Curriculum Vitae

Martin Mion-Mouton

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Born in Rouen (France), October 25, 1993.

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Current situation (since september 2021): Postdoctoral fellow, Technion university (mentor: Tali Pinsky).

Previous situations:

- Temporary Researcher and Teacher (*ATER*), Strasbourg university, 09/2020-08/2021;
- PhD student under contract, Strasbourg university, 09/2017-08/2020.

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 grant** 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 Gwénaël 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

Research interests

- Rigid geometric structures, Cartan geometries, Path geometries, Flag manifolds;
- Differentiable dynamical systems, (Partially) Hyperbolic dynamical systems;
- Anosov flows, Three-dimensional flows.

My research interests lie at the intersection between differential geometry and differentiable dynamical systems. On a geometrical point of view, I am especially interested with rigid geometric structures on manifolds, and on a dynamical point of view with hyperbolic and partially hyperbolic systems. I am mainly interested with the interactions between these dynamical and geometrical objects, typical examples of such interactions being: (partially) hyperbolic systems having smooth (central,) stable and unstable distributions; and conversely rigid geometric structures having a "large" group of automorphisms. I am also interested with three-dimensional Anosov flows, through questions leaving the realm of rigid geometric structures and involving mostly topological tools.

List of Publications and Preprints

3. Geometrical compactifications of geodesic flows and path structures.
   Accepted for publication in Geometriae Dedicata. (arXiv:2112.02900, hal-03466455)
   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 $\mathrm{T}^1\Sigma$ for which this compactification is realized is the pair of one-dimensional distributions tangent to the stable and unstable horocyles of $\mathrm{T}^1\Sigma$. 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.

Communications

Conferences

- 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

- 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 *Oseledets theorem* and *Pesin's theory*) in a working seminar about *Brown-Fisher-Hurtado's results and Zimmer's programm*, 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 Estatistíca* (Saõ 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.

Administrative responsibilities

- 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.

Selection of attended conferences

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, université 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 géomètres dynamiques*, GDR Platon, online.

2019 *Paroles aux jeunes chercheurs en géométrie et dynamique*, GDR Platon, University of Lorraine.
1st Joint Meeting Brazil-France in Mathematics, IMPA (Rio de Janeiro).
Géométrie et Dynamique de A à Z in the honnor 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 géométrie, 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 systèmes dynamique et géométries, GDR Platon, University of Rennes.

2016 *Paroles aux jeunes chercheurs en géométrie et groupes*, GDR Platon, University of Strasbourg.

Teaching and scientific outreach

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 Mellionnec (Côtes-d'Armor, Britanny, 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*.