

# Guillaume Falmagne

*Postdoctoral researcher in complex systems (Princeton University)*

## Education and research experience

- from July 2025 **Research Fellow and Team Leader**, SOHAM centre, TU Dublin & Trinity College Dublin, *CORES0/COOLNET: large-scale cooperation*
- 2022 – 2025 **Postdoctoral research associate**, High Meadows Environmental Institute, Princeton University, *Complex socio-ecological systems*, Supervisor: Simon LEVIN
- Summer 2024 Complex Systems Summer School, Santa Fe Institute (SFI)  
4-week interdisciplinary course on complex behavior in mathematical, physical, living, and social systems
- Spring 2022 **Postdoctoral researcher**, Subatech (IMT Atlantique, CNRS), Nantes, *Partonic energy loss in the quark-gluon plasma*, Supervisor: François ARLEO
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- 2018 – Dec 2021 **PhD in particle physics**, Laboratoire Leprince-Ringuet, École Polytechnique (Institut Polytechnique de Paris).
- Courses Advanced Quantum Field Theory, CERN-Fermilab Hadron Collider Physics school (2019), International School of QCD (LPT Orsay, 2018). Models for the energy transition, plant seeds, ethics of research.
- Research *The  $B_c^+$  meson in heavy ion collisions with the CMS detector; Partonic energy loss in the quark-gluon plasma*, supervisors: Raphaël GRANIER DE CASSAGNAC, François ARLEO.
- .....
- 2017–2018 **2nd year of Master in High Energy Physics**, École Polytechnique (Université Paris-Saclay), *summa cum laude*
- Research **5-month internship**, feasibility study on PhD topic
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- end 2016 – jun 2017 Volunteering and cultural [experience](#) in South America and Eastern Europe.
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- 2015 – end 2016 **12-month research internship**, CERN, Geneva,  $\Lambda_b^0$  production charge asymmetry measurements with the LHCb detector, supervisor: Sascha STAHL.
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- 2013–2015 **Bachelors degree and 1st year of Master in Fundamental Physics**, École Normale Supérieure de Cachan (Paris-Saclay) and Université Pierre et Marie Curie (Paris 6), *magna cum laude*
- Research (2015) **4-month internship**, SLAC National Accelerator Laboratory, Stanford University, *NNLO-parton showers matching & MINLO jet clustering in SHERPA*, supervisors: Lance DIXON, Stefan HOECHE.
- Research (2014) **2-month internship**, Laboratoire Leprince-Ringuet, École Polytechnique, *Resolution unfolding of the CMS detector*, supervisor: Raphaël GRANIER DE CASSAGNAC.
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- 2011–2013 Classes préparatoires in Mathematics and Physics, Lycée Henri Poincaré (Nancy, France)
- 2011 Baccalauréat in Sciences, *summa cum laude*







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## Awards and fellowships

- 2024 Recipient of the **Prize of the Lopez-Loreta Foundation** for the CORESO project, 1-million euro grant over 5 years
- 2023 **Best poster (2nd place) of the Collective Intelligence Symposium**, Santa Fe Institute
- 2022 PhD thesis award of *Institut Polytechnique de Paris*
- 2022 PhD thesis award of *Groupeement de Recherche QCD*
- 2022 Accessit to the *Daniel Guinier* PhD thesis award of *Société Française de Physique*
- 2022 **CERN Senior Research Fellowship**, declined for HMEI Research Associate position, Princeton U.
- 2013 **Admission at ENS Cachan after national competitive exams**, 'normalien': full 4-year funding

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## Main publications

- 2025 **Interpretable Early Warnings using Machine Learning in an Online Game-experiment (r/place)**, *Guillaume Falmagne, Anna B. Stephenson, Simon A. Levin (Princeton)*, [arXiv:2502.09880](https://arxiv.org/abs/2502.09880), in review with PNAS
- Role (2022-25)  Lead author
- 2024 **Path-length dependence of parton and jet energy loss from universal scaling laws**, *François Arleo, Guillaume Falmagne*, [arXiv:2411.13258](https://arxiv.org/abs/2411.13258)
- 2024 **Probing the path-length dependence of parton energy loss via scaling properties in heavy ion collisions**, *François Arleo, Guillaume Falmagne*, *PRD Letters* **109** (2024), [L051503](https://arxiv.org/abs/2405.1503)
- 2019 **Quenching of hadron spectra in XeXe and PbPb collisions at the LHC**, *François Arleo, Guillaume Falmagne*, *Proc. of Hard Probes 2018*, [PoS 075](https://arxiv.org/abs/1805.075)
- Role (2018-23)  Extending the model and its comparison to measurements; set forth three additional scaling laws
- 2022 **Observation of the  $B_c^+$  Meson in Pb-Pb and pp Collisions at  $\sqrt{s_{NN}} = 5.02$  TeV and Measurement of its Nuclear Modification Factor**, *CMS collaboration*, *Phys. Rev. Lett.* **128**, [252301](https://arxiv.org/abs/2203.01)
- Role (2018-21)  Contact author and main analyser
- 2021 **Observation of a  $\Lambda_b^0 - \bar{\Lambda}_b^0$  production asymmetry in proton-proton collisions at  $\sqrt{s} = 7$  and 8 TeV**, *LHCb collaboration*, *JHEP* **10** (2021) [060](https://arxiv.org/abs/2106.060)
- Role (2015-17)  Major analyser
- 2019–2021 **Author of all papers from the CMS Collaboration submitted in this period (> 200)**  
 Direct contributions to: Muon reconstruction in heavy ion collisions ([CMS-PAS-MUO-21-001](https://arxiv.org/abs/2103.001) Public Analysis Summary), Fragmentation of jets containing a  $J/\psi$  ([PLB\(2021\) 136842](https://arxiv.org/abs/2103.13684))
- 2015 **Les Houches 2015: Physics at TeV Colliders Standard Model Working Group Report**, *J.R. Andersen et al.*, [arXiv:1605.04692](https://arxiv.org/abs/1605.04692)
- Role (2015)  Contribution to matching NNLO and parton showers in V-Higgs + MINLO procedure in SHERPA

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## Current projects

- 2022-now **A dynamical model for tipping cascades due to the moisture recycling network in the Amazon rainforest**, with *Nico Wunderling (PIK)*, work in progress
- 2023-now **Understanding scaling laws and optimization principles of organizations using a Reddit social experiment (r/place)**, with *Anna B. Stephenson (Princeton)* and *Chris Kempes (Santa Fe Institute for Complexity)*, work in progress
- 2023-now **Extracting uni-dimensional voter spectra from ranked choice voting ballots**, with *Samuel S. Wang (Princeton)*, *Keena Lipsitz (CUNY)*, *Simon A. Levin (Princeton)*, and *Annie B. Stephenson (Princeton)*, work in progress
- 2023-now **The large-scale propagation of cooperation on multilayer networks**, with *Giuseppe Ferro (Princeton)*, *Woi Sok Oh (Princeton)*, and *Emma Zajdela (Princeton)*, work in progress

## Scientific talks

- 2025 CS2Italy (Computational Social Science), University of Trento, *CORES0/COLNET: new tools for large-scale cooperation*
- 2024 Workshop on spreading in social networks, DIMACS Rutgers University, *CORES0/COLNET: COoperation in Large-scale NETworks*
- 2024 ERSI Critical Transitions Workshop, Stockholm Resilience Center, *CORES0/COLNET: COoperation in Large-scale NETworks*
- 2024 CoCCoN (Cooperation and Collective Cognition Network) seminar, HU Berlin, online, *CORES0/COLNET: COoperation in Large-scale NETworks*
- 2024 **European Geosciences Union (EGU) General Assembly**, Vienna (Austria), [online](#), *Interpretable Early Warning System using Machine Learning in a Large-scale Game-experiment*
- 2024 **International School and Conference on Network Science (NetSciX)**, Venice (Italy), *Tipping cascades in the Amazon rainforest due to the moisture recycling network*
- 2023 ERSI Critical Transitions Workshop, PIK, Berlin (Germany), *Trees, networks and games for large-scale cooperation*
- 2023 Seminar at Theoretical Ecology Tea, EEB, Princeton, *Structural aspects of large-scale cooperation*
- 2023 GdR QCD General Assembly, talk for 2022 PhD award, [online](#), *Collective phenomena and critical transitions: from plasma to complex socio-ecological systems*
- 2023 **Collective Behaviour Workshop**, [Isaac Newton Institute](#), Cambridge (UK), *Early warning signals and the structure and emergence of collaborations with a large-scale experiment*
- 2023 Seminar at Max Planck Institute for Human Development, Berlin (Germany), *Early warning signals and the structure of collaborations using a large-scale experiment on Reddit*
- 2023 Seminar at PIK (Potsdam Institute for Climate Impact Research, Germany), *Investigating early warning signals with a large-scale collaborative experiment on Reddit*
- 2023 **Collective Intelligence Symposium**, [poster](#), Santa Fe Institute (NM, USA), *Surveying early warning signals of transitions using a large-scale collaborative experiment*
- 2021 **CERN-LHC Seminar**, [online](#) ([recording available](#)), *First observation of the  $B_c^+$  meson in PbPb and pp collisions at 5.02 TeV at CMS*
- 2021 Rencontres QGP France, [Étretat](#) (France), *First observation of  $B_c^+$  meson production in PbPb and pp collisions with CMS*
- 2021 **9th Edition of Large Hadron Collider Physics Conference (LHCP)**, [online](#) ([recording available](#)), *Exotic quarkonia production in heavy ion collisions:  $X(3872)$  and  $B_c^+$*
- 2021 **19th International Conference on Strangeness in Quark Matter (SQM)**, [online](#), *First measurement of the  $B_c^+$  meson nuclear modification factor in PbPb collisions with CMS*  
📖 **Published proceedings:** [EPJ Web of Conferences 259](#), 12011 (2022)
- 2021 **14th International Workshop on Heavy Quarkonium (QWG)**, [online](#), *Quarkonium production studies in nuclear collisions at CMS*
- 2020 Journées CMS-France, [online](#),  *$B_c$  production: Towards a first observation in heavy ions collisions*
- 2019 Journées de Rencontre des Jeunes Chercheurs, [Moulin-Mer](#) (France), *Probing the quark-gluon plasma with the  $B_c$  meson in CMS*  
📖 **Published proceedings:** C. Armand et al., [JRJC 2019 Book of Proceedings](#), p.88
- 2019 **GdR Intensity Frontier Workshop**, [Sommières](#) (France),  *$B_c$  meson production in pp and PbPb collisions with CMS, and plenary talk ( $B_c$  session summary)*
- 2019 QGP France, [Étretat](#) (France), *Modification of  $B_u^+$ ,  $B_s^0$  and  $B_c^+$  mesons in PbPb collisions with the CMS detector*
- 2018 **Int. Conf. on Hard & EM Probes of High-Energy Nuclear Collisions**, [Aix-les-Bains](#) (France),  *$B_s^0$  and  $B^+$  meson nuclear modification factors in PbPb collisions at 5.02 TeV with CMS detector*  
📖 **Published proceedings:** G. Falmagne for the CMS Collaboration, Proc. of Hard Probes 2018, [PoS 143](#)

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## Teaching experience

- Fall 2024 **Instructor of the *Programming for Biology* course**, EEB department, Princeton University
- 2023 – 2025 Private research mentor, CCIR
- 2018 – 2021 **Teaching assistant**, *École Polytechnique (Institut Polytechnique de Paris)*  
Optics, Waves, and Radiation (Bachelor 2<sup>nd</sup> year). Advanced Particle Physics (Master 1<sup>st</sup> year).
- 2020 **Research supervisor**, *École Polytechnique*  
Noémie Pilleux: Master 1st year, 2 months. Natalie Blot: Bachelor, 2 months.
- 2014 – 2016 Private tutoring, *LiveMentor*  
Mathematics and physics for students in classes préparatoires.
- nov-dec 2014 Teaching internship in physics in high school, *Lycée Frédéric Mistral, Fresnes (France)*

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## Service

### Conference organization

- Feb 2025 **Lead organizer of the 6th Critical Transitions Workshop**, Princeton University, USA
- Dec 2023 **Central organizer of the 4th Critical Transitions Workshop**, *Potsdam Institute for Climate Impact Research (PIK)*, Potsdam (Germany)

### Scientific outreach

- Nov 2023 **Two pictures exhibited in “Birdiversity”**, Princeton  
Communicating the science and challenges of bird diversity through art
- oct 2019 Volunteer at **CERN Open Days**, CMS site, Geneva  
Outreach on CMS activities, 80,000 visitors in total in a week-end
- apr 2019 Animation of the CERN stand at **Geek Touch Convention**, Lyon (France)  
Demonstrating CERN activities to a broad public

### Lab and school life

- 2023 Member of the **Climate Committee** of the EEB department, *D&I and general climate*
- 2019–2022 **Representative** of students and postdocs and sustainable development leader at **LLR Lab Council**
- 2014–2015 Member of the **student association** of the ENS Cachan  
In charge of communication and partnerships
- nov 2013 Humanitarian association of ENS Cachan: social microcredit event (*The Rise*, Babyloan)

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## Languages

- French, English native/fluent
- German Reading, writing, conversation
- Spanish, Italian Reading, basic conversation

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## Non-professional activities

- Rugby 10+ years in clubs and a university team
- Scuba-diving CMAS two star diver
- Running Typical performance: 10km in 40min
- Music Flute (classical formation, university bands), classical singing (multiple choirs)
- Photography [Travel blog](#), pictures exhibited in “Birdiversity” (Princeton) and in “A World Of Stations” (Paris), [instagram](#)