Programme des Journées de Dynamiques de l'IMJ-PRG

7 et 8 octobre 2021

Programme

Jeudi 7 octobre

- **9h** Jessica Massetti (Univ. Roma Tre), On the existence of Weak Sobolev almost-periodic solutions for the 1-dimensional NLS

- **10h10** Michela Procesi (Univ. Roma Tre), Linearization for infinite dimensional Hamiltonian systems

- **11h10** Pause café

- **11h40** Susanna Terracini (Univ. Torino), Refraction Trajectories in Central Mass Galaxies

- **12h40** Pause déjeuner

- **14h** Serge Cantat (IRMAR, Univ. Rennes 1), Dynamics of groups of algebraic diffeomorphisms of surfaces

- **15h10** Charles Frances (IRMA, Univ. Strasbourg), Plongements grossiers et actions isométriques de groupes discrets

- **16h10** Pause café

- **16h40** Vincent Delecroix (LaBRI, Univ. Bordeaux), Measured foliations minimality and GL(2,R)-actions on the moduli space of Abelian differentials

Vendredi 8 octobre

- **9h** Barbara Schapira (IRMAR, Univ. Rennes 1), Ruelle resonances for the geodesic flow of non-compact negatively curved manifolds

- **10h10** Ana Rechtman (IRMA, Univ. Strasbourg), Livres brisés et dynamique des flots de Reeb en dimension 3

- **11h10** Pause café

- **11h40** Rhiannon Dougall (Univ. Durham), Growth in covers, from a thermodynamic formalism viewpoint

- **12h40** Pause déjeuner

- **14h** Valérie Berthé (Univ. de Paris), Symbolic discrepancy and Pisot dynamics

- **15h10** Marcel Guardia (UPC Barcelona), Breakdown of small amplitude breathers for the nonlinear Klein-Gordon equation

Résumés

Valérie Berthé: Symbolic discrepancy and Pisot dynamics

Discrepancy is a measure of equidistribution for sequences of points. A bounded remainder set is a set with bounded discrepancy, that is, the number of times it is visited differs by the expected time only by a constant. We discuss dynamical, symbolic and spectral approaches to the study of bounded remainder sets for Kronecker sequences. We also consider discrepancy in the setting of symbolic dynamics and we discuss the existence of bounded remainder sets for some families of zero entropy subshifts. We focus on the case of Pisot parameters for toral translations and then show how to construct symbolic codings in terms of multidimensional continued fraction algorithms which lead to renormalization schemes. This is joint work with W. Steiner and J. Thuswaldner.

Serge Cantat: Dynamics of groups of algebraic diffeomorphisms of surfaces.

I shall survey the results obtained with Romain Dujardin in a recent series of papers. The theme is the following: start with two algebraic diffeomorphisms of a closed real or complex algebraic surface, and apply them randomly; what can be said of the asymptotic distribution of typical orbits ? In other words, can we classify invariant and stationary measures ?

Rhiannon Dougall: Growth in covers, from a thermodynamic formalism viewpoint

There has been much interest in extending Kesten's criterion for amenability (in terms of a random walk) to other contexts: geometric and dynamical. In the setting of this talk, we replace the independent steps of the random walk with hyperbolic dynamics, and capture the structure of the cover using the thermodynamic formalism. I will discuss the work of Coulon–Dougall–Schapira–Tapie and of Dougall–Sharp, and a reformulation of the ideas in the setting of countable Markov shifts.

Charles Frances: Plongements grossiers et actions isométriques de groupes discrets

Le but de l'exposé est de montrer comment la notion de plongement grossier entre espaces métriques, introduite par M. Gromov dans les années 80, permet de mieux comprendre les actions de groupes discrets préservant des structures géométriques rigides. On mettra l'accent sur l'étude du groupe des isométries d'une métrique lorentzienne, et on montrera une alternative de Tits pour ces groupes.

Marcel Guardia, Breakdown of small amplitude breathers for the nonlinear Klein-Gordon equation

Breathers are temporally periodic and spatially localized solutions of evolutionary PDEs. They are known to exist for integrable PDEs such as the sine-Gordon equation, but are believed to be rare for general nonlinear PDEs. When the spatial dimension is equal to one, exchanging the roles of time and space variables (in the so-called spatial dynamics framework), breathers can be interpreted as homoclinic solutions to steady solutions and thus arise from the intersections of the stable and unstable manifolds of the steady states. In this talk, we shall study the nonlinear Klein-Gordon equation and show that small amplitude breathers cannot exist (under certain conditions). We also construct generalized breathers, these are solutions which are periodic in time and in space are localized up to exponentially small (with respect to the amplitude) tails. This is a joint work with O. Gomide, T. Seara and C. Zeng.

Jessica Massetti: On the existence of Weak Sobolev almost-periodic solutions for the 1-dimensional NLS

Existence of almost periodic solutions (i.e. solutions which are limit, in the uniform topology in time, of quasi-periodic functions) for evolution PDEs is a tough problem, with a lot of open questions. Very

few results are known on this topic and most of them deal with the construction of very regular solutions for semilinear parameter dependent PDEs (mainly the Nonlinear Schrödinger (NLS) equation). In this talk I shall discuss some recent results on the existence of finite regularity solutions of this kind for the translation invariant NLS. Actually our solutions tipically solve the equation only in a weak sense, which constitutes, as far as we know, the first result on weak almost-periodic or quasi-periodic solutions for a PDE.

Michela Procesi: Linearization for infinite dimensional Hamiltonian systems

I shall consider classes of analytic infinite dimensional Hamiltonian dynamical systems in the neighborhood of an elliptic fixed point. I shall show that if the linear frequencies satisfy a Diophantine-like condition and if the Hamiltonian is formally symplectically conjugated to its quadratic part, then it is also analytically symplectically conjugated to it. Of course what is an analytic symplectic change of variables depends strongly on the choice of the phase space. Here we work on periodic functions with Gevrey regularity.Based on joint work with L. Stolovitch

Ana Rechtman: Livres brisés et dynamique des flots de Reeb en dimension 3

La correspondance de Giroux établit qu'une structure de contact en dimension 3 est portée par une décomposition en livre ouvert de la variété. Il existe alors un champ de Reeb qui est tangent à la reliure et transverse à l'intérieur des pages. Dans ce cas, une page est une section de Birkhoff du flot et on peut étudier la dynamique en étudiant le difféomorphisme induit sur la page. Cette correspondance est peu utile quand on veut étudier la dynamique de tous les champs de Reeb associés à une structure de contact fixée.

Nous avons montré que tout champ de Reeb non-dégénéré, est portée par un livre brisé (une généralisation de la notion de livre ouvert). Grâce à cette construction, nous avons étudié certains aspects de la dynamique des flots de Reeb : nous établissons par exemple, qu'un champ de Reeb non-dégénéré a deux ou une infinité d'orbites périodiques. Ceci est un travail en collaboration avec Vincent Colin et Pierre Dehornoy.

Barbara Schapira: Ruelle resonances for the geodesic flow of noncompact negatively curved manifolds

We are interested in the stochastic properties of the geodesic flow of a noncompact negatively curved manifold M. Let m_F be a Gibbs measure associated with a smooth potential F on the unit tangent bundle $T^1 M$. Under a dynamical assumption, called strong positive recurrence, saying that a pressure at infinity δ_∞^F is strictly smaller than the topological pressure δ^F, this measure m^F is finite, mixing, and admits Ruelle resonances at least up to $\delta_\infty^F - \delta^F < 0$.

This is a joint work with Sébastien Gouezel and Samuel Tapie. In my talk, I will explain and motivate this abstract, and give some flavour of the proof.

Susanna Terracini: Refraction Trajectories in Central Mass Galaxies

We consider a new type of dynamical systems of physical interest, where two different forces act in two complementary regions of the space, namely a Keplerian attractive center sits in the inner region, while an harmonic oscillator is acting in the outer one. In addition, the two regions are separated by an interface Σ, where a Snell's law of ray refraction holds. Trajectories concatenate arcs of Keplerian hyperbolæ with harmonic ellipses, with a refraction at the boundary. When the interface also has a radial symmetry, then the system is integrable, and we are interested in the effect of the geometry of the interface on the stability and bifurcation of periodic orbits from the homotetic collision-ejection ones. We give local condition on the geometry of the interface for the stability and obtain a complete picture of stability and bifurcations in the elliptic case for period one and period two orbits. Next we we consider the general problem of periodic and quasi-periodic orbits through KAM and Aubry-Mather theory and we connect the existence of invariant curves to that of caustics.