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 — *2025 - 2028(exp.)*
  LPENS & Centre de Sciences des Données
  Supervisors: Giulio Biroli (ENS) and Marc Mézard(Bocconi University)
- **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=BSZqpqgqM0`

Conferences, Workshops and Seminars

Invited Talks

- **LemanTH 2026** — **Lausanne, Switzerland**
  Workshop — *April 2026*
  - Talk on the Memorization/Generalization transition in Diffusion Models.
- **Vitelli's Group Meeting** — **Online**
  Group meeting — *March 2026*
  - Talk on the non-reciprocal p-spins.
- **Scattering Club** — **Online**
  Invited Seminar — *February 2026*
  - 1h 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*
  - 30 min invited talk on the Memorization/Generalization transition in diffusion models.
- **Centre de Sciences des Données Internal Seminar** — **Paris, France**
  Invited Seminar — *December 2025*
  - 1h 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, Danemark**
  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, Competitive PhD scholarship for ENS students

Reviewing

- Machine Learning Workshops: EurIPS 2025 Workshop Principles of Generative Modeling (PriGM), ICLR 2026 Workshop DeLTa, ICLR 2026 Workshop Sci4DL.
- Machine Learning Journals: TMLR

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 Gabrié. Fall 2025
- "Khôlles" (Preparation for the oral Exam for French "Grandes Écoles") in Mathematics and Physics for Classes Préparatoires PC, Lycée Stanislas (2022–2024)

Relevant Experience

- **Statistical Physics and Diffusion Models** — **Bocconi University, Milano, Italy**
  Research Internship — *February 2025-May 2025*
  - Supervisor: Marc Mézard, Departement of Computing Sciences.
  - The Memorization/Generalization transition in diffusion models.
  - Resulted in a publication accepted at Neurips 2025

- **Statistical Physics and Diffusion Models** — **École Normale Supérieure-PSL, France**
  Research Internship — *April 2024-January 2025*
  - Supervisor: Giulio Biroli, Centre de Sciences des Données.
  - 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.