Douglas Finamore, Ph.D.

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About me

I'm a mathematician working in the fields of Dynamical Systems, Contact Dynamics, and Global Analysis. Specific research areas and mathematical skills include foliations, Lie group actions, contact and Anosov dynamics, billiards, and Wasserstein spaces.

Education

PhD **Universidade de São Paulo**, Mathematics — *Mar 2019 – Mar 2023*
- GPA: 4.0/4.0
- **Supervisor:** Dr. Carlos Alberto Maquera Apaza

MS **Universidade Estadual de Campinas**, Mathematics — *Mar 2017 – Feb 2019*
- GPA: 4.0/4.0
- **Supervisor:** Dr. Gabriel Ponce

BS **Universidade Federal de Minas Gerais**, Mathematics — *Mar 2012 – Jul 2016*
- GPA: 3.02/4.0
- **Exchange year:** Universitetet i Bergen, Bergen - NO — *Jun 2015 - Jun 2016*

Experience

IMECC - UNICAMP, Post-doctoral researcher — *Campinas, BR*, *Nov 2024 – Ongoing*

CMLS - École Polytechnique, Post-doctoral researcher — *Palaiseau, FR*, *Jan 2024 – Nov 2024*

ICMC-USP, Teaching assistant — *São Carlos, BR*, *Mar 2020 – Nov 2021*
- Calculus I, II, and III

IMECC - UNICAMP, Teaching assistant — *Campinas, BR*, *Feb 2018 – Nov 2018*
- Calculus III and Advanced Linear Algebra

Publications

Journal Articles

Contact foliations and generalised Weinstein Conjectures — *Ann. Glob. Anal. Geom.*, 2024
Douglas Finamore
10.1007/s10455-024-09957-w

Quasiconformal contact foliations — *Math. Ann.*, 2024
Douglas Finamore
10.1007/s00208-023-02687-7

A characterization of the n-dimensional torus — *Preprint*, 2022
Elizeu França, ***Douglas Finamore***
arXiv

Miscellaneous

Contact foliations: closed leaves and generalised Weinstein conjectures — *PhD thesis*, 2023
Douglas Finamore
10.11606/T.55.2023.tde-30082023-163143

Entropy of pseudogroups and foliations — *MS dissertation*, 2019
Douglas Finamore
10.47749/T/UNICAMP.2019.1080998

Conference talks, posters, and organisation

Talks and posters

Séminaire de Systèmes Dynamiques de Jussieu — *IMJ-PRG - Sorbonne Université*, *Apr 2024*
- **Talk**: *Estimating the number of closed leaves for contact foliations*

Greifswald-Marburg Joint Research Seminar — *Online event*, *May 2022*
- **Talk**: *Closed orbits for contact foliations*

First Iterations in Dynamical Systems — *Online event*, *Oct 2021*
- **Talk**: *k-contact structures and their induced foliations: closed orbits and generalised Weinstein conjectures*

X Workshop de Teses e Dissertações em Matemática — *ICMC - USP*, *Nov 2020*
- **Talk**: *Generalised k-contact structures and their induced foliations*

V Escola Brasileira de Sistemas Dinâmicos — *ICEx - UFMG*, *Oct 2019*
- **Poster**: *Dynamical Complexity of Foliations: Entropy and a Theorem of Ghys-Langevin-Walczak*

XIII Encontro Científico dos Pós-Graduandos do IMECC — *IMECC - UNICAMP*, *Oct 2018*
- **Talk**: *Entropy of foliations and pseudogroups* (in Portuguese)

VII Simpósio Nacional / Jornadas de Iniciação Científica IMPA — *IMPA*, *Nov 2014*
- **Talk**: *Representations of finite groups and applications to Quantum Physics* (in Portuguese)

XXII Semana de Conhecimento e Cultura UFMG — *ICEx - UFMG*, *Oct 2013*
- **Poster**: *Shor's algorithm for factoring integers* (in Portuguese)

Conference organisation

VI Encontro Paulista de Alunos de Dinâmica — *IMECC - Unicamp*, *Jan 2020*
- Marketing and organisation

I Encontro Paulista da Pós-Graduação em Matemáticas — *Online event*, *Feb 2022*
- Marketing and organisation

Research projects

Geometry and dynamics on Wasserstein spaces *2025 - ongoing*

- This project is in collaboration with Drs. Christian Rodrigues and André Gomes at the Applied Analysis group in IMECC-UNICAMP, as part of the Max Planck Institute's *Geometry and Probability in Dynamical Systems* research group. My focus is on the coarse geometry of spaces of probability measures equipped with the Wasserstein metric and its implications for dynamical systems. A key problem we explore is understanding the dynamics induced on the space of probability measures $\mathcal{P}(X)$ by the pushforward map f_* given a dynamical system $f : X \to X$. With the Wasserstein metric, we gain new tools to analyze derivatives, expansiveness, and other properties of f_* beyond traditional topological dynamics. We also investigate metric rigidity questions in $(\mathcal{P}(X), w)$ and applications of the Wasserstein metric to continuity problems for Lyapunov exponents.
- *Role*: Researcher.

Rigidity of billiards *2024 - ongoing*

- This project is a collaboration with Dr. Martin Leguil (École Polytechnique) and extends our work from my postdoctoral stay at CMLS. Broadly, we ask how much information about a hyperbolic billiard can be recovered from periodic data. Specifically, we investigate under what conditions spectral rigidity holds for Sinai billiards: if two billiard tables share the same marked length spectrum, are they necessarily isometric? To answer this, we study the coarse geometry of the phase space of Sinai billiard flows and the extent to which classical rigidity results, such as those of Otal and Croke for negatively and nonpositively curved surfaces, remain valid in the CAT(0) setting.
- *Role*: Main researcher.

q-contact structures: geometry, dynamics, and applications *2023 - ongoing*

- This project is a natural extension of the themes I worked on during my PhD, and focuses on the study of q-contact structures, objects that generalize classic contact structures, but allowing for codimension higher than one. As a consequence, such structures naturally define actions of the q-dimensional Euclidean space on their ambient manifolds, whose orbit foliation can then be seen as direct generalization of the flow of the Reeb vector field. There is a myriad of questions one can ask about such structures, most of them in the way of understanding which properties of a contact structure still hold in this generalized scenario. I'm currently concerned with problems of determining what are the interesting (and useful) invariants of such structures, of whether or not contact rigidity holds for them, and in applications of such objects to the efforts of classifying Anosov actions of higher rank groups.
- *Role*: Main researcher.

Dynamics and Topology of Intrinsically Harmonic Forms *2022 - ongoing*

- This project is a collaboration with Dr. Elizeu França. We study intrinsically harmonic differential forms and their impact on manifold topology. A key goal is to prove a conjectured "dual" of Tischler's theorem: that an orientable closed n-dimensional manifold supporting a closed nowhere-vanishing $(n-1)$-form fibres over the circle.
- *Role*: Researcher.

Grants and awards

CAPES Thesis Awards 2024, Honourable Mention in the category of Brazil's best thesis on Mathematics, Probability, and Statistics *2024*

CAPES Math/AmSud Post-Doc Scholarship, Grant number 88887.898617/2023-00 *2024*

CAPES Programa de Excelência Acadêmica (PROEX) Doctorate Scholarship, Grant number PROEX-11377206/D *2019 - 2023*

CNPQ Master Studies Scholarship, Grant number 131555/2017-0 *2017 - 2019*

CAPES Science without Borders Scholarship *2015 - 2016*

FAPEMIG Junior Researcher Grant *2013 - 2015*

Skills

Languages: Portuguese (native), English (fluent), Norwegian, French (intermediate level), German, Italian (basic skills).

Coding: C#, SQL, JavaScript, Python, LaTeX, HTML.

Technologies: .NET, Visual Studio, TexWorks, Wolfram Mathematica, MATLAB, Geogebra.

Misc: Academic research, teaching, training, consultation, LaTeX typesetting, and publishing.

References

Dr. Carlos Maquera
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ICMC - USP
- Av. Trabalhador São-Carlense São Carlos, SP
- cmaquera@icmc.usp

Dr. Martin Leguil
Centre de Mathématiques Laurent Schwartz
École Polytechnique
- 91128 Palaiseau Cedex, France
- martin.leguil@polytechnique.edu

Dr. Christian Rodrigues
Department of Applied Mathematics
IMECC - UNICAMP
- Pça. Sérgio Buarque de Holanda, Campinas, SP
- rodrigues@ime.unicamp.br

Dr. Ali Tahzibi
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