

Alejandro Bravo-Doddoli

Curriculum Vitæ

Department of Mathematics
University of Michigan, Ann Arbor, MI 48109
Personal Website
abravodo@umich.edu

Academic Appointments

Postdoctoral Researcher (Incoming), Centro de Investigación en Matemáticas (CIMAT), Guanajuato, Mexico Jan 2027– Jan 2030 (expected)
Visiting Professor, University of Michigan, USA Aug 2026–Present
Postdoctoral Assistant Professor, University of Michigan, USA Aug 2023– July 2026

Education

University of California, Santa Cruz, Ph.D. in Mathematics 2023
Advisor: Richard Montgomery.
Dissertation: *Metric Lines in Metabelian Carnot Groups*.
National Autonomous University of Mexico, M.S. in Mathematics 2016
Thesis: *The Dynamics of an Articulated n -Trailer Vehicle*.
National Autonomous University of Mexico, B.S. in Mathematics 2014
Thesis: *Hodge Theory in Real and Complex Manifolds*.

Research Interests

Sub-Riemannian Geometry, Geometric Mechanics, Geometric Control Theory, Dynamical Systems, Integrable Systems, Symplectic Geometry, Lie Groups and Lie Algebras.

Published Papers

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- [1] **A. Bravo-Doddoli**. *Metric Lines in Engel-Type Group*. **Journal of Dynamical and Control Systems** (2026). In press. arXiv: 2405.08186.
 - [2] Y. Wang, S. Ku, and **A. Bravo-Doddoli**. *Metric Lines in the Special Euclidean Group on the Plane*. **Involve** 19.3 (2026), pp. 471–490. DOI: 10.2140/involve.2026.19.471.
 - [3] **A. Bravo-Doddoli**, P. Arathoon, and A. M. Bloch. *Integrable Sub-Riemannian Geodesic Flow on the Orthogonal Group*. **Nonlinearity** 38.11, 115007 (2025). DOI: 10.1088/1361-6544/ae19c0.
 - [4] **A. Bravo-Doddoli**. *Metric Lines in Jet Space*. **Analysis and Geometry in Metric Spaces** 12.1 (2024), pp. 6101–6111. DOI: 10.1515/agms-2024-0016.
 - [5] **A. Bravo-Doddoli**, E. Le Donne, and N. Paddeu. *Symplectic Reduction of the Sub-Riemannian Geodesic Flow for Metabelian Nilpotent Groups*. **Geometric Mechanics** 1.1, 2450002 (2024). DOI: 10.1142/S2972458924500023.
 - [6] **A. Bravo-Doddoli**. *Chaotic Sub-Riemannian Geodesic Flow on $J^2(\mathbb{R}^2, \mathbb{R})$* . **Regular and Chaotic Dynamics** 28 (2023), pp. 835–840. DOI: 10.1134/S1560354723060023.
 - [7] **A. Bravo-Doddoli**. *No Periodic Geodesics in the Jet Space*. **Pacific Journal of Mathematics** 322.1 (2023). arXiv: 2203.16178.

- [8] **A. Bravo-Doddoli**. *Higher Elastica: Geodesics in Jet Space*. **European Journal of Mathematics** 8 (2022), pp. 1377–1391. DOI: 10.1007/s40879-022-00574-0.
- [9] **A. Bravo-Doddoli** and R. Montgomery. *Geodesics in the Jet Space*. **Regular and Chaotic Dynamics** 27.2 (2022), pp. 151–182. DOI: 10.1134/S1560354722020034.
- [10] **A. Bravo-Doddoli** and L. C. García-Naranjo. *The Dynamics of an Articulated n -Trailer Vehicle*. **Regular and Chaotic Dynamics** 20 (2015), pp. 497–517. DOI: 10.1134/S1560354715050019.

Preprints and Submitted Manuscripts

- [1] **A. Bravo-Doddoli**, H. Hou, W. Clark, and A. M. Bloch. *The Integrability of a Knife-Edge Billiard in a Disk*. Submitted to *Arnold Mathematical Journal*. 2026. arXiv: 2609.12963.
- [2] M. T. C. Lau and **A. Bravo-Doddoli**. *Optimal Synthesis on the Special Linear Group*. Submitted to *Differential Geometry and its Applications*. 2026. arXiv: 2610.16222.
- [3] **A. Bravo-Doddoli**, L. C. García-Naranjo, and E. Rigato. *Abelian Instances of Nonabelian Symplectic Reduction*. Submitted to *Journal of Symplectic Geometry*. 2025. arXiv: 2510.20006.
- [4] D. Catalá, M. Vollmayr-Lee, and **A. Bravo-Doddoli**. *Metric Lines in the Space of Curves*. Submitted to *Analysis and Geometry in Metric Spaces*. 2025. arXiv: 2511.21065.

Fellowships and Awards

B. Alan Taylor Outstanding Postdoctoral Assistant Professor Teaching Award , Department of Mathematics, University of Michigan.	2025
CONACYT Doctoral Fellowship , Mexico. Fellowship to pursue doctoral studies abroad.	2017–2021
Incentive Program for Productivity and Performance of Teaching Staff , National Autonomous University of Mexico, academic year 2015–2016 and 2016–2017.	2016, 2017
Honorable Mention, Medalla Medalla Sotero Prieto , Mexican Mathematical Society. National recognition for an outstanding bachelor's thesis, academic year 2013–2014.	2014
CONACYT Master's Fellowship , Mexico. Fellowship to pursue a national master's degree.	2014–2016

Invited Talks

<i>The Integrability of a Knife-Edge Billiard in a Disk</i> , Billiards and Stars: Geometry and Dynamics, CIMAT, Guanajuato, Mexico.	2026
<i>Integrable Sub-Riemannian Geodesic Flow in the Engel-Type Group</i> , 8th Conference on Finite Dimensional Integrable Systems in Geometry and Mathematical Physics, CIMAT, Mexico.	2025
<i>Metric Lines in the Jet Space</i> , Joint Mathematics Meetings, San Francisco, USA.	2024
<i>Persistence of Periodic Orbits on the Monster Tower and the n-Trailer System</i> , Americas Conference on Differential Equations and Nonlinear Analysis, CIMAT, Mexico.	2019
<i>The Dynamics of an Articulated n-Trailer Vehicle</i> , Workshop on Nash Blow-up and the Semple Tower, KU Leuven, Belgium.	2019

Research Visits

University of Padova , Italy. Research visit hosted by Prof. Garcia-Naranjo (2 weeks).	2023 , 2025
University of Fribourg , Switzerland. Research visit hosted by Prof. Le Donne (2 weeks).	2022
Mathematical Sciences Research Institute (MSRI) , Berkeley, California, USA. <i>Hamiltonian Systems, from Topology to Applications through Analysis</i> (3 weeks).	2018

Seminar Talks

2021–2026

University of Fribourg, Switzerland; University of Padova, Italy; University of California, Santa Cruz, USA; George Mason University, USA; The Ohio State University, USA; University of Illinois Urbana-Champaign, USA; University of Michigan, USA; Diálogos Virtuales de Análisis y Geometría, UNAM, Mexico (online); Geometric Theory of Optimal Control Seminar, Moscow (online).

2016–2020

Instituto de Matemáticas, UNAM, Mexico; IIMAS, UNAM, Mexico; University of California, Santa Cruz, USA (3 talks); TV Ciencias, Facultad de Ciencias, UNAM, Mexico (online).

Selected Contributed Talks

Symplectic Reduction of the Sub-Riemannian Geodesic Flow for Metabelian Carnot Groups, AMS 2023 Spring Western Sectional Meeting, California State University, Fresno, USA.

The Dynamics of an Articulated n -Trailer Vehicle, XLIX National Congress of the Mexican Mathematical Society, University of Aguascalientes, Mexico. 2016

Hodge Theory in Real and Complex Manifolds, National Congress of the Mexican Mathematical Society, University of Sonora, Mexico. 2015

Academic teaching appointments

Graduate Teaching Assistant, University of California, Santa Cruz, USA. 09/2017–06/2023

Assistant Lecturer, National Autonomous University of Mexico, Mexico. 08/2016–06/2017

Graduate Student Instructor, National Autonomous University of Mexico, Mexico. 08/2014–06/2016

Undergraduate Teaching Assistant, National Autonomous University of Mexico, Mexico. 08/2012–06/2014

Undergraduate Research Mentorship

Independent Studies

- *Irrationality of Infinite Multiplication*

Student: Yoshihiro Paris.

Outcome: Student-authored manuscript submitted for publication.

- *Optimal Synthesis on the Special Linear Group*

Student: Tsz Chun Lau.

Outcome: Joint manuscript submitted for publication.

Research Experiences for Undergraduates (REU)

- **REU Mentor**, University of Michigan, Summer 2025.

Project: Metric Lines in the Space of Curves.

Students: Daniela Catalá and Miriam Vollmayr-Lee.

Outcome: Joint manuscript submitted for publication (see Preprint [4]).

- **REU Mentor**, University of Michigan, Summer 2024.

Project: Metric Lines in the Special Euclidean Group on the Plane.

Students: Yu Wang and Sean Ku.

Outcome: Joint research publication (see Published Paper [2]).

Laboratory of Geometry (LoG(M))

- **Undergraduate Research Mentor**, University of Michigan, Fall 2024.
Project: *Geodesic Flow on Special Linear Group*.
Students: Harish Jaisankar, Ziming Sun, Tsz Chun Lau, George Li.
- **Undergraduate Research Mentor**, University of Michigan, Winter 2024.
Project: *Let's Take It From the Top*.
Students: Ramon Diego, Haley Gipson, Huaidian Hou, Anna Huang.
- **Undergraduate Research Mentor**, University of Michigan, Fall 2023.
Project: *Why Does the Kid Swing Alone in the Park?*
Students: Pranavi Pratapa, Wenjie Zhou, Qingyao Zhu, Ziqian Zhu.

Academic Service and Outreach

Academic Leadership

- **Director**, Laboratory of Geometry (LoG(M)), University of Michigan (2024–2026).
- **Organizer**, Graduate Student Seminar, University of California, Santa Cruz (2022–2023).

Professional Service

- **Referee** for *Russian Journal of Nonlinear Dynamics, Regular and Chaotic Dynamics*, and *Calculus of Variations and Partial Differential Equations*.

Educational Outreach

- **Math Circle Volunteer**, Santa Cruz Math Circle, University of California, Santa Cruz (2021–2023).
- **Literacy Educator**, CCemac–Logos–C.I.E. Literacy Campaign, Mexico (2007–2010). Taught literacy classes in rural and Indigenous communities using Paulo Freire's culture-circle approach.

Courses taught

University of Michigan (2023–2026)

- Introduction to Differential Geometry (Math 433). Winter 2026.
- Ordinary Differential Equations with Proofs (Math 316). Winter 2024, Spring 2024, Fall 2024, Winter 2025.
- Laboratory of Geometry (Math 440). Fall 2024, Winter 2025, Fall 2025, Winter 2026.
- Integral Calculus (Math 116). Fall 2023, Fall 2025.

University of California, Santa Cruz (2017–2023)

Graduate Teaching Assistant: Complex Analysis (Math 103A), Integral Calculus (Math 19B), Differential Calculus (Math 19A), Calculus with Applications (Math 11), Precalculus (Math 3), Linear Algebra (Math 21), Ordinary Differential Equations (Math 24), and Vector Calculus with Applications (Math 23A).

National Autonomous University of Mexico (UNAM), 2012–2017

Assistant Lecturer (2016–2017)

- Differential Calculus. Winter 2017.
- Integral Calculus. Fall 2016.

Graduate Student Instructor (2014–2016)

- Abstract Algebra. Fall 2014, Winter 2015.

- Analytic Geometry. Fall 2015.
- Differential Calculus. Winter 2016.

Undergraduate Teaching Assistant (2012–2014): Abstract Algebra and Multivariable Calculus.

Professional Development and Certifications

- **Rackham Professional Development Certificate in Diversity, Equity, and Inclusion**, Rackham Graduate School, University of Michigan (2025).
- **Preparing for Inclusive Teaching**, Center for Innovations in Teaching and Learning, University of California, Santa Cruz (2017, 2018, 2020, 2021).

Languages

Spanish (native), English (fluent), French (beginner), Italian (beginner).