

Jairo Bochi

Curriculum Vitae

Contact Information

Facultad de Matemáticas
Pontificia Universidad Católica de Chile (PUC-Chile)
Avenida Vicuña Mackenna 4860
Santiago Chile
jairo.bochi@gmail.com

Research Interests

Dynamical systems (multiplicative ergodic theory, non-uniform hyperbolicity, generic dynamics, invariant measures, relations with Control Theory, relations with Geometry), Mathematics in general.

Academic History

- 2001 *Doctor in Mathematics*, IMPA, Rio de Janeiro, Brazil.
Thesis title: *Zero Lyapunov exponents for conservative systems*
Thesis advisor: Marcelo Viana.
- 1997 *M.S. in Mathematics*, UFRGS, Porto Alegre, Brazil.
Advisor: Artur O. Lopes.
- 1996 *B.S. in Mathematics*, UFRGS, Porto Alegre, Brazil.

Employment Record

- 2014– Associate Professor, PUC-Chile.
- 2011–2013 Associate Professor, PUC-Rio.
- 2008–2011 Assistant Professor, PUC-Rio.
- 2005–2007 Assistant Professor, UFRGS, Porto Alegre.
- 2002–2004 Junior Researcher, IMPA, Rio de Janeiro.

Research Grants

- 2014– *Fondecyt*, Conicyt, Chile.
- 2013 *Produtividade em Pesquisa*, level 1D, CNPq, Brazil.
- 2012–2013 *Jovem Cientista da Nosso Estado*, FAPERJ, Brazil.
- 2008–2011 *Incentivo à Produtividade em Pesquisa para Novos Professores*, PUC–Rio, Brazil.
- 2007–2012 *Produtividade em Pesquisa*, level 2, CNPq, Brazil.
- 2001–2013 Member of several research teams supported by CNPq, CAPES, FAPERJ.

Honors and Awards

- 2007–2011 Affiliate Member of the Brazilian Academy of Sciences.

Lectures on International Congresses

- 2014 Ergodic Theory Workshop. University of North Carolina at Chapel Hill, USA.
- 2013 Ergodic Optimization and Related Fields. USP, São Paulo, Brazil.
- 2013 Mathematical Congress of the Americas. Guanajuato, Mexico.

- 2013 Non-positive curvature, isometric actions and dynamics of cocycles. Cajón de Maipo, Chile.
- 2012 II Brazilian School on Dynamical Systems. University of São Paulo, São Carlos, Brazil.
- 2012 Montevideo Dynamical Systems Conference. Universidad de la República, Montevideo, Uruguay.
- 2011 LX Dynamical Systems Colloquium. Celebrating the 60th anniversary of Rodrigo Bamón. Pucón, Chile.
- 2011 Workshop on Symplectic Dynamics. Institute for Advanced Study, Princeton, USA.
- 2011 International Conference on Dynamics Beyond Uniform Hyperbolicity. CIRM, Marseille, France.
- 2011 International Conference on Topological Methods on Dynamical Systems. UNICAMP, Campinas, Brazil.
- 2010 Workshop on Ergodic Theory. Institute Mittag-Leffler, Djursholm, Sweden.
- 2009 III CLAM Congreso Latino Americano de Matemáticos, Santiago, Chile.
- 2008 School and Workshop on Dynamics. Universidade de la República, Montevideo, Uruguay.
- 2006 International Symposium on Dynamical Systems, UFBA, Salvador, Brazil.
- 2006 Young Researchers Symposium, IMPA, Rio de Janeiro, Brazil.
- 2006 AMS Spring Meeting of the Western Section. San Francisco State University, USA.
- 2005 XIV Escuela Latinoamericana de Matemática. Solís, Uruguay.
- 2005 International Conference on Dynamical Systems. Angra dos Reis, Brazil.
- 2005 Colloquium of Dynamical Systems and Smooth Ergodic Theory. Bordeaux, France.
- 2004 International Conference on Dynamical Systems in Honor of J. Massera. Universidade de la República, Montevideo, Uruguay.
- 2004 Systèmes dynamiques multidimensionnels non-uniformément hyperboliques. CIRM, Luminy, France.
- 2003 Recent Trends in Dynamics III. Universidade do Porto, Portugal.
- 2003 International Workshop on Robustness and Partial Hyperbolicity. Búzios, Brazil.
- 2003 Research Trimester on Dynamical Systems. Scuola Normale Superiore di Pisa, Italy.
- 2001 Recent Trends in Dynamics. Universidade do Porto, Portugal.
- 2001 School and Workshop on Dynamical Systems. ICTP, Trieste, Italy.
- 2001 International Workshop on Dynamical Systems and Geometry in honor of Prof. Michel Herman. IMPA, Rio de Janeiro, Brazil.
- 2000 International Conference on Dynamical Systems. IMPA, Rio de Janeiro, Brazil.

Research Visits

- Aug. 2013 Universidad de Santiago de Chile, by invitation of Andrés Navas, and Pontificia Universidad Católica de Chile, by invitation of Mario Ponce.
- Feb. 2013 Institute of Mathematics, Polish Academy of Sciences (Warsaw), by invitation of Michał Rams.
- Mar. 2011 Universidad de Santiago de Chile, by invitation of Andrés Navas.
- Feb. 2011 Université de Bourgogne (Dijon), by invitation of Christian Bonatti.
- Jan. 2011 Université de Bordeaux, by invitation of Nicolas Gourmelon.

- Feb. 2010 Institute Mittag-Leffler (Djursholm), by invitation of Michael Benedicks.
- Jan.-Feb. 2009 Université de Bourgogne (Dijon), by invitation of Christian Bonatti.
- Jul. 2007 Rice University (Houston), by invitation of David Damanik.
- Jul. 2006 IMPA (Rio de Janeiro), by invitation of Artur Avila.
- Apr. 2006 Caltech (Pasadena), by invitation of Anton Gorodetski.
- Feb. 2006 Collège de France (Paris), by invitation of Jean-Christophe Yoccoz.
- Jun. 2004 Université de Paris 13 – Villetaneuse, by invitation of Bassam Fayad.
- May-Jun. 2003 Université de Paris 13 – Villetaneuse, by invitation of Bassam Fayad.
- Nov. 2002 KTH (Stockholm), by invitation of Michael Benedicks.
- May 2001 Université de Paris 7, by invitation of Håkan Eliasson.

Scientific Production

Published articles:

- Universal regular control for generic semilinear systems. Jointly with N. Gourmelon. Published online in *Mathematics of Control, Signals, and Systems*. doi:10.1007/s00498-014-0126-x
- Generic linear cocycles over a minimal base. *Studia Mathematica*, 218 (2013), no. 2, 167–188.
- Almost reduction and perturbation of matrix cocycles. Jointly with A. Navas. Published online in *Annales de l'Institut Henri Poincaré – Analyse Non linéaire*. doi:10.1016/j.anihpc.2013.08.004
- A geometric path from zero Lyapunov exponents to rotation cocycles. Jointly with A. Navas. Published online in *Ergodic Theory and Dynamical Systems*. doi:10.1017/etds.2013.58
- Robust vanishing of all Lyapunov exponents for iterated function systems. Jointly with C. Bonatti and L.J. Díaz. *Mathematische Zeitschrift*, 176 (2014), 469–503.
- Perturbation of the Lyapunov spectra of periodic orbits. Jointly with C. Bonatti. *Proceedings of the London Mathematical Society*, 105 (2012), no. 1, 1–48.
- Nonuniform hyperbolicity, global dominated splittings and generic properties of volume-preserving diffeomorphisms. Jointly with A. Avila. *Transactions of the American Mathematical Society*, 364 (2012), no. 6, 2883–2907.
- Opening gaps in the spectrum of strictly ergodic Schrödinger operators. Jointly with A. Avila and D. Damanik. *Journal of the European Mathematical Society*, 14 (2012), no. 1, 61–106.
- Uniformly hyperbolic finite-valued $SL(2, R)$ cocycles. Jointly with A. Avila and J.C. Yoccoz. *Commentarii Mathematici Helvetici*, 85, no. 4 (2010), 813–884.
- C^1 -generic symplectic diffeomorphisms: partial hyperbolicity and zero center Lyapunov exponents. *Journal of the Institute of Mathematics of Jussieu*, 9, no. 1 (2010), 49–93.
- Nonuniform center bunching and the genericity of ergodicity among C^1 partially hyperbolic symplectomorphisms. Jointly with A. Avila and A. Wilkinson. *Annales Scientifiques de l'École Normale Supérieure*, 42, n. 6 (2009), 931–979.
- Some characterizations of domination. Jointly with N. Gourmelon. *Mathematische Zeitschrift*, 263, no. 1 (2009), 221–231.

- Cantor spectrum for Schrödinger Operators with potentials arising from generalized skew-shifts. Jointly with A. Avila and D. Damanik. *Duke Mathematical Journal*, 146, no. 2 (2009), 253–280.
- A uniform dichotomy for generic $SL(2, \mathbb{R})$ cocycles over a minimal base. Jointly with A. Avila. *Bulletin de la Société Mathématique de France*, 135 (2007), 407–417.
- Generic expanding maps without absolutely continuous invariant σ -finite measure. Jointly with A. Avila. *Mathematical Research Letters*, 14 (2007), 721–730.
- A generic C^1 map has no absolutely continuous invariant probability measure. Jointly with A. Avila. *Nonlinearity*, 19 (2006), 2717–2725.
- Dichotomies between uniform hyperbolicity and zero Lyapunov exponents for $SL(2, R)$ cocycles. Jointly with B. Fayad. *Bulletin of the Brazilian Mathematical Society*, 37, no. 3 (2006), 307–349.
- A remark on conservative diffeomorphisms. Jointly with B. Fayad and E. Pujals. *Comptes Rendus Acad. Sci. Paris, Ser. I* 342 (2006), 763–766.
- The Lyapunov exponents of generic volume preserving and symplectic maps. Jointly with M. Viana. *Annals of Mathematics*, 161 (2005), No. 3, 1423–1485.
- Lyapunov exponents: How frequently are dynamical systems hyperbolic? Jointly with M. Viana. *Modern dynamical systems and applications*, 271–297, Brin, Hasselblatt, Pesin (eds.) Cambridge Univ. Press, 2004.
- L^p -generic cocycles have one-point Lyapunov spectrum. Jointly with A. Arbieto. *Stochastics and Dynamics*, 3 (2003), 73–81.
- Inequalities for numerical invariants of sets of matrices. *Linear Algebra and its Applications*, 368 (2003), 71–81.
- Pisa Lectures on Lyapunov Exponents. Jointly with M. Viana. *Dynamical Systems – Part II: Topological, Geometrical, and Ergodic Properties of Dynamics*, 23–47. Scuola Normale Superiore, Pisa 2003.
- Robust transitivity and topological mixing for C^1 flows. Jointly with F. Abdenur and A. Avila. *Proceedings of the American Mathematical Society*, 132 (2003), 699–705.
- Uniform (projective) hyperbolicity or no hyperbolicity: a dichotomy for generic conservative maps. Jointly with M. Viana. *Annales de l’Institut Henri Poincaré – Analyse non linéaire*, 19 (2002), 113–123.
- Genericity of zero Lyapunov exponents. *Ergodic Theory and Dynamical Systems*, 22 (2002), 1667–1696.
- A formula with some applications to the theory of Lyapunov exponents. Jointly with A. Avila. *Israel Journal of Mathematics*, 131 (2002), 125–137.

Preprints:

- The entropy of Lyapunov-optimizing measures of some matrix cocycles. Jointly with M. Rams. arXiv:1312.6718 (27 pages).
- Continuity properties of the lower spectral radius. Jointly with I.D. Morris. arXiv:1309.0319 (44 pages).

Citations: Cited 248 times by 109 authors, H number = 9, according to AMS MathSciNet (April 2014).

Teaching Experience

Advanced minicourses:

C¹ perturbation techniques in the neighborhood of periodic orbits, Institute of Mathematics, Polish Academy of Sciences (Będlewo), 2013. 6h course, joint with Christian Bonatti.

Quasi-periodic cocycles with Liouvillean frequencies, Scuola Normale Superiore, Pisa, 2010. One week course, joint with Raphaël Krikorian.

Lyapunov exponents, ICTP, Trieste, 2008. Two week course, joint course with Artur Avila.

Lyapunov exponents for generic volume preserving maps, Morningside Center for Mathematics, Chinese Academy of Sciences, Beijing, 2007. One week course.

Deterministic products of matrices, Scuola Normale Superiore, Pisa, 2002. Joint course with Marcelo Viana.

Graduate Teaching:

Ergodic Theory, PUC-Rio (2012), UFRGS (2006), IMPA (2003, 2002).

Differential Topology, PUC-Rio (2011).

Measure Theory, PUC-Rio (2013, 2011), IMPA (2004).

Analysis in \mathbb{R}^n , PUC-Rio (2010), IMPA (2003).

Dynamical Systems, PUC-Rio (2009, 2008).

General Topology, UFRGS (2006).

Algebraic Topology, UFRGS (2005).

Hyperbolic Dynamics, IMPA (2002).

Undergraduate Teaching:

Discrete Mathematics, PUC-Rio (2013, 2010, 2009).

Introduction to Analysis, PUC-Rio (2013, 2011, 2009), UFES Summer School (2006).

Multivariate Calculus, PUC-Rio (2012).

Linear Algebra, PUC-Rio (2012, 2008), UFRGS (2006).

Introduction to Probability, PUC-Rio (2012, 2010).

Differential Equations, PUC-Rio (2011, 2010), UFRGS (2005).

Univariate Calculus, PUC-Rio (2009), UFRGS (2007).

Lebesgue Integration, UFRGS (2007).

Analytical Geometry, UFRGS (2007, 2006).

Undergraduate Advising: 3 students at PUC-Rio, 1 student at UFRGS.

School-level Teaching:

Leader of the project *Mathematics for Highly Capable Students*, Anne Frank High School, Porto Alegre (2006).

Graduate Students Advising

Former students:

2013–2014 Paulo N. Orenstein. MSc, PUC-Rio. Dissertation: “Optimal transport and the Wasserstein metric”. Co-advised by Carlos Tomei.

2012–2013 Cong Zhou. MSc, PUC-Rio. Dissertation: “Multiplicative ergodic theorem in non-positively curved spaces”.

2009–2012 Miguel K. Schnoor. PhD, PUC-Rio. Thesis: “The non-existence of absolutely continuous invariant probabilities is C^1 -generic for flows”.

2009–2011 Pedro H. Milet. MSc, PUC-Rio. Dissertation: “Peano curves and line fields”.

Academic Administration

Mar.2011 – Feb.2013 Department's Director of Graduate Studies, PUC-Rio.

Event Organization

- 2013 Dynamical Systems Session of the 29th Brazilian Mathematical Colloquium (IMPA).
- 2010–2012 EDAI (monthly Dynamical Systems joint seminar of PUC-Rio, UFRJ and UFF universities). www.mat.puc-rio.br/edai
- 2010 VIII Oktobermat, PUC-Rio. www.mat.puc-rio.br/oktober2010

Supplementary Information

Born June 12, 1975 in Porto Alegre, Brazil.

Married, no children.

May 17, 2014