Schedule

All talks are held at the Brin Center on the 4th floor of the CSIC Building.

May 30

1:00–2:50	Victoria Sadovskaya	*Cocycles and local rigidity for partially hyperbolic systems-1*
2:50–3:20	COFFEE	
3:20–5:10	Aaron Brown	*Hyperbolicity and smooth ergodic theory in rigidity-1*

May 31

8:30–9:00	BREAKFAST	
9:00–10:50	Kurt Vinhage	*Rigidity of higher rank group actions in continuous time-1*
10:50–11:20	COFFEE	
11:20–1:10	Aaron Brown	*Hyperbolicity and smooth ergodic theory in rigidity-2*
1:10–2:45	LUNCH	
2:45–4:35	Victoria Sadovskaya	*Cocycles and local rigidity for partially hyperbolic systems-2*
4:50–5:40	Alexey Okunev	*Averaging & passage through resonances in two-frequency systems near separatrices*

June 1

8:30–9:00	BREAKFAST	
9:00–10:50	Aaron Brown	*Hyperbolicity and smooth ergodic theory in rigidity-3*
10:50–11:20	COFFEE	
11:20–11:50	Jason Day	*Equilibrium measures for shift spaces via dimension theory*
11:35–12:05	James Marshall	*A positive proportion Livshits theorem*
12:10–12:40	Bastian Nunez	*Inverse limit spaces as solenoidal manifolds*
12:40–2:30	LUNCH	
2:30–4:20	Carlangelo Liverani	*Statistical properties of hyperbolic systems-1*
4:35–5:25	Homin Lee	*Smooth actions on manifolds by higher rank lattices*

June 2

8:30–9:00	BREAKFAST	
9:00–10:50	Kurt Vinhage	*Rigidity of higher rank group actions in continuous time-2*
10:50–11:20	COFFEE	
11:20–1:10	Victoria Sadovskaya	*Cocycles and local rigidity for partially hyperbolic systems-3*
1:10–3:00	LUNCH ON YOUR OWN	
3:00–4:50	Carlangelo Liverani	*Statistical properties of hyperbolic systems-2*

June 4

11:00-4:00		picnic at Great Falls, VA (weather permitting)

June 5

8:30–9:00	BREAKFAST	
9:00–10:50	Carlangelo Liverani	*Statistical properties of hyperbolic systems-3*
10:50–11:20	COFFEE	
11:20–1:10	Kurt Vinhage	*Rigidity of higher rank group actions in continuous time-3*
1:10–2:45	LUNCH	
2:45–4:35	Mark Demers	*Thermodynamic formalism for finite horizon Sinai billiards-1*
4:50–5:50	Yeor Hafouta	*Sequential Ruelle–Perron-Frobenius Theorem & applications*

June 6

8:30–9:00	BREAKFAST	
9:00–10:50	Adam Kanigowski	*Bernoulli properties of smooth systems-1*
10:50–11:20	COFFEE	
11:20–1:10	David Burguet	*An entropic approach to constructing SRB measures-1*
1:10–3:00	LUNCH ON YOUR OWN	
3:00–4:50	Mark Demers	*Thermodynamic formalism for finite horizon Sinai billiards-2*

June 7

8:30–9:00	BREAKFAST	
9:00–10:50	Adam Kanigowski	*Bernoulli properties of smooth systems-2*
10:50–11:20	COFFEE	
11:20–1:10	Davi Obata	*Rigidity for u-Gibbs measures-1*
1:10–2:45	LUNCH	
2:45–4:35	David Burguet	*An entropic approach to constructing SRB measures-2*
4:50–5:40	Jaime Paradela	*Hyperbolic dynamics and the 3 Body Problem*

June 8

8:30–9:00	BREAKFAST	
9:00–10:50	Mark Demers	*Thermodynamic formalism for finite horizon Sinai billiards-3*
10:50–11:20	COFFEE	
11:20–1:10	Davi Obata	*Rigidity for u-Gibbs measures-2*
1:10–3:00	LUNCH ON YOUR OWN	
3:00–4:50	David Burguet	*An entropic approach to constructing SRB measures-3*

June 9

8:30–9:00	BREAKFAST	
9:00–10:50	Davi Obata	*Rigidity for u-Gibbs measures-3*
10:50–11:20	COFFEE	
11:20–1:10	Adam Kanigowski	*Bernoulli properties of smooth systems-3*
1:10–2:00	Box lunch	

Abstracts.

Courses.

Aaron Brown *Hyperbolicity and smooth ergodic theory in rigidity.*

I introduce important results in smooth ergodic theory/non-uniform hyperbolicity and explain how to use them in various rigidity results.

David Burguet *An entropic approach to constructing SRB measures*

Mark Demers *Thermodynamic formalism for finite horizon Sinai billiard maps and flows.*

My minicourse will be about applications of functional analysis techniques to the study of equilibrium states for dispersing billiard maps and flows.

Adam Kanigowski *Bernoulli properties of smooth systems*

The course will be denoted to methods for proving or disproving Bernoulli properties for smooth systems including skew products and partially hyperbolic systems.

Carlangelo Liverani *Techniques to investigate statistical properties of hyperbolic systems*

I present three ideas (transfer operators, standard pairs, Hilbert metrics) relevant to studying the asymptotic properties of dynamical systems.

The emphasis will be on their application and how they can complement each other, rather than on technical details. To this end, I will discuss three related problems relevant to the study of Dynamical Systems.

More precisely, the lectures will focus on the following:

Lecture 1: Limit theorems (CLT and its corrections for ergodic averages, Transfer Operators).

Lecture 2: Deterministic walks in random environment (loss of memory, Hilbert Metrics).

Lecture 3: Fast-slow systems (asymptotic properties, Standard Pairs).

Reference: Demers, Mark F.; Kiamari, Niloofar; Liverani, Carlangelo Transfer operators in hyperbolic dynamics–an introduction. 33 o Coloquio Brasileiro de Matematica. IMPA, Rio de Janeiro (2021) 238 pp.

Davi Obata *Rigidity for u-Gibbs measures*

Victoria Sadovskaya *Cocycles and local rigidity for partially hyperbolic systems*

Kurt Vinhage *Rigidity of higher rank group actions in continuous time.*

Time 1 maps of Anosov flows are an abundant source of examples of partially hyperbolic dynamical systems. We will explore natural generalizations which come from considering actions of Lie groups, requiring that elements of the action act normally hyperbolically with respect to the orbit foliation. Such actions are expected to have strong rigidity properties. We will review recent progress which has revealed many new examples, features and methods when classifying such actions. Joint work with D. Damjanovic, R. Spatzier and D. Xu.

Postdocs.

Yeor Hafouta *Sequential complex Ruelle–Perron-Frobenius Theorem & applications*
Sequential complex Ruelle–Perron-Frobenius Theorem replaces the spectral theorem for autonomous systems. In this talk I will describe several applications of this result to limit theorems for expanding maps.

Homin Lee *Smooth actions on manifolds by higher rank lattices*

Alexey Okunev *Averaging and passage through resonances in two-frequency systems near separatrices*
The averaging method is a powerful tool used in perturbation theory. There are two major obstacles to applying the averaging method, resonances and separatrices. We study the averaging method for the simplest situation where both these obstacles are present at the same time, time-periodic perturbations of one-frequency Hamiltonian systems with separatrices. The Hamiltonian depends on a parameter that slowly changes for the perturbed system (so slow-fast Hamiltonian systems with two and a half degrees of freedom are included in our class). We obtain realistic estimates on the accuracy of the averaging method for most initial data. The main novelty of our setting is that so called strong resonances (i.e., resonances such that capture into resonance is possible) accumulate on the separatrices, so there are infinitely many strong resonances.

Jaime Paradela *Hyperbolic dynamics and oscillatory motions in the 3 Body Problem*
Consider the planar 3 Body Problem with masses $m_0, m_1, m_2 > 0$. We address two fundamental questions: the existence of oscillatory motions and chaotic hyperbolic sets.

In 1922, Chazy classified all the possible final motions of the three bodies, that is, the behaviors the bodies may have when time tends to infinity. One of the possible behaviors are oscillatory motions: solutions of the 3 Body Problem such that the positions of the bodies q_0, q_1, q_2 satisfy

$$\liminf_{t\to\pm\infty} \sup_{i,j=0,1,2,i\neq j} \|q_i - q_j\| < +\infty \quad \text{and} \quad \limsup_{t\to\pm\infty} \sup_{i,j=0,1,2,i\neq j} \|q_i - q_j\| = +\infty.$$

Assume that all three masses $m_0, m_1, m_2 > 0$ are not equal. Then, we prove that such motions exist. We also prove that one can construct solutions of the 3 Body Problem whose forward and backward final motions are of different type.

This result relies on constructing invariant sets whose dynamics is conjugated to the (infinite symbols) Bernouilli shift. These sets are hyperbolic for the symplectically reduced planar 3 body problem. As a consequence, we obtain the existence of chaotic motions, an infinite number of periodic orbits and positive topological entropy for the 3 Body Problem. This is joint work with Marcel Guardia, Pau Martin and Tere Seara.

Students.

Jason Day *Equilibrium measures for shift spaces via dimension theory*

Using a construction analogous to Hausdorff measures, we produce leaf measures for two-sided shift spaces. Given certain counting estimates, these measure gives rise to an equilibrium state. We give explicit descriptions of these leaf measures using topological pressure as a dimensional quantity. We also show how this approach can be used to construct equilibrium states for shifts beyond subshifts of finite type. This is joint work with Vaughn Climenhaga.

James Marshall *A positive proportion Livshits theorem*

Given a transitive Anosov system on a closed connected Riemannian manifold, the Livshits theorem states that a Holder function is a coboundary if all of its periods vanish. In this talk, I will explain how a finer statistical understanding of the distribution of these periods can be used to show that a function is a coboundary if all of its periods vanish on a set of positive asymptotic upper density. I will also discuss applications of this to various rigidity results. This is joint work with Caleb Dilsavor.

Bastian Nunez Inverse limit spaces as solenoidal manifolds

The inverse limit (or natural extension) of a map is a useful tool in the study of non-invertible dynamical systems. In this short talk we look at this construction from a geometric point of view: if the system is given by a self-covering map of a manifold, the corresponding inverse limit space is a solenoidal manifold, and invariant measures can be lifted canonically to this new space. We can also get a nice description of these lifts in terms of their disintegration along the partition into fibers.

This idea can be exploited to show continuity of Lyapunov exponents in certain contexts, and I'll briefly mention two recent results in this vein: Andersson, Carrasco and Saghin (2022, preprint) prove C^1 continuity of the exponents in a family of conservative maps of the two-torus, while Viana and Yang (2019) use it to show C^0 continuity of exponents in certain families of SL(2)-cocycles. What both approaches have in common is the use of a larger geometric structure describing the inverse limit space (as a foliated space and as an attractor in a larger-dimensional manifold, respectively), along with some results about projectivized cocycles, to prove continuity.

(Partially supported by scholarship ANID-Subdireccin de Capital Humano/Magster Nacional/2022 - 22221279, and PUCV internal project 124.791/2023.)