

# Cyril Falcon

*Ph.D., Professeur agrégé*

Saint-Germain-en-Laye  
Yvelines, Île-de-France  
✉ [cyril.falcon@math.cnrs.fr](mailto:cyril.falcon@math.cnrs.fr)  
🌐 [cyril-falcon@github.io](https://github.com/cyril-falcon)  
in [falcon-cyril](https://www.linkedin.com/in/falcon-cyril)  
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), pp. 425-428.  
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 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.

## 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 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

Python (data analysis) Advanced

Simulink (modelling) Intermediate

Shell script (scripting) Expertise

Git (version control) Advanced

$\text{\LaTeX}$  (scientific documents) Expertise

## Language skills

French Mother tongue

English Fluent

Spanish Intermediate

Russian Elementary

## Miscellaneous interests

Sports Swimming, running, MTB riding and mountain hiking.

Puzzles Puzzles creation relying on steganographic methods.