown that the approximation sequence built using Selmer and Brun algorithms converge to the right vector with an extra ergodic property. On the other hand, Nogueira demonstrated that the algorithm proposed by Poincaré almost never converges.

Starting from the classical case of Farey's algorithm, which is an "additive" version of Gauss's algorithm, I will present a combinatorial point of view on these algorithms which allows to us to use a random walk approach. In this model, taking a random vector for the Lebesgue measure will correspond to following a random walk with memory in a labelled graph called symplicial system. The laws of probability for this random walk are elementary and we can thus develop probabilistic techniques to study their generic dynamical behaviour. This will lead us to describe a purely graph theoretic criterion to check the convergence of a continued fraction algorithm.

Benoît Saussol (Aix-Marseille Université)

Title : **Recurrence rate for some dynamical systems in infinite measure.**

Abstract : We present some results on the time a typical orbit has to run until it comes back close to its initial condition. The systems we consider are modeled by $\mathbb{Z}$ or $\mathbb{Z}^2$ extension of subsshift of finite type. Returns close to the origin happen when the system comes back at small scale (the compact dynamics) and at large scale (a random walk on $\mathbb{Z}$ or $\mathbb{Z}^2$). A precise version of the central limit theorem shows that these two events are asymptotically independent, from which the computation of the recurrence rate can be done. We finish by an application to the T,T^{-1} transformation.

Frédéric Naud (Sorbonne Université)

Title : **Random covers of hyperbolic surfaces and uniform spectral gap.**

Abstract : We will go back to Selberg and his eigenvalue conjecture to motivate the subject. We will then survey some of the various models of random hyperbolic surfaces, both for compact and non-compact families. I will then try to explain some of the latest results obtained with Michael Magee and Doron Puder.

Polina Vytnova (University of Warwick)

Title: **A new approach to computing Lyapunov exponentsl.**

Abstract: Last year, in a joint work with M. Pollicott we have presented a new and remarkably efficient way of computing Hausdorff dimension of certain Cantor sets. Recently, we have extended this method to computing Lyapunov exponents for expanding maps of an interval and for random matrix products. In the talk I am planning to cover the theoretical background, some computational details of the method and present several examples.