Duality of velocity and measure for nonstationary solenoids

Albert Fisher
IME-USP

Vershik's adic transformations, a far-reaching generalization of the adding machine map, are defined on an ordered one-sided Bratteli diagram. We show that the same ordering on a two-sided diagram leads naturally to a nonstationary solenoid space. We give a necessary and sufficient condition for the adic transformation, and the translation flow on the solenoid, to be uniquely ergodic, and show that this condition is dual to the flow having a unique natural velocity. An interesting class of examples comes from interval exchange transformations; we examine duality in that context.

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Smooth conjugacies for uniformly and non-uniformly hyperbolic dynamics

Alberto Pinto
Universidade do Porto

We will discuss some results on smooth conjugacy classes for uniformly and non-uniformly expanding maps after the works of de Melo and van Strien. We will relate circle diffeomorphisms and Denjoy maps that are fixed points of renormalization with Anosov and derived Anosov diffeomorphisms. We will extend Livsic and Sinai eigenvalue formula for Anosov diffeomorphisms to hyperbolic basic sets on surfaces.

Free curves and periodic points for torus homeomorphisms

Alejandro Kocsard
IMPA

Abstract: Given a homeomorphism f : T2 ! T2 isotopic to the identity, we prove that if f does not exhibit any free curve (i.e. every essential simple closed curve intersects its image), then f has a fixed point, or f has infinitely many periodic points with periods arbitrarily large and positive topological entropy.

Dynamical and topological properties for a class of recurrent sequences

A. Messaoudi
UNESP, São José do Rio Preto

We study dynamical and topological properties for a class of recurrent sequences. In particular we show that the stochastic adding machines associated to these sequences are related to the Julia sets for endomorphisms of Cn, n _ 2. This is a joint work with Daniel Smania.

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Existence and uniqueness of the measure of maximal entropy
for the Teichmueller flow on the moduli space of abelian differentials (joint work with B.M. Gurevich)

Alexander I. Bufetov
Rice University

Abstract: The moduli space of abelian differentials carries a natural Lebesgue measure class, and, by the Theorem of H.Masur and W.Veech, the Teichmueller flow on the moduli space of abelian differentials preserves a finite ergodic measure in the Lebesgue measure class. The entropy of the flow with respect to the absolutely continuous measure has been computed by Veech in 1986. The main result of the talk, obtained by B.M. Gurevich and the speaker, is that the absolutely continuous measure is the unique measure of maximal entropy for the Teichmueller flow.

The first step of the proof is an observation that the absolutely continuous measure has the Margulis property of uniform expansion on unstable leaves. The argument proceeds in Veech's space of zippered rectangles: following Veech, a finite cover of the flow is represented as a suspension flow over a countable topological Bernoulli chain and with a Hoelder, bounded below roof function depending only on the future (the coding is constructed, as usual, by choosing a flow transversal corresponding to a renormalization matrix all whose entries are positive). The flow is then approximated by a sequence of flows whose roof functions depend only on one coordinate in the sequence space; since the roof function is Hoelder, the approximation is fast enough to yield the result.

Some generalized versions of Denjoy Theorem.

Andres Navas
IMPA

I will discuss some generalized versions of the classical Denjoy Theorem mainly for (groups of) diffeomorphisms. The results to be discussed include:

- Existence of Morse-Smale diffeomorphisms in groups of C^2 circle diffeomorphisms having a minimal invariant Cantor set;

- Generalized versions for commuting diffeomorphisms having intermediate regularity;

- A generalized "conformal" C^{k+1}-version in dimension k. Several open problems will be adressed.

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On Hausdor® dimension of the set of oscillatory motions

Anton Gorodetski
California Institute of Technology, Pasadena

Consider a restricted version of a three body problem, i.e. one of the bodies has the mass which is negligible compared to the masses of two others. There are solutions where the light body has a bounded orbit, and in this case all the limit points of the orbit are nite. There are solutions where it goes to in¯nity, and in this case the in¯nity can be considered as the only limit point. The orbit is called *oscillatory* if the set of its limit points contains in¯nity as well as ¯nite points. Even the existence of oscillatory orbits is highly non-trivial. Oscillatory motions were ¯rst found in the famous Sitnikov model, and Alexeev explained their appearance using the methods of hyperbolic dynamics. One of the most challenging problems regarding oscillatory orbits is an open Kolmogorov conjecture. It claims that the set of initial conditions that correspond to oscillatory motions has zero measure.
Amazingly enough, the question about the structure of the set of oscillatory motions is related to some recent works in the smooth dynamical systems such as lateral thickness of Cantor sets and persistent intersections (Moreira, 1996), area-preserving Henon family as a limit of renormalization procedure (Mora-Romero, 1997), conservative Newhouse phenomena (Duarte, 2000), and splitting of separatrices (Gelfreich, 2000, Gelfreich-Sauzin, 2001). We improve some of these results (consider a one-parameter version of a conserva- tive Newhouse phenomena, establish the relation between lateral thicknesses of a Cantor set and its Hausdor® dimension, adapt the reparameterization procedure of Mora-Romero to the case of degenerate saddles etc.) and apply them to show that in many cases the set of oscillatory motions has full Hausdor® dimension. This is a joint work with V.Kaloshin.

A most basic two dimensional generalization of interval exchange transformation (joint work with Anthony Quas)

Arek Goetz
San Francisco State University

In this talk we investigate the following map T defined on the plane. The map T acts as a rotation T0 by some angle alpha on the lower half plane and T acts as a rotation T1 by alpha on the upper half plane. The real line is the discontinuity for T. The map T is an example of a piecewise rotation. These systems have been of particular interest in the last decade to both pure mathematicians and researchers in electrical engineering. Boshernitzan and the speaker showed that in cases when T is not invertible, all T-orbits are either attracted to a bounded set or all T-orbits starting outside of a bounded set diverge to infinity. In the complementary case when T is invertible Quas and the speaker show that every neighborhood of infinity contains necklaces of periodic cells. These necklaces are increasing tight. This geometric result yields that even though T acts on an unbounded set, the map is conservative that is Lebesgue almost all points return to their neighborhoo ds. Finally, in case the angle of rotation alpha is rational all T-orbits are bounded.

The Ten Martini Problem

Artur Avila
Jussieu

The spectrum of the almost Mathieu operator is the bifurcation locus for a family of quasiperiodic cocycles. An old question (often dated back to 1964) that became knows as the Ten Martini Problem, asks whether the spectrum is always a Cantor set, that is, in dynamical terms, whether uniformly hyperbolic cocycles are dense in the family. We will discuss the full solution of the problem, joint with Svetlana Jitomirskaya, which involves a careful analysis of the region of transition from Diophantine to Liouville behavior.

Singular Hyperbolicity For Transitive Attractors Of C2-Flows

Aubin Arroyo†
UNAM

In the context of Cr-flows on 3manifolds (r > 1), the notion of singular hyperbolicity, inspired on the Lorenz Attractor, is the right generalization of hyperbolicity (in the sense of Smale) for C1-robustly transitive sets with singularities. In this talk we estabish conditions under which a transitive attractor with singularities of a C2-flow on a 3-manifold is singular hyperbolic.
One of these conditions is on the set of equilibrium points of _; named S(_), and is a natural generalization of the notion of Lorenz-like singularity, for attractors with several equilibrium points. These conditions include the classical relation on eigenvalues of each singular point: _ss < _s < 0 < -_s < _u and how they are involved in the dynamics:
• Any singular point lay on the boundary of the attractor; i.e Wss(_) \ _ = {_},
for any _ 2 S(_). Wss(_) denotes the stable manifold of _, associated to the strong-stable eigenvalue.
• Both unstable separatrices of each singular point accumulate on S(_).
On the other hand, we use a dominated splitting for the linear Poincar´e flow with a strong-contracting one dimensional direction. This setting is the natural context dealing with the following conjecture: Any C1-flow is approximated by another which exhibits a homoclinic tangency or by one which is singular hyperbolic. More precisely, we prove the following theorem:
Theorem: Let _ be a transitive attractor of a C2-flow with singularities such that: the linear Poincar´e flow on the set of regular points has a dominated splitting, with contracting direction; the set of singular points is Lorenz-like; and all periodic orbits are hyperbolic, then _ is singular hyperbolic.

C^1-stable intersections of regular Cantor sets do not exist

Carlos Gustavo
IMPA

We will prove that, given two C^1-regular Cantor sets K and K', it is possible to find regular Cantor sets arbitrarily close in the C^1 topology to K and K´ which are disjoint. We conclude that generic pairs (K,K') of regular Cantor sets in the C^1 topology are such that the arithmetic difference K-K' (which is the set of the real numbers t such that K intersects K'+t) has empty interior, i.e., is a Cantor set.

Genericity of the centralizer of C1-generic diffeomorphisms

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Christian Bonatti
Dijon

Consider a transitive Anosov vectorfield X on a 3 manifold.In 1983 Fried proved that X admits (infinitely many) Birkhoff sections, that is embedded suface with boundary whose interior is transverse to the flow and the boundary consists in finietly many periodic orbits. In a join work wirth N. Guelman we associate an Axiom A+ strong tranversality diffeomorphism f_S to any such Birkhoff section S, wich is a C0-small perturbation of the time one map X_1 along the orbits of X. Futhermore, the non-wandering set of F_S consists in exactly one hyperbolic attractor and one hyperbolic repellor

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Twisted Cohomological Equation And Renormalization

Daniel Smania
(Icmc-Usp)

Let f : I ! I be the analytic unimodal map on the interval I that is the unique fixed point of the Feigenbaum renormalization operator R and v : I ! R be an analytic vector field. We study the existence and regularity of the solution _ for the twisted cohomological equation
v(x) = Df(x) _(x) - _(f(x)) on the closure of the orbit of the critical point P(f) (that is a Cantor set). Let DfR be the derivative of the renormalization operator on its fixed point f and define
_ := lim sup n |DfRn · v|1/n. We show that if _ < 1 then the solution _ is Cr(_) on P(f), with lim_!0 r(_) = 1.
We will try to give an exposition motivating the problem (and its solution) for non-specialists in the audience.

A Full Family Of Multimodal Maps On The Circle

E. De Faria, W. De Melo, P.A.S. Salomão And E. Vargas

We exhibit a family of 2m-modal maps of the circle which has the property that any continuous 2m-modal map of the circle is semi-conjugate to one map of this family. This semi-conjugacy may fail to be a conjugacy only on sets where the dynamics is well understood.

The holonomic model and the study of sub-actions

Eduardo Garibaldi
(Instituto de Matem´atica - UFRGS)

We propose a new model of ergodic optimization for expanding dynamical systems: the holonomic setting. In fact, we introduce an extension of the standard model used in this theory. The formulation we consider here is quite natural if one wants a meaning for possible variations of a real trajectory under the forward shift. In another contexts
(for twist maps, for instance), this property appears in a crucial way. version of the Aubry-Mather theory for symbolic dynamics is introduced. We are mainly interested here in problems related to the properties of maximizing probabilities for the two-sided shift. Under the transitive hypothesis, we show the existence of sub-actions for Holder potentials also in the holonomic setting. A representation formula for calibrated sub-actions is presented, which drives us naturally to a classification theorem for these sub-actions. We investigate then properties of the support of maximizing probabilities. Finally, we prove that the set of Holder separating sub-actions is a residual subset of the Holder sub-actions.

On Attractors And Topological Consequences

Enoch Apaza

In this work we prove that *every* closed *n*-manifold, *n* ¸ 3, sup- ports an Axiom A vector ¯eld and a di®eomorphism of *Cr*- class, *r* ¸ 1, without sinks or sources (i.e., trivial attractors or repellers). We also prove that in the *C*1-topology, there is an open set of Axiom A vector ¯eld and a di®eomorphism without sinks and sources. We also get a condition for an Axiom A vector ¯eld in *S*3 to exhibit a sink or a source. The restriction to *S*3 is justi¯ed by the following topological result: If *M* is a closed 3-manifold such that every embedded torus bounds a solid torus, then *M* is homeomorphic to *S*3. This result is *the converse of the Solid Torus Theorem*, which we will prove in this work as a particular case of a more general result. Moreover we prove that if *U* is a basin of a non trivial singular-hiperbolic attractor ¤, then *H*1(*U*) is in¯nite and the periodic orbits of ¤ represents a element of in¯nite order in ¼1(*U* ¡ *K*), where *K* is the union of strong stable manifolds of each singularity of ¤.

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C^2-structural stability vs C^1-$structural stability in surfaces with boundary.

Enrique Pujals
IMPA

Following the thesis of W. de Melo (structural stability for surfaces) and the thesis of his first student, M.J. Pacifico (structural stability for vector fields in manifods with boundary), we will show examples of diffeomorphism which are C^2-$structural stable ($C^2$-$robust transitive) and they are not C^1-$structural stable ($C^1$-$robust transitive).

Prime ends and homoclinic orbits for billiards, geodesic and contact flows.

Fernando Oliveira
Departamento de Matematica
UFMG

The theory of prime ends can be used to prove many interesting results about the dynamics of area preserving maps, including the existence of homoclinic orbits. In this talk we will show how the classical hypothesis that periodic points be Moser stable can be relaxed to the simple requirement that they be just elliptic. This simplifies and enlarges the range of applications, which include systems like billiards, geodesic and contact flows.

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Periodic points in homoclinic classes

Flavio Abdenur
IMPA

We study the properties of the set of periodic orbits in homoclinic classes H of C^1-generic diffeomorphisms. Among the properties studied are the indices, Lyapunov exponents, and transition properties of the set of periodic orbits in H.

Hilbert's 16th problem for classical Liénard equations.

Freddy Dumortier
Limburgs University

Abstract: The talk deals with the question on whether for classical Liénard equations of a given degree there exists a uniform upper bound on the number of limit cycles. We present some recent results towards an affirmative answer. We also present some results about a similar question concerning critical periods.

Transporte Caótico EM

Iberê L. Caldas
Instituto de Física, Universidade de São Paulo

Inicialmente, apresentamos alguns mapas que usamos para investigar as propriedades, dinâmicas e estatísticas, associadas ao caos lagrangiano das linhas de um campo magnético clássico descrito por um sistema hamiltoniano. Com esses mapas descrevemos plasmas com linhas de campo caóticas. Destacamos os mapas com frequências angulares que não variam monotônicamente no espaço de fase (*non twist maps*). A seguir, usamos esses mapas para mostrar como as reconexões e bifurcações, das cadeias de ilhas criadas por ressonâncias, inflenciam o transporte anômalo observado (típico de sistemas caóticos). Calculamos, também, as variedades dos pontos fixos desses mapas e como elas determinam o transporte anômalo observado.

On t-conformal measures and Hausdor_ dimension for a family of non-uniformly hyperbolic horseshoes

Renaud Leplaideur and Isabel Rios

We consider horseshoes with homoclinic tangencies inside the limit set. For a class of such maps, we prove the existence of a unique equilibrium state μt, associated to the (non-continuous) potential -t log Ju. We also prove that the Hausdor_ dimension of the limit set is the unique number t0 such that the pressure of μt0 is zero. To deal with the discontinuity of the jacobian, we introduce a countable Markov partition adapted to the dynamics, and work with the first return map to a rectangle of it.

Maps without absolutely continuous invariant measures

Jairo Bochi
UFRGS (Porto Alegre)

I will present two joint results with Artur Avila:

1. A generic C^1 map of from a compact manifold to itself has no ACIP (absolutely continuous (w.r.t Lebesgue measure) invariant probability measure).

2. A generic C^1 expanding map of the circle has no ACσ (absolutely continuous invariant σ-finite measure). Possible extensions will be discussed.

Partial Hyperbolicity And Ergodicity In Dimension Three.

M.A. Rodriguez Hertz

In [HHU] we proved the Pugh-Shub conjecture for conservative partially hyperbolic di_eomorphisms with one dimensional center. That is, stably ergodic di_eomorphisms are dense among the conservative partially hyperbolic ones. Can we describe this abundance of ergodicity more accurately? More precisely:
Problem 1. Which 3-dimensional manifolds support a non-ergodic partially hyperbolic di_eomorphism? We conjecture that the answer to this question is that the only (orientable) such manifolds are the mapping tori (manifold supporting the suspension) of di_eomorphisms commuting with an Anosov one, namely, mapping torus of Anosov di_eomorphism, T3, and the mapping torus of -id where id is the identity map of T2.
If this conjecture is true, then the fact of being partially hyperbolic will automatically imply ergodicity in many manifolds. We prove this for a family of manifolds: Theorem 1. Let f : N ! N be a conservative partially hyperbolic C2 di_eomorphism where N 6= T3 is a compact 3-dimensional nilmanifold. Then, f is ergodic. Recall that a 3-dimensional nilmanifold is a quotient of the Heisenberg group (upper triangular 3 × 3-matrices with ones in the diagonal) by a discrete subgroup. Sacksteder [Sa] proved that certain a_ne di_eomorphisms of nilmanifolds are ergodic. These examples are partially hyperbolic.
Some of our results apply to other manifolds and we obtain, for instance, that every conservative partially hyperbolic di_eomorphism of S3 is ergodic but is this probably a theorem about the empty set. This is a joint work with Federico Rodriguez Hertz and Ra´ul Ures.

Kleinian groups acting on CP(2)

Jose Seade
Curnavaca

Kleinian groups play a key role in classical one-dimensional holomorphic dynamics. In this talk we shall discuss briefly their generalizations to higher dimensions, and then concentrate in the case n = 2, explaining recent work on this subject.

Entropy expansiveness and Domination

Jose Vieitez.
Universidad de la Republica

Let $f: M \to M$ be a C^r-diffeomorphism, $r\geq 1$, defined on a compact boundary-less surface M. We prove that if K is a compact f-invariant subset of M with a dominated splitting then f/K is h-expansive (entropy expansive). Conversely, if there exists a C^1 neighborhood $\mathcal{U}$ of f and a homoclinic class $H(p)$ of a f- hyperbolic periodic point p, such that for every $g\in {\cal U}$ the analytic continuation $H(p_g)$ of $H(p)$ is h-expansive then there is a dominated splitting for $H(p)$.

Algebraic foliations with transverse invariant measures

Julio Rebelo
PUC - Rio

We consider holomorphic folaitions on a complex compact surface M. Very little is known about the Ergodic theory of these foliations whereas they have a natural dynamical interest in that they nothing but ODEs defined over C. One of the first important step towards de development of their Ergodic Theory is to understand those foliations admitting transverse invariant measures. The purpose of my talk will be to present a detailed description of these foliations along with the structure of the corresponding measures. Also we shall indicate some applications of this result to questions regarding the hyperbolicity of algebraic surfaces.

Konstantin Khanin
Toronto

We shall give a complete proof of the following result. Let circle diffeomorphism be of the class C^{2+\alpha} and its rotation number be Diophantine with exponent \delta. Then a conjugacy with a rigid rotation is C^{1+\alpha - \delta}-smooth provided that \alpha > \delta.

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Destroying horseshoes: generating bifurcations inside homoclinic classes

Lorenzo Diaz
PUC – Rio

We discuss the destruction of horseshoes by partially hyperbolic bifurcations. These bifurcations occur inside a horseshoe (a hyperbolic homoclinic class of a saddle) and do not involve critical behaviour (homoclinic tangencies).

We introduce a model bifurcation for three dimensional diffeomorphisms we call generating one.
This bifurcation dysplays the following dynamical features:
(i) at the bifurcation: the dynamics of the homoclinic class is richer than the one before, (explosion of the dynamics) and there is the absortion of a homoclinic class of a saddle of unstable index two by the homoclinic class of saddle of unstable index one (this provides an example of a homoclinic class properly contained in other class);
(ii) after the bifurcation: there is the phenomenon of intermingled homoclinic classes associated to saddles of different indices.

Families of Minimal sets in Reversible Systems

Marco Antonio Teixeira
(Unicamp).

We study the dynamics near an equilibrium *p*0 of a *'¡*reversible v.f. in *R*2*n* with reversing symmetry *'* satisfying *'*2 = *I* and *dimFix*(*'*) = *n:*
One of characteristics properties of reversible systems is that generically periodic orbits or invariant tori or minimal sets of such systems typically appear in one-parameter families. Questions can be formulated, such as: (i) how do branches of such minimal sets terminate or originate?; (ii) can one branch of minimal sets bifurcate from another such branch?; (iii) how persistent is such branching process when the original system is slightly perturbed? Our main concern is to ¯nd conditions for the existence of one-parameter families of minimal sets (periodic orbits and homoclinic orbits) going through an equilibrium point.

Renormalization of Henon maps: Topology

Marco Martens
Gronigen

Topological aspects of infinitely renormalizable Henon maps are discussed. The attractor of such systems is a Cantor set with the dynamics of the adding machine. The topological differences these maps might have appear in the network of stable and unstable manifolds of the periodic points. A number of topological invariants related to the laminar aspects of this network are introduced. These invariants are also related to the non-rigidity of the Cantor attractor. Finally, the consequences for the bifurcation pattern are discussed.

Flows on boundary manifolds

Maria José Pacífico
UFRJ

I will talk about stability of vector fields on manifolds with boundary that are tangent to the boundary, subject of my PHD thesis, oriented by de Melo.

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Robust Ergodic Properties in Partially Hyperbolic Dynamics

Martin Andersson
IMPA

We introduce a multi-dimensional analogue to Tsujii's admissible mea- sures, replacing Gibbs-u states in partially hyperbolic dynamics. These are then used to study systems whose central direction is mostly contract- ing, earlier considered by Bonatti and Viana. Their result on existence and _niteness of physical measures are extended in two directions: On the one hand, their result extends to non-invertible maps. On the other, we prove robustness of the mostly contracting property, and statistical sta- bility of the physical measures for gegeric perturbations. We also discuss an application to the theory of stable ergodicity.

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Cylinder renormalization of critical circle maps and Siegel disks

Michael Yampolsky

I will briefly review the cylinder renormalization of critical circle maps, which was the main tool in the proof of hyperbolicity of the renormalization horseshoe. I will then discuss the application of this technique to analytic maps with Siegel disks, and present several new results.

Equilibrium States for Interval Maps

Mike Todd
UNIS

Given a C^2 piecewise monotone interval map (I,f) and some potential functions $\phi:I \to \R$, we show existence and uniqueness of equilibrium states with respect to this potential among the class of all ergodic invariant measures with positive Lyapunov exponent. In particular, we prove the existence and uniqueness of equilibrium states for the potential $\phi_t:x\mapsto -t\log|Df(x)|$ for t in a one-sided neighbourhood of 1 whenever f satisfies a polynomial growth condition on the derivative along critical orbits. We also can consider another class of potentials $\phi:I \to \R$ such that $\sup\phi-\inf \phi$ is less than the topological entropy of the system.

The general approach here is to find suitable inducing schemes for our map and then to get an equilibrium state using the theory of Sarig. Then we must work to show that we can project this measure to the original system and obtain an equilibrium state there. This type of approach was used by Pesin and Senti for certain unimodal maps satisfying a type of exponential growth of the derivative along the critical orbits condition. An important issue there is to show that this measure is unique for the system (I,f), independently of the inducing scheme which the measure comes from. We solve this problem by using so-called Hofbauer towers.

Recent developments in the MLC

Misha Lyubich

We prove local connectivity of the Mandelbrot set for a certain class of infinitely renormalizable parameter values. It is a joint work with Jeremy Kahn.

Conditional variational principle and measure of full dimension

Nuno Luzia
IMPA

We prove the existence of an ergodic invariant measure with full dimension for a class of repellers that are invariant under transformations of the type $f(x,y)=(a(x,y), b(y))$ and which are C^2-perturbations of general Sierpinski carpets. In order to do so we establish a variational principle for the topological pressure of certain noncompact sets.

The Dynamics of Pinched Planar Unfoldings of Interval Maps.

Sheldon Newhouse
Michigan State University

Thiis is joint work with M. Jakobson. We study so called power-methods to prove the existence of ergodic attractors in parametrized families of planar maps of the form $(x,y) -> (A(t,x) - B(t,x)y,x)$ where t is an external parameter. Among other things we obtain dissipative maps with SRB measures whose supports have large Hausdorff dimension.

Affine Actions of a free semigroup on the real line.

Samuel Senti
(UFRJ)

We consider actions of the free semigroup with two generators on the real line, where the generators act as affine maps, one contracting and one expanding, with distinct fixed points. Then every orbit is dense in a half-line, which leads to the question whether it is, in some sense, uniformly distributed. We present answers to this question for various interpretations of the phrase "uniformly distributed". This is a work in collaboration with V. Bergelson and M. Misiurewicz.

New examples of 4-interval exchange transformations

Sebastien Ferenczi
Institut de Mathématiques de Luminy

Using a new induction process, we build families of nontrivial 4-interval exchanges with new properties: in particular, some of them have measurable eigenvalues but are topologically weakly mixing, and some of them are non uniquely ergodic, with eignvalues for one extremal invariant measure and weak mixing for the other

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Instability Region for Billiards on Ovals

M.J. Dias Carneiro, S. Oliffson Kamphorst And S. Pinto De Carvalho
UFMG

The billiard problem consists in the free motion of a point particle in the plane region enclosed by an oval, being reflected elastically at the impacts with the boundary. Since the particle moves with constant velocity inside the region, the motion is completely determined by the point of reflection and the direction of movement immediately after each reflection. This billiard model defines a conservative two dimensional discrete dynamical system on an annulus. If the oval is su_ciently di_erentiable then there are invariant non trivial curves near the boundary of the annulus. The region between two consecutive invariant curves was called instability region by Birkho_. In this work we investigate the dynamics on the instability region that contains the 2-periodic orbits.

"Anisotropic spaces of distributions, transfer operators, and zeta functions for hyperbolic dynamics"

Viviane Baladi (IMPA) M. Tsujii **(**Hokkaido University)

For many years, transfer operators were associated to hyperbolic dynamics by first considering a "quotient" expanding system. Due to limited smoothness of the dynamical foliations this does not permit exploiting fully the regularity of the map. We introduce anisotropic spaces of distributions, by using cones in Fourier space. Last year, we obtained good bounds on the essential spectral radius of the transfer operator on such spaces. More recently, we constructed a different version of the spaces, which gives a better bound (this new bound coincides with Kitaev's bound for the radius of convergence of the dynamical determinant), and allows us to obtain a spectral interpretation of the zeroes of the dynamical determinants. We also give a "variational" expression for our new upper bound.

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Large Deviations For Semiflows Over A Non-Uniformly Expanding Base

Vitor Araujo

We obtain a large deviation bound for continuous observables on suspension semiows over a non-uniformly expanding base transformation with non-at singularities or criticalities, where the roof function de_ning the suspension behaves like the logarithm of the distance to the singular/critical set of the base map. That is, given a continuous function we consider its space average with respect to a physical measure and compare this with the time averages along orbits of the semiow, showing that the Lebesgue measure of the set of points whose time averages stay away from the space average tends to zero exponentially fast as time goes to in_nity.
Suspension semiows model the dynamics of ows admitting cross-sections, where the dynamics of the base is given by the Poincar_e return map and the roof function is the return time to the cross-section. The results are thus applicable in particular to semiows modeling the geometric Lorenz attractors and the Lorenz ow, as well as other semiows with multidimensional non-uniformly expanding base with non-at singularities and/or criticalities under slow recurrence rate conditions to this singular/critical set. We are also able to obtain exponentially fast escape rates from subs ets without full measure for these classes of suspension semiows.

Julia sets of positive measure for quadratic polynomials(according to X.Buff et A.Cheritat)

Jean-Christophe Yoccoz
(College de France)

It has been for almost a century an outstanding qu estion in holomorphic dynamics whether the Julia set of a rational map either is the full Riemann sphere or has Lebesgue measure zero.Xavier Buff and Arnaud Cheritat,building over former work of Cheritat and following a program of Adrien Douady, have recently answered negatively this question by showing that some quadratic polynomials with a non linearizable indifferent fixed point have a Julia set of positive measure.We will present some aspects of their construction, which relies in particular on a recent renormalization theorem of Inoue and Shishikura.

Decay of correlations and return times for invertible maps

J. Alves
(Porto)

We consider diffeomorphisms for which there is a set with a hyperbolic structure in some region of the phase space. We show that the decay of correlations of the SRB measure of the diffeomorphism is related to the tail of return times to the set with the hyperbolic structure, at least for some specific rates. This generalizes previous results by Young. (Joint with Vilton Pinheiro).

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Curvature Perturbations and Vortex Stability.

Stefanella Boatto
(UFF)

Vortex modeling has a long history. Descartes (1644) used it as a model for the solar systems. J.J. Thomson (1883) used it as a model for the atom. We consider point-vortex systems, which can be regarded as "discrete" solutions of the Euler equation. Their dynamics is described by a Hamiltonian system of equations. In particular we are interested in vortex dynamics on simply connected surfaces of constant curvature K -- i.e. a plane, spheres and hyperbolic surfaces. It is known that polygonal configurations of N point-vortices are relative equilibria of the system. We study the stability of such polygonal configurations, and, more specifically, how stability depends upon the number of vortices N and the curvature K of the surface. To address such a question we have to formulate the problem in a unified geometrical way. The fact that the surfaces of interest can be viewed as K\"alher manifolds greatly simplify our task. Nonlinear stability is then studied by making use of the Dirichlet Criterion. Stability ranges are the K- intervals for which the Hessian of the Hamiltonian - evaluated at the equilibrium configuration -- is positive or negative definite.