

Raphaël URFIN

Centre de Sciences des Données, 45 rue d'Ulm – 75005 Paris – France

About me

I am a first year PhD student at École Normale Supérieure - PSL in Paris supervised by Giulio Biroli (ENS) and Marc Mézard (Bocconi University) working on the theory of diffusion models. My background is in theoretical physics.

Education

- **PhD in Physics** **ENS-PSL, Paris**
Subject: Generative Diffusion and Statistical Physics
LPENS & Centre de Sciences des Données
Supervisors: Giulio Biroli (ENS) and Marc Mézard (Bocconi University)
2025 - 2028(exp.)
- **ENS Diploma** **ENS-PSL, Paris**
Interdisciplinary Diploma validating my studies at ENS.
2021-2025
- **M2 ICFP Theoretical Physics Track** **ENS-PSL, Paris**
First Class Honors, 17.38/20
2023 - 2024
Relevant classes: Advanced Statistical Physics, Disordered Systems, Machine Learning.
- **M1 ICFP** **ENS-PSL, Paris**
First Class Honors, 17.8/20
2022 - 2023
Relevant classes: Phase Transitions, Introduction to Quantum Field Theory, General Relativity.
- **Bachelor in Physics and Mathematics** **ENS-PSL, Paris**
First Class Honors, 17.38/20 (Physics) and 16.36/20 (Mathematics)
2021 - 2022

Publications

* denotes equal contribution.

- Tony Bonnaire*, **Raphaël Urfin***, Giulio Biroli, Marc Mézard.
Why Diffusion Models Don't Memorize: The Role of Implicit Dynamical Regularization in Training.
NeurIPS 2025, **Best Paper Award (4 papers among +20000 submissions)**
<https://openreview.net/forum?id=BSZqpqqM0>

Conferences, Workshops and Seminars

Invited Talks.....

- **Scattering Club** **Online**
Invited Seminar February 2026
 - 45 min invited talk on the Memorization/Generalization transition in diffusion models. Webinar organized by the data science for astrophysics group of LPENS.
- **Voxel51 Best of NeurIPS 2025** **Online**
Invited Seminar January 2026
 - 45 min invited talk on the Memorization/Generalization transition in diffusion models.
- **Machine Learning & Signal Processing @ ENS Lyon** **Lyon, France**
Invited Seminar November 2025
 - 1 hour invited talk on the Memorization/Generalization transition in diffusion models.

Contributed Talks.....

- **Journées de Physique Statistique 2026** **Paris, France**
Conference *January 2026*
 - 4-minute flash talk on the Memorization/Generalization transition in Diffusion Models.
- **EurIPS 2025** **Copenhagen, Denmark**
Conference *December 2025*
 - Poster+Oral Presentation of our paper accepted at NeurIPS 2025.
- **NeurIPS in Paris 2025** **Paris, France**
Workshop *November 2025*
 - Poster+Oral Presentation of our paper accepted at NeurIPS 2025.
- **StatPhys 29** **Florence, Italy**
Conference *July 2025*
 - 15-minute contributed talk on the Memorization/Generalization transition in diffusion models.
- **Youth in High Dimensions** **Trieste, Italy**
Workshop *July 2025*
 - 15-minute contributed talk on the Memorization/Generalization transition in diffusion models.
- **Journées de Physique Statistique 2025** **Paris, France**
Conference *January 2025*
 - 4-minute flash talk presenting results from my M2 internship.

Summer Schools.....

- **Beg Rohu Summer School of Statistical Physics** **Beg Rohu, France**
Summer School *June 2025*
 - Lectures on Machine Learning and Statistical Physics by international researchers (e.g. Yann Lecun, Julia Kempe, Stéphane Mallat, Marc Mézard).
 - Poster presentation on the Memorization/Generalization transition in diffusion models.
- **Complex and Glassy Systems** **Cargese, France**
Summer School *July 2024*
 - Lectures on Statistical Physics and interdisciplinary applications by international researchers (e.g. Marc Mézard, Eric Vanden-Eijnden, Valentina Ros, Guy Bunin).

Awards and Grants

- 2025: Recipient of one of the four best paper awards at NeurIPS 2025. **(4 papers among +20000 submissions)**
- 2025: CDSN, PhD scholarship for ENS students

Reviewing

Reviewer for: EurIPS 2025 Workshop Principles of Generative Modeling (PriGM)

Skills

- Languages: French (Native), English (Fluent), Italian (Fluent).
- Software skills: Python (Pytorch), Matlab, Latex.

Teaching Experience

- TA Machine Learning (M2, Master ICFP, ENS-PSL), taught with Marc Lelarge and Leonardo Defilippis. Spring 2026.
- TA Mathematics Tutoring for first year student in Physics at ENS. 36h. Taught in French with Amir-Kian Kashani-Poor. Fall 2025

- TA Stochastic Processes for physics (M1 level, Master ICFP, ENS-PSL), 16 hours, class taught in English with Marylou Gabri . Fall 2025
- "Kh lles" (Preparation for the oral Exam for French "Grandes  coles") in Mathematics and Physics for Classes Pr paratoires PC, Lyc e Stanislas (2022 2024)

Relevant Experience

- **Statistical Physics and Diffusion Models** **Bocconi University, Milano, Italy**
Research Internship *February 2025-May 2025*
 - Supervisor: Marc M zard, Departement of Computing Sciences.
 - The Memorization/Generalization transition in diffusion models.
 - Resulted in a publication accepted at Neurips 2025
- **Statistical Physics and Diffusion Models** ** cole Normale Sup rieure-PSL, France**
Research Internship *April 2024-January 2025*
 - Supervisor: Giulio Biroli, Centre de Sciences des Donn es.
 - The effect of implicit regularization in diffusion models.
- **Emergent behaviors in large ecosystems** **University of Cambridge, UK**
Research Internship *January-July 2023*
 - Supervisor: Camille Scalliet, Soft Matter Group, Department of Applied Mathematics and Theoretical Physics.
 - Using tools from disordered systems (Cavity Method, Random Matrix Theory...) to understand emergent collective behaviors in ecological systems.
- **Transport of Anisotropic Particles in a Vortex Flow** **ESPCI, Paris**
Research Internship *July 2022*
 - Supervisors: Anke Lindner, Marinne Aulnette, 'Complex Suspensions' team, PMMH
 - Measurements of the vector field of the vortex flow with the PIV method and data analysis with Matlab.