Sexto Workshop de Sistemas Dinâmicos
Universidade Federal do Rio Grande do Sul
26 a 30 de Setembro de 2022

CADERNO DE RESUMOS

Comitê Científico

- Isable Rios (UFF)
- Luna Lomonaco (IMPA)
- Marcelo Viana (IMPA)
- Rafael Potrie (UDeLaR - Uruguai)

Comitê Organizador

- Alexandre Baraviera (UFRGS)
- Lucas Backes (UFRGS)
- Lucas Oliveira (UFRGS)

Porto Alegre
Setembro 2022

Apoio:

Palestrantes

- Begoña Alarcón (UFF)
- Fábio Tal (USP)
- Isabel Rios (UFF)
- Jérôme Los (Aix-Marseille University)
- Jaqueline Siqueira (UFRJ)
- Luciana Salgado (UFRJ)
- Miguel Ratis Laude (IMPA)
- Sébastien Alvarez (UDeLaR - Uruguai)
- Sergio Romaña (UFRJ)
- Silvius Klein (PUC-Rio)
- Yuri Lima (UFC)

Programa

Segunda-feira, 26 de setembro
- 14h   Fábio Tal (USP)
- 15h   Intervalo para o café
- 15h30   Begoña Alarcón (UFF)

Terça-feira, 27 de setembro
- 14h   Yuri Lima (UFC)
- 15h   Intervalo para o café
- 15h30   Jérôme Los (Aix-Marseille University)
- 16h30   Intervalo para o café
- 16h45   Isabel Rios (UFF)

Quarta-feira, 28 de setembro
- 14h   Yuri Lima (UFC)
- 15h   Intervalo para o café
- 15h30   Sébastien Alvarez (UDeLaR - Uruguai)
- 16h30   Intervalo para o café
- 16h45   Jaqueline Siqueira (UFRJ)

Quinta-feira, 29 de setembro
- 14h   Yuri Lima (UFC)
- 15h   Intervalo para o café
- 15h30   Sergio Romaña (UFRJ)
- 16h30   Intervalo para o café
- 16h45   Luciana Salgado (UFRJ)

Sexta-feira, 30 de setembro
- 14h   Miguel Ratis Laude (IMPA)
- 15h   Intervalo para o café
- 15h30   Silvius Klein (PUC-Rio)
- 16h30   Encerramento

Global dynamics for planar vector fields with a star node and homogeneous nonlinearities

Begoña Alarcón (UFF)

Abstract: We study the global dynamics of vector fields of the form $u' = \lambda u + Q(u)$, where $\lambda \neq 0$ and $Q(u)$ is a planar homogeneous polynomial vector field. We discuss the number and stability of equilibrium points, both in the plane and in the circle at infinity in the Poicaré compactification. We obtain conditions for the existence of a globally attracting poly-cycle, thus extending previous results on the existence of limit cycles. A more detailed analysis is done for symmetric vector fields.

This is joint work with Isabel Labouriau and Sofia Castro, University of Porto (Portugal).

Rotational Chaos for annular dynamics

Fábio Tal (USP)

Abstract: We study homeomorphisms of surfaces,with emphasys the annulus, trying to characterize when the associated dynamical system has positive topological entropy and rotational entropy. Using topological techniques, we show (with P. Le Calvez) that the presence of any type of shear in conservative settings imply that either the dynamics is near-integrable or it must have a rotational horseshoe. For the general case, we show (with A. Passeggi) that if one can find an invariant circloid with sheared dynamics (having non-trivial rotation set), then the dynamics must also have a rotational horseshoe, solving a conjecture dating back to the 80s.

Uniform hyperbolicity for random maps with positive Lyapunov exponents

Isabel Rios (UFF)

Abstract: We consider discrete dynamical systems with hyperbolic measures. We present an example of a non-uniformly hyperbolic system where all invariant measures have Lyapunov exponents uniformly bounded away from zero. We discuss conditions that, together with the hyperbolicity of the measures, imply uniform hyperbolicity, in the context of non-uniformly expanding maps and of random maps. This talk is based on three joint papers with Stefano Luzzatto and Yongluo Cao.

Groups and dynamics: Bowen-Series like maps

Jérôme Los (Aix-Marseille University)

Abstract: In this talk the goal is to describe a recent construction of a dynamical system from a surface group presentation. The resulting dynamics is given by a particular class of piecewise homeomorphisms of the circle. Some of the properties of these maps are presented.

On Ergodic Theory of impulsive semiflows

Jaqueline Siqueira (UFRJ)

Abstract: Impulsive Dynamical Systems (IDS) can be seen as suitable mathematical models of real world phenomena that display abrupt changes in their behaviour. More precisely, an IDS is described by three objects: a continuous semiflow on a space X; a set D contained in X where the flow undergoes sudden perturbations; and an impulsive function from D to X, which determines the change in the trajectory each time it collides with the impulsive set D.

In spite of their great range of applications, IDS have started being studied from the viewpoint of Ergodic Theory only quite recently in the work of Alves and Carvalho (2014). A key challenge, inherent to the dynamics, is that in general, an impulsive semiflow is not continuous. In this talk I will provide sufficient conditions for the existence of invariant measures that imply the ones given by Alves and Carvalho and are somewhat easier to verify. Moreover, I will discuss how typical is the invariance of the non-wandering set of an impulsive semiflow. I will finish the talk with some open problems. This talk is based upon two works with Afonso and Bonotto and with Torres and Varandas.

Ergodic and geometric aspects of (nonuniformly) sectional hyperbolic systems

Luciana Salgado (UFRJ)

Abstract: In 2009, the notion of nonuniformly sectional hyperbolic set was introduced, joint with A. Arbieto, and we proved a C^1-generic relation between nonuniformly sectional hyperbolicity and sectional hyperbolicity. In 2012, joint with V. Araújo, we extended results from Lewowicz and Wojkowski on quadratic forms and hyperbolicity to partial, singular and 2-sectional hyperbolicity for fows. In 2019, I introduced a broadest notion of (uniform) sectional hyperbolicity and sectional Lyapunov exponents, by considering sectional expansion of any dimension between 2 and the full dimension of the central bundle. Then, several characterizations of these notions were given, in particular, an ergodic characterization of

domination property, by using Lyapunov functions. In this talk, it will be presented these notions of (nonuniformly) sectional hyperbolicity recently made, and some related results and derivated theory of it.

Mating quadratic polynomials with representations of $C_2 * C_3$

Miguel Ratis Laude (IMPA)

Abstract: The dynamical theory of rational maps and the theory of Kleinian groups have several parallels compiled in what is known as the Sullivan dictionary. One of the entries of this dictionary compares the ability to mate elements. We explore a construction due to Bullet and Harvey that combines a quadratic polynomial with connected Julia set and a faithful discrete representation of $C_2 * C_3$ (the free product of the cyclic groups of orders 2 and 3) with connected regular set. The result is a $2:2$ rational correspondence, defined as a polynomial relation $p(z, w) = 0$. This relation can be placed in a two-parameter family, and we look into continuity properties of this process when we allow the polynomial or the group representation to move through their one-parameter families.

Candel's theorem revisited

Sébastien Alvarez (UDeLaR - Uruguai)

Abstract: The famous Candel's theorem states that leaves of any Riemann surface lamination of hyperbolic type can be simultaneously uniformized by the unit disc. This proved to be very useful in complex dynamics (since Sullivan's work about the renormalization conjecture), in hyperbolic dynamics (in the study of geometric properties of leaves of invariant foliations) and in foliation theory (it is essential in Thurston's theory of universal circles for 3-dimensional foliations). It is a subtle theorem of continuity that we revisit by putting a topology in the space of (coverings of) leaves of a compact lamination, and proving the continuity of uniformizing maps for this topology. We go further by proving that it is possible to prescribe the curvature of leaves: for every hyperbolic surface lamination and every continuous negative function, which is smooth in each leaf, then there exists a unique conformal laminated metric such that the curvature of each leaf is given by this function (the case of a constant function gives Candel's theorem). This is joint work with Graham Smith (UFRJ).

Um problema deixado por Ricardo Mañé

Sergio Romaña (UFRJ)

Abstract: Comumente a geometria controla a dinâmica de seu fluxo geodésico, no entanto, algumas vezes a dinâmica do fluxo geodésico também pode controlar

a geometria. Nesta palestra discutiremos uma resposta positiva a um problema deixado por R. Mañé. Mas especialmente, mostraremos que toda variedade não compacta com curvatura limitada por baixo e cujo fluxo geodésico é Anosov não tem como pontos conjugados. Ou seja, podemos controlar o tipo de geometria que aparece com a condição de hiperbolicidade do fluxo geodésico. Trabalho em colaboração com ítalo Melo (UFPI)

Large deviations estimates for certain partially hyperbolic systems

Silvius Klein (PUC-Rio)

Abstract: In this talk I will present some results on large deviations type estimates for certain skew-product dynamical systems. Moreover, I will describe an abstract approach for deriving such statistical properties, based on the strong mixing properties of an appropriate Markov operator. Based on joint work with Ao Cai and Pedro Duarte.

Symbolic dynamics for nonuniformly hyperbolic systems

Yuri Lima (UFC)

Abstract: Symbolic dynamics are an important tool towards the representation of chaotic systems, as they simplify the study of dynamical properties in various aspects, e.g. the counting of closed orbits and of measures of maximal entropy. It is known for almost fifty years that uniformly hyperbolic systems have good symbolic codings (Adler-Weiss, Sinai, Bowen, Ratner). Some years ago, Sarig constructed good symbolic codings for the non-uniformly hyperbolic component of surface diffeomorphisms. His work improves the classical work of Katok on the nowadays called "Katok horseshoes". This minicourse aims to introduce the basic tools of Sarig's methods and to discuss the state of art on the field, which covers surface diffeomorphisms, three dimensional flows, Bunimovich billiards, multimodal maps of the interval, and their higher dimensional counterparts.