

CURRICULUM VITAE

Martin MION-MOUTON

Max Planck Institute for Mathematics in the Sciences Born in Rouen, France, on October 25th, 1993.
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Current situation (since september 2023): Postdoctorate, Max-Planck institute for Mathematics in the sciences in Leipzig, in Anna Wienhard's research group.

Previous situations:

- Postdoctoral fellow, Technion university (mentor: Tali Pinsky), 2021-2023;
- Temporary Researcher and Teacher (*ATER*), Strasbourg university, 2020-2021;
- PhD student under contract, Strasbourg university, 2017-2020.

EDUCATION

Mathematics

- 2017 - 2020 **Ph.D in Mathematics**, University of Strasbourg, defended on 11 december 2020.
Title: *Some geometrical and dynamical global properties of Lagrangian contact structures*.
Advisor: Charles Frances.
Thesis committee: T. Barbot (rapporteur), S. Crovisier, S. Dumitrescu, E. Falbel (rapporteur), C. Frances, O. Guichard (president), A. Rechtman.
Recipient of the **best PhD poster award**, doctoral school MSII.
- 2016 - 2017 **Master 2 of fundamental Mathematics**, theme *Geometry and Topology*, graduated *with honors*, University of Strasbourg (Master 2 thesis under the supervision of Charles Frances).
Recipient of the **pre-doctoral fellowship** of the Labex IRMIA.
- 2015 - 2016 **Master 1 of fundamental Mathematics**, École Normale Supérieure de Lyon (Master 1 thesis under the supervision of Charles Frances).
- 2014 - 2015 **Bachelor of Sciences in fundamental Mathematics**, École Normale Supérieure de Lyon (graduate thesis under the supervision of Gwénaél Massuyeau).
- 2012 - 2014 **Preparatory classes** to french "Grandes écoles", Lycée Saint-Louis, Paris.
Undergraduate studies in Mathematics and Physics.

Music

- 2011 - 2012 **Bachelor of Arts in Percussion**, graduated *with highest honors*, National Conservatory of Music of the Region of Rouen (class of Catherine Favre and Ronan Quelen).
- 2012 Admission to the session 2012 of the **French Youth Orchestra** (conducted by Dennis Russell Davies).

Research interests

- Rigid geometric structures, Parabolic Cartan geometries, Path geometries, Flag structures in dimension 3;
- Partially Hyperbolic diffeomorphisms, Anosov flows;
- Singular Lorentzian surfaces; Interval exchange maps.

My research interests lie at the intersection between differential geometry and differentiable dynamical systems. On a geometrical point of view, I am especially interested in rigid geometric structures on manifolds and their singular counterparts on surfaces, and on a dynamical point of view in (partially) hyperbolic systems and interval exchange maps. I am particularly interested in the interactions between these dynamical and geometrical objects appearing in the following situations: (partially) hyperbolic systems having smooth (central,) stable and unstable distributions; rigid geometric structures having a “large” group of automorphisms; singular Lorentzian surfaces whose lightlike foliations are suspensions of interval exchange maps.

Publications

3. [Geometrical compactifications of geodesic flows and path structures.](#)
Geometriae Dedicata **217**(2) (2022), 18. ([doi:10.1007/s10711-022-00751-1](#))
Abstract : In this paper, we construct a geometrical compactification of the geodesic flow of non-compact complete hyperbolic surfaces Σ without cusps having finitely generated fundamental group. We study the dynamical properties of the compactified flow, for which we show the existence of attractive circles at infinity. The geometric structure of $T^1\Sigma$ for which this compactification is realized is the pair of one-dimensional distributions tangent to the stable and unstable horocycles of $T^1\Sigma$. This is a Kleinian path structure, that is a quotient of an open subset of the flag space by a discrete subgroup Γ of $\mathrm{PGL}_3(\mathbb{R})$. Our study relies on a detailed description of the dynamics of $\mathrm{PGL}_3(\mathbb{R})$ on the flag space, and on the construction of an explicit fundamental domain for the action of Γ on its maximal open subset of discontinuity in the flag space.
2. [Cartan connections and path structures with large automorphism groups](#) (with E. Falbel et J.M. Veloso).
International Journal of Mathematics **32**(12) (2021). ([doi:10.1142/S0129167X21400164](#))
Abstract: We classify compact manifolds of dimension three equipped with a path structure and a fixed contact form (which we refer to as a strict path structure) under the hypothesis that their automorphism group is non-compact. We use a Cartan connection associated to the structure and show that its curvature is constant.
1. [Partially hyperbolic diffeomorphisms and Lagrangian contact structures.](#)
Ergodic Theory and Dynamical Systems **42**(8) (2022), 2583-2629. ([doi:10.1017/etds.2021.54](#))
Abstract: In this paper, we classify the three dimensional partially hyperbolic diffeomorphisms whose invariant distributions are smooth, such that $E^s \oplus E^u$ is a contact distribution and whose non-wandering set equals the whole manifold. We prove that up to a finite quotient or a finite power, they are smoothly conjugated either to the time-one map of an algebraic contact-Anosov flow, or to an affine partially hyperbolic automorphism of a nil-manifold. The rigid geometric structure induced by the invariant distributions plays a fundamental role in the proof.

Preprints in preparation

4. [Rigidity of singular de-Sitter tori with respect to their lightlike foliations.](#)
5. [Surgeries of three-dimensional flag structures and non-uniformizable examples](#) (with E. Falbel).

Communications

Conferences

- March 2024, *Aspects of ergodic theory for hyperbolic groups*, Leipzig (contributed talk).
- April 2023, *Anosov systems*, CIRM, Luminy (short talk).
- July 2022, *Complex Hyperbolic Geometry and Related Topics*, CIRM, Luminy.
- June 2022, *Geometric structures, compactifications and group actions*, Strasbourg (short talk).
- December 2020, *Jeunes géomètres dynamiques*, GDR Platon.
- August 2019, *1st Joint Meeting Brazil-France in Mathematics* (session 10), IMPA, Rio de Janeiro, Brasil.

Seminars

- Avril 2024, Geometry and Topology seminar, university of Luxembourg.
- March 2024, Spectral theory and Geometry seminar, Grenoble university.
- February 2024, seminar of Ergodic theory and dynamical systems, university Paris-13.
- February 2024, Ergodic theory seminar, Rennes university.
- February 2024, Geometry and Topology seminar, Aix-Marseille university.
- October 2023, Geometry seminar, Max-Planck institute for Mathematics in the Sciences, Leipzig.
- February 2023, Geometry and Topology seminar, Sorbonne university.
- January 2023, Differential Geometry seminar, Heidelberg university.
- March 2022, seminar Geometry and Topology, Technion university.
- March 2022, seminar The mathematics of motion, Technion university.
- October 2021, seminar of Geometry, university of Bordeaux.
- October 2021, Darboux seminar, university of Montpellier.
- March 2021, seminar of Dynamical systems and geometry, university of Angers.
- March 2021, Teich seminar, university of Marseille.
- February 2021, seminar of Geometry, topology and dynamical systems, university Paris-Saclay.
- February 2021, seminar of Ergodic theory and dynamical systems, university Paris-13.

Ph.D student Seminars

- 2021, university of Strasbourg.
- 2019, university of Nantes.
- 2018, university of Dijon.
- 2017, university of Strasbourg.

Reading groups

- 2022, two talks (about *Circle and Seifert bundles* and *Torus bundles and their geometrization*) in a working seminar about *Three-manifolds and their geometrization*, Technion university.
- 2018, two talks (about *Oseledecs theorem* and *Pesin's theory*) in a working seminar about *Brown-Fisher-Hurtado's results and Zimmer's programm*, Strasbourg university.

Scientific and administrative activities

- 2024, Co-organization of the Winter school in Geometry and Dynamics in Aussois.
- 2024, Co-organization of the Geometry seminar, MPI MiS, Leipzig.
- Referee for the journal: *Forum Mathematicum*.
- 2022, Collaboration with the university libraries of Lille university for the creation of the guide *Codes and softwares for research* in link with the *Passport for open science*.
- 2022, Organization of a working seminar about *Three-manifolds and their geometrization*, Technion university.
- 2021, Co-organization of a working seminar about *Mostow rigidity*, university of Strasbourg.

Awards and distinctions

- 2024, recipient of the programme SALTO of the Max-Planck society for a long research stay at the institute of Mathematics of Marseille.
- 2023, post-doctoral fellowship, Max-Planck institute for Mathematics in the sciences, Leipzig.
- 2021, post-doctoral fellowship, Technion.
- 2020, best poster award, doctoral school MSII, Strasbourg university.
- 2017, doctoral fellowship, Strasbourg university.
- 2016, pre-doctoral fellowship, labex IRMIA, Strasbourg university.

Visiting positions

- January 2023, visit at the *Institut de mathématiques de Jussieu Paris Rive Gauche*, under invitation of Elisha Falbel.
Theme of work: Rigidity of higher-dimensional partially hyperbolic diffeomorphisms.
- July 2022, visit at the *Institut de mathématiques de Jussieu Paris Rive Gauche*, under invitation of Elisha Falbel.
Themes of work: Regularity of Lyapunov distributions and rigidity.
- September-October 2021, visit at the *Institut de mathématiques de Jussieu Paris Rive Gauche*, under invitation of Elisha Falbel.
Theme of work: Rigidity of higher-dimensional path geometries.
- July 2019, visit at the *Instituto de Matemática e Estatística* (São Paulo) under invitation of Uirá Matos, with support of the Fondation Louis D-Institut de France (project coordinated by M. Viana).
Themes of work: Rigid geometric structures defined by distributions of specific growth vectors.

Selection of attended conferences

- 2024 *Group Actions and Rigidity: Around the Zimmer Program*, CIRM, Luminy.
Aspects of ergodic theory for hyperbolic groups, Leipzig.
- 2023 *GRAZP: Groups and Rigidity Around the Zimmer Program*, Ventotene.
Anosov systems, CIRM, Luminy.
Spring school in geometry and dynamics, Lille university.
- 2022 *Israel Mathematical Union annual meeting*, Ben-Gurion University, Be'er Sheva.
Complex Hyperbolic Geometry and Related Topics, CIRM, Luminy.
Geometric structures, compactifications and group actions, Strasbourg.
Action now meeting, universit  du Technion.
- 2021 *Action now meeting*, institut Weizmann.
A Hyperbolic Day Online, en ligne.
Topics at the Interface of Low Dimensional Group Actions and Geometric Structures, IMS (Singapour), en ligne.
- 2020 *Jeunes g om tres dynamiques*, GDR Platon, online.
- 2019 *Paroles aux jeunes chercheurs en g om trie et dynamique*, GDR Platon, University of Lorraine.
1st Joint Meeting Brazil-France in Mathematics, IMPA (Rio de Janeiro).
G om trie et Dynamique de A   Z in the honor of Abdelghani Zeghib, University of Avignon.
- 2018 *Topology and Dynamics in the Swiss Alps*, Borel seminar, Les Diablerets.
Paroles aux jeunes chercheurs en groupes et g om trie, GDR Platon, University of Lyon 1.
Pseudo-riemannian geometry and Anosov representations, University of Luxembourg.
Geometry in Action, and Actions in Geometry, third edition, University of Lorraine.
Geometry in Action, and Actions in Geometry, 2nd edition, University of Luxembourg.
- 2017 Conference in honor of Christophe Bavard, University of Bordeaux.
Paroles aux jeunes chercheurs en syst mes dynamique et g om tries, GDR Platon, University of Rennes.
- 2016 *Paroles aux jeunes chercheurs en g om trie et groupes*, GDR Platon, University of Strasbourg.

Teaching

Teaching assistant at the University of Strasbourg

- 2020 - 2021 Oral examinations in Mathematics.
Course on *Linear algebra*, first year undergraduate students in Mathematics and Physics.
- 2018 - 2021 Problem sessions on *Topology* and *Differential and Integral calculus*, for third year undergraduate students in Mathematics.
- 2017 - 2018 Course on *Elementary Logic and Set theory*, for 1st year undergraduate students in Mathematics.
Course on *Maple*, for 1st year undergraduate students in Mathematics.
Problem sessions on *Differential equations*, for 1st year undergraduate students in Biology.

Examinator in the **Lycée du Parc** (Lyon)

- 2015 - 2016 Oral examinations in Mathematics, for undergraduate students of selective 2nd year "MP*" of preparatory classes.

Supervision

- 2020 - 2021 Supervision of the master's thesis of Justin Rieber (M2 agrégation).
Subject: *Vector fields of the plane and Poincaré-Bendixson theorem*.

Popularization

- 2022 Around the *Week of mathematics*, discussion with pupils, preparation of explicative videos, and presentation of the job of mathematician, in the elementary school of Mellionec (Côtes-d'Armor, Brittany, France).
- 2018 - 2019 Voluntary supervision of a "Maths En Jeans" session (popularization in mathematics for High School students), Lycée Marc Bloch (Strasbourg).
- 2014 - 2015 Voluntary tutoring in Mathematics.

OTHER INFORMATIONS

Language skills: French (mother tongue), English (fluent), German (rudimentary), Italian (rudimentary).

Programming: Latex, Maple, Html.

Other teaching experiences

- 2020-2021: Tap Dance classes, choreographic center of Strasbourg.
- 2010-2012: Percussions classes, Music schools of Canteleu and Forges-les-Eaux (Normandy, France).

Associative experiences

- 2017-2021: Participation to the organization of dance festivals in the association *Lindy Spot*.
- 2014-2016: treasurer of the association *Champ Libre*, association for cinema of the *ENS de Lyon*.