Cyril Falcon

Ph.D., Professeur agrégé

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French citizenship
Born on August 4th, 1994 in Bordeaux

Positions

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

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

5. **Gradient staircases and generating family homology of Legendrian submanifolds**, (in preparation).
   Joint work with Frédéric Bourgeois.
4. **General planar bias in identifying most efficient paths in non-Euclidean geometries**, (in preparation).
   Joint work with Charlotte Barot and Véronique Izard.
3. **Recursive KalmanNet : Analyse des capacités de généralisation d'un réseau de neurones récurrents guidé par un filtre de Kalman**, In *30e Colloque sur le traitement du signal et des images*, GRETSI, (2025).
   Joint work with Mathéo Clavaud, Hassan Mortada and Jean-Philippe Michel.
2. **Recursive KalmanNet: Deep Learning-Augmented Kalman filter for State Estimation and Consistent Uncertainty Quantification**, In *2025 33rd European Signal Processing Conference (EUSIPCO)*, IEEE, (2025).
   Joint work with Mathéo Clavaud, Yanis Kahil, Hassan Mortada and Jean-Philippe Michel.
1. **Generating family homologies of Legendrian submanifolds and moduli spaces of gradient staircases**, Doctoral thesis, Université Paris-Saclay, (2023).

Research talks

2025/09/09 **Recursive KalmanNet: Deep Learning-Augmented Kalman filter**, EUSIPCO 2025, Saracen Sands Hotel & Congress Centre, Isola delle Femmine (Italy).

2022/12/02 **Recursive KalmanNet : Capacités de généralisation**, GRETSI 2025, Palais de la Musique et des Congrès, Strasbourg (France).

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)

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 Jacques Hadamard Foundation offers scholarships for excellence to French and foreign students.

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 examinators: Professor Alexandru Oancea and Professor Lisa Traynor.
Examinators: 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.

Administrative and community responsabilities

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 of introducing students to various research fields and raising their awareness of job opportunities outside the academic world.

Student supervision

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

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.

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 2020, Universiteit Antwerpen, Antwerpen (Belgium).

19/03/07–09 CAST 2019, 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

MATLAB (numerical analysis) Advanced
Simulink (modelling) Intermediate
Git (version control) Advanced
Python (data analysis) Advanced
Shell script (scripting) Expertise
LaTeX (scientific documents) Expertise

Language skills

French Mother tongue
Spanish Intermediate
English Fluent
Russian Elementary

Miscellaneous interests

Sports Swimming, running, MTB riding and mountain hiking.

Puzzles Puzzles creation relying on steganographic methods.