Journées de Dynamique
4–6 Octobre 2023
Abstracts

Samuel Tapie *Entropy at infinity and applications in negative curvature*

In this talk, I will focus on some relationships between topology, analysis and geometry which are provided by studying the geodesic flow on non-compact manifolds with negative curvature. I will first recall some classical notions of entropy and then present entropies at infinity and entropy gap property. I will sketch various applications to counting closed orbits, Laplace spectrum and mixing properties of the geodesic flow.

Mario Shannon *Pseudo-Anosov structures compatible with pseudo-Anosov homeomorphisms, and the connectivity of the Graph of Anosov Flows*

Given an Anosov flow in a closed 3-manifold, it is possible to construct many other ones by doing Fried surgeries along periodic orbits. The graph whose vertices are the pairs (Anosov flow,3-manifold) and two vertices are connected with an edge if there is a Fried surgery transforming one into the other, is called the *Graph of Anosov Flows*. Up to the reasonable hypothesis, one open question is the connectivity of this graph. Our aim in this talk is to see how this question can be translated into a problem of *Affine Structures on Closed Surfaces* and, even more, *Affine Interval Exchange Transformations*.

Reem Yassawi *Tame or wild Toeplitz shifts*

The Ellis semigroup $E(X,T)$ of a topological dynamical system is defined to be the compactification of the action T in the topology of pointwise convergence on the space of all functions X^X. *Tameness* is a concept whose roots date back to Rosenthal's ℓ^1 embedding theorem, which says that if a sequence in ℓ^1 does not have a weakly Cauchy subsequence, then it must be the sequence of unit vectors in ℓ^1. Köhler linked the concept of tameness to the Ellis semigroup. A system is *tame* if its Ellis semigroup has size at most the continuum. Non-tame systems are very far from tame, as they must contain a copy of $\beta\mathbb{N}$, the Stone-Čech compactification of $\mathbb{N}$.

Since then, the dynamics community has investigated the question of which systems are tame. In this talk I will give a brief exposition of these results, and talk about my recent work with Gabriel Fuhrmann and Johannes Kellendonk, where we study tameness, or otherwise, of Toeplitz shifts.

Mar Giralt *Chaotic phenomena to L_3 in the Restricted 3-Body Problem*

The Restricted 3-Body Problem models the motion of a body of negligible mass under the gravitational influence of two massive bodies, called the primaries. If the primaries perform circular motions and the massless body is coplanar with them, one has the Restricted Planar Circular 3-Body Problem (RPC3BP). In rotating coordinates, it is a two degrees of freedom Hamiltonian system with five critical points, $L_1, .., L_5$, called the Lagrange points. The Lagrange point L_3 is a saddle-center critical point (collinear with the primaries and beyond the largest one) with a 1-dimensional stable and unstable manifold. When the ratio between the masses of the primaries μ is small, the modulus of the hyperbolic eigenvalues are weaker, by a factor of

order $\sqrt{\mu}$, than the elliptic ones.

The first result we present is an asymptotic formula for the distance between the stable and unstable manifolds of L_3. Due to the rapidly rotating dynamics, this distance is exponentially small with respect to $\sqrt{\mu}$ and, as a result, classical perturbative methods (i.e the Melnikov-Poincaré method) can not be applied.

The second result studies the family of Lyapunov periodic orbits of L_3 with Hamiltonian energy level exponentially close (with respect to $\sqrt{\mu}$) to that of L_3. In particular, we show that there exists a set of periodic orbits whose unstable and stable manifolds intersect transversally. By the Smale-Birkhoff homoclinic theorem, this implies the existence of chaotic motions (Smale horseshoe) exponentially close to L_3 and its invariant manifolds. In addition, we also show the existence of a generic unfolding of a quadratic homoclinic tangency which lead to the existence of Newhouse domains for the RPC3BP.

This is a joint work with Inma Baldomá and Marcel Guardia.

Tere Seara *Existence of pseudo-orbits which lead to Arnold diffusion in a conformally symplectic system*

For a mechanical system consisting of a rotator and a pendulum coupled via a small, time-periodic Hamiltonian perturbation, it is kwon that, under suitable explicit conditions, there exist orbits along which the energy of the rotator grows by an amount independent of the size of the coupling parameter, for all sufficiently small values of the coupling parameter. There is a vast literature on establishing Arnold diffusion for such systems.

In this talk, we present the case when an additional, dissipative perturbation is added to the rotator-pendulum system with coupling. Therefore, the system obtained is not symplectic but conformally symplectic.

We provide explicit conditions on the dissipation parameter, so that the resulting system has pseudo-orbits exhibiting energy growth.

Even if In this work the coupling is carefully chosen, however the mechanism we present can be adapted to general couplings.

Samuel Kittle *Absolute continuity of stationary measures and inverse entropy methods*

We discuss new techniques based on inverse entropy methods for proving that stationary measures are absolutely continuous. Using these we provide sufficient conditions for self-similar measure and Furstenberg measures to be absolutely continuous.

Elise Janvresse *Sum-of-digits, central limit theorem and b-adic odometer*

TBA

Joanna Kulaga *Invariant measures for $\mathscr{B}$-free systems and beyond*

Given $\mathscr{B} \subseteq \mathbb{N}$, we consider the corresponding set $\mathcal{F}_{\mathscr{B}} = \mathbb{Z} \setminus \bigcup_{b \in \mathscr{B}} b\mathbb{Z}$ of $\mathscr{B}$-free integers. We define X_η – the $\mathscr{B}$-free subshift – as the smallest subshift containing $\eta := \mathbf{1}_{\mathcal{F}_{\mathscr{B}}} \in \{0,1\}$. Such systems are interesting both from the number-theoretic and dynamical viewpoint and they can manifest

various types of behavior. I will mostly concentrate on results related to invariant measures. The talk is based on joint works with Aurelia Dymek, Daniel Sell, Michał Lemańczyk and Michał Rams.

Joel Moreira *Sets of multiplicative recurrence and Pythagorean triples*

After Poincare's recurrence theorem, Furstenberg introduced the notion of a set of recurrence : a set of times with the property that in any dynamical system, recurrence holds at some time from the set. This notion has surprising implications in combinatorial number theory, and many sparse sets of recurrence are nowadays known. More recently, extensions of this notion for actions of (semi)groups have been defined and studied, most fruitfully for the semigroup of integers under multiplication.

I will explore this notion of sets of recurrence, explain how it connects to number theory, and present a (sketch of a) very recent proof that for any partition of the natural numbers into finitely many colors, there exists a Pythagorean triple with at least two terms of the same color.

Nicolas de Saxcé *Diagonal orbits in spaces of lattices*

Since the work of Minkowski in the early twentieth century, the space of lattices has been a fundamental tool in the study of natural or rational numbers. Then, Margulis and his followers, in particular Dani, showed that methods from ergodic theory could be used very efficiently in that setting. More recently, Schmidt and Summerer started the "parametric geometry of numbers", which is a way to describe diagonal orbits in the space of lattices, using a simple combinatorial coding. This construction can be viewed as a generalization of continued fractions, and in particular, it can be used to show existence of real points with specific diophantine properties, and to answer problems that were previously understood only in dimension 1.

Jon Chaika *Horocycle orbit closures in rank 1 loci are nice*

Recently, fairly wild phenomena has been found in the dynamics of the horocycle flow on strata of translation surfaces. In particular, there exist horocycle orbit closures with fractional Hausdorff dimension. This talk will show that in certain special subloci of strata of translation surfaces, *Rank 1 loci*, this behavior does not occur and in fact the orbit closures are nice. This talk will not assume familiarity with translation surfaces. This is joint work with B. Weiss and F. Ygouf.

Cagri Sert *Stationary probability measures on projective spaces*

We give a description of stationary probability measures on projective spaces for an iid random walk on $GL_d(\mathbb{R})$. This is done in two parts. In a first part, we study the case (non-critical or block-dominated case) where the random walk has distinct deterministic exponents in the sense of Furstenberg–Kifer–Hennion. In a second part (critical case), we show that if the random walk has only one deterministic exponent, then any stationary probability measure on the projective space lives on a subspace on which the ambient group of the random walk acts completely reducibly. This connects the critical setting with the work of Guivarc'h–Raugi and Benoist–Quint. Combination of all these works allow to get a complete description. Joint works with Richard Aoun.

Jenny Wang *Periodic data and smooth rigidity for hyperbolic automorphisms on torus*

We study the regularity of the conjugacy between an irreducible Anosov automorphism A on torus and its small perturbation f. We say that f and A have the same periodic data if the derivatives of the return maps of f and A at the corresponding periodic points are conjugate. It is conjectured that f is C^∞ conjugate to A if and only if f and A have the same periodic data. In this paper, we confirm the conjecture. This completes the characterization of the most elementary C^1-invariant for local C^∞ rigidity. We also give the first example of cocycle rigidity over fibers with conjugate periodic data.

Livio Flaminio *New estimates on the equidistribution of some nilflows*

Using methods from dynamical systems (cohomological equations, invariant distributions) and from non-Abelian harmonic analysis, we prove an effective equidistribution result for a class of higher step nilflows. As a corollary, we obtain bounds on Weyl sums for higher degree polynomials with a power saving comparable to the best known, derived by J. Bourgain, C. Demeter and L. Guth and by T. Wooley.