

# Cyril Falcon

*Ph.D., Professeur agrégé*

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*French citizenship*

*Born on August 4th, 1994 in Bordeaux*



## Current position

23/05– **Research engineer in Navigation algorithms**, Exail, Saint-Germain-en-Laye.

## Academic positions

18/09–22/08 **Doctoral research scientist in Pure Mathematics**, LMO (Univ. Paris-Saclay, CNRS), Orsay.

18/09–22/08 **Teaching assistant in Mathematics**, Université Paris-Saclay, Gif-sur-Yvette.

## Research interests

I investigate contact rigidity aspects of isotopies through closed Legendrian submanifolds by studying the algebraic structure of their invariants constructed from generating families. From a general perspective, I am also interested in the categorical correspondence between these generating family invariants and the ones built from pseudo-holomorphic curves and constructible sheaves.

**Keywords.** Symplectic and contact topology, Legendrian submanifolds, Contact rigidity, Morse–Bott–Cerf theories, Generating families, Moduli spaces analysis.

## Research papers

4. **Statistical validation method for robust data fusion with an INS**, (in preparation).  
with Thomas Brunner and Jean-Philippe Michel.
3. **A Floer-Gromov compactness theorem for moduli spaces in generating family theory of Legendrian submanifolds**, (in preparation).
2. **General planar bias in identifying most efficient paths in non-Euclidean geometries**, with Charlotte Barot and Véronique Izard, (to be submitted).
1. **Generating family homologies of Legendrian submanifolds and moduli spaces of gradient staircases**, Doctoral thesis, Université Paris-Saclay (2023).

## Research talks

- 2022/12/02 **Generating family homology of Legendrian submanifolds and moduli spaces of gradient staircases**, Symplectix, IHP, Paris (France).
- 2022/02/04 **Generating family homology of Legendrian submanifolds and moduli spaces of gradient staircases**, CoSy ANR launch meeting, IMJ-PRG, Paris (France).
- 2020/09/10 **A compactness result in generating family theory**, Geometry, Topology and Dynamics seminar, LMO, Orsay (France)

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## Grants, distinctions and scholarships

- 2018 **Graduate research grant**, Ministère de l'Enseignement Supérieur et de la Recherche.  
The French government selectively offers research grants to conduct doctoral research.
- 2015, 2017 **Sophie Germain Master's scholarship**, Fondation Mathématique Jacques Hadamard.  
The foundation Jacques Hadamard offers Scholarships for excellence to French and foreign students.

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## Academic background

- 2023/01/25 **Doctoral degree in Pure mathematics**, Université Paris-Saclay.  
Research field: Symplectic and contact topology.  
*Generating family homologies of Legendrian submanifolds and moduli spaces of gradient staircases.*  
Supervisor: Professor Frédéric Bourgeois.  
President: Professor Claude Viterbo.  
Referees and examiners: Professor Alexandru Oancea and Professor Lisa Traynor.  
Examiners: Baptiste Chantraine, Ph.D. and Professor Urs Frauenfelder.
- 2018 **Magister degree in Mathematics**, with honours, Université Paris-Saclay.  
Double Master's degree obtained after three years of selective and intensive curriculum.  
Thesis: *Homological invariants of Legendrian submanifolds obtained from generating families.*
- 2018 **Research Master's degree in Mathematics**, with honours, Université Paris-Saclay.  
Qualification title: Arithmetics, Analysis, Geometry.  
Specialisation: Differential topology, differential geometry and dynamical systems.  
Thesis: *Geography of the generating family homology* (supervisor: Pr. Frédéric Bourgeois).
- 2017 **Agrégation externe in Mathematics**, 67th/3582, Ministère de l'Éducation Nationale.  
Most difficult competitive examination for civil service in public education in France.
- 2017 **Taught Master's degree in Mathematics**, with high honours, Université Paris-Saclay.  
Qualification title: Teaching training in higher education in Mathematics.  
Thesis: *Classification of circle immersions in Euclidean spaces* (supervisor: Anne Vaugon).
- 2015 **Bachelor's degree in Mathematics**, with honours, Université Paris-Sud.  
Qualification title: Pure and Applied Mathematics.  
Thesis: *Circles families on the 2-dimensional revolution torus* (supervisor: Rémi Leclercq).  
Internship: *Light-induced Marangoni flow* (supervisor: Pr. Thomas Bickel, LOMA).
- 2012–2014 **Mathematics and Physics classes préparatoires**, Lycée Michel-Montaigne.  
Highly selective and intensive undergraduate curriculum to prepare for the national competitive examinations to enter one of the top French engineering schools.
- 2012 **Scientific baccalauréat with specialisation in mathematics**, with highest honours.  
French national academic qualification at the end of high school.

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## Administrative and community responsibilities

- 19/09–21/09 **CoSouDo (Collecte de SOUtenance des DOctorants) member**.  
Fundraising to buy presents for doctoral students defending their thesis.
- 19/09–20/12 **Co-creator and co-organizer of the Explique-moi... seminar**, LMO, Orsay (France).  
Mathematical outreach seminar at the undergraduate level with the aim to introduce students to various research fields and raise their awareness of job opportunities outside the academic.

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## Student supervision

- 24/03–24/08 **Kalman filter aided neural network for inertial navigation**, Yanis Kahil.  
Last year of Engineering degree.  
Co-supervision with Jean-Philippe Michel and Hassan Mortada.

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## University teaching

- 2020–2021 **Real analysis and geometry tutorials**, 24h, Université Paris-Saclay.  
Second year of Bachelor's degree in Mathematics and Physics.
- 2019–2021 **Linear algebra tutorials**, 72h, Université Paris-Saclay.  
First year of Bachelor's degree in Mathematics.
- 2019–2021 **Linear algebra and analysis refresher tutorials**, 32h, Polytech Paris-Saclay.  
First year of Engineering degree.
- 2018–2019 **Discrete mathematics tutorials**, 44h, IUT d'Orsay.  
First year of Associate degree in Computer science.
- 2018–2019 **Linear algebra tutorials**, 20h, IUT d'Orsay.  
First year of Associate degree in Computer science.

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## Mathematical outreach

- Recurring **Creations and animations of several mathematical outreach workshop events.**  
*Euler characteristic of curves and surfaces from Morse theory*, middle school pupils, Sciences Essonne.  
Multiple workshops at Fête de la Science, from middle school pupils to highschool students, LMO.
- 19/11/21 **Generating family homology and gradient staircases**, Pampers seminar for young researcher in geometry, IRMAR, Rennes (France).
- 19/10/28 **Isotopies of Legendrian submanifolds**, Lebesgue doctoral meetings, Nantes Université, Nantes (France).
- 19/06/25 **Legendrian knots invariants**, Doctoral student seminar, LMJL, Nantes (France).
- 19/03/27 **Legendrian knots invariants**, Doctoral student seminar, LMO, Orsay (France).
- 19/02/06 **Morse theory**, Explique-moi... seminar, LMO, Orsay (France).
- 2019–2020 **Private lessons in Mathematics.**  
Differential calculus for a third year student in Bachelor's degree in Mathematics.  
Differential equations for two first year students in Engineering degree.  
Fourier analysis for two first year students in Engineering degree.
- 2019 **Jury member for Tournoi Français des Jeunes Mathématiciennes et Mathématiciens.**  
A national team mathematics tournament for high school students.
- 05/31–05/02 National final, ENSTA ParisTech, Palaiseau (France).
- 05/11–12 Regional final Paris 2, CentraleSupélec, Gif-sur-Yvette (France).
- 2015– **Active member of Mathematics StackExchange.**  
English spoken questions and answers forum for people studying mathematics.

## Research events attended

- Weekly **Geometry, Topology and Dynamics seminar**, LMO, Orsay (France).
- Monthly **Symplectix working group**, IHP, Paris (France).
- Five yearly **Nantes–Orsay seminar**, LMJL, Nantes (France), LMO, Orsay (France).
- Yearly **Workshop on Symplectic Geometry, Contact Geometry, and Interactions (CAST)**.
- 20/02/11–13 **CAST XIV**, Universiteit Antwerpen, Antwerpen (Belgium).
- 19/03/07–09 **CAST XIII**, Humboldt-Universität, Berlin (Allemagne).
- 21/05/17–21 **Advances in Symplectic Topology**, Online event.
- 21/04/26–30 **From Hamiltonian Dynamics to Symplectic Topology**, Online event.
- 21/04/19–23 **Research school on Symplectic and Contact Topology**, ÉNS, Paris (France).
- 19/10/28–30 **Lebesgue doctoral meetings**, Nantes Université, Nantes (France).
- 19/09/19–20 **From celestial Mechanics to Reeb Flows**, IRMA, Strasbourg (France).
- 18/06/11–13 **Differential Topology and mathematics of today**, LMO, Orsay (France).

## Computer skills

$\text{\LaTeX}$	(scientific documents) Expertise	Inkscape	(vector graphics) Expertise
MATLAB	(numerical analysis) Advanced	SageMath	(computer algebra) Advanced
Simulink	(modeling) Intermediate	Python	(data analysis) Intermediate

## Language skills

French	Mother tongue	English	Fluent
Spanish	Intermediate	Russian	Elementary

## Miscellaneous interests

- Sports Swimming, running, forest biking and mountain hiking.
- Puzzles Creation of puzzles based on steganographic methods.