FRANCESCO MORI

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PROFESSIONAL SUMMARY

I am a theoretical physicist at Harvard University, supported by the Center of Mathematical Sciences and Applications and a Shuman Educational Research Grant. My research spans nonequilibrium statistical physics, active matter, animal navigation, and machine learning.

RESEARCH EXPERIENCE

Research Associate *Sept. 2025 - Present*
Center of Mathematical Sciences and Applications, Harvard University.

Leverhulme-Peierls Fellow (independent postdoctoral position) *Oct. 2022 - Sept. 2025*
Rudolf Peierls Centre for Theoretical Physics, Department of Physics, University of Oxford

Junior Research Fellow, New College, Oxford. *Oct. 2022 - Sept. 2025*

Research Visitor, City University of New York. *Feb. 2025 - Present*

Part-time consultant, Scroll Prize, Inc. *Sept. 2024 - June. 2025*
Contributing to the Vesuvius challenge. Image reconstruction of ancient papyri (pre-79 AD).

Ph.D. in Theoretical Physics, Université Paris-Saclay *Oct. 2019 - June 2022*
Laboratory of Theoretical Physics and Statistical Models (LPTMS), Orsay.
Supervisor: Satya Majumdar.
Title: *Extreme value statistics of stochastic processes: from Brownian motion to active particles*.

TEACHING

Abilitazione Scientifica Nazionale *2025*
Accredited to hold Associate Professor positions in Italian universities. (Sections 02/A2 and 02/B2)

Qualification aux fonctions de maître de conférences *2024*
Accredited to hold lecturer positions in French universities. (Section 28 - Theoretical Physics)

Stipendiary Lecturer, New College (Oxford) *2023*
Mathematical Methods, Thermal Physics.

Tutor, Oxford Study Abroad Program *2023*
Biological Physics.

Teaching assistant, Université Paris-Saclay *2021 - 2022*
Computer Science, Statistical Physics.

FUNDING

Shuman Educational Research Grant *9-month research grant.* *2025*

Lockey Fund Award (USA) *Travel award to attend scientific conferences in the USA.* *2024*

Lockey Fund Award (Europe) *Travel award to attend scientific conferences in Europe.* *2024*

Astor Travel Scholarship *Travel fund for visits to the USA.* *2024*

Leverhulme-Peierls Fellowship *2022*
"intended to support the most talented theoretical physicists worldwide at an early stage of their careers"
One of three top candidates among more than 100 applicants.

AWARDS

Université Paris-Saclay International Master's Scholarship *2018*
1-year master program at Paris-Saclay University.

Erasmus Scholarship *2018*
6-month exchange program at Paris-Saclay University.

Alta Scuola Politecnica *2017*
Excellence path for the top 1% of master students of Politecnico di Torino and Milano.

Physics of Complex Systems Travel Grant *2017*
6-month exchange program at SISSA and ICPT (Trieste, Italy).

Young Talent Project Travel Grant *2016*
6-month exchange program at Lund University (Sweden)

Young Talent Project *2014*
Excellence program for the top 5% of bachelor students of Politecnico di Torino.

EDUCATION

M. Sc. in Physics of Complex Systems, Université Paris-Saclay *Sept. 2018 - Jul. 2019*
Ranking: 1/42, GPA: 18.6/20

M. Sc. in Physics of Complex Systems, Politecnico di Torino *Oct. 2017 - Jul. 2019*
GPA: 30.00/30, Final mark: 110/110 cum laude.

M. Sc. in Engineering Physics, Politecnico di Milano *Oct. 2017 - Jul. 2019*
Final mark: 110/110 cum laude.

Intern Student, LPTMS, Orsay (with Satya Majumdar). *Mar. 2019 - Jun. 2019*

iMat Project (Project on natural language processing and materials science) *Jun. 2018 - Sept. 2019*
European Materials Modelling Council, Alta Scuola Politecnica.

Visiting student, SISSA and ICTP (Trieste, Italy). *Sept. 2017 - Feb. 2018*

Visiting student, Lund University (Sweden). *Aug. 2016 - Feb. 2017*

B. Sc. in Applied Mathematics, Politecnico di Torino *Oct. 2014 - Jul. 2017*
GPA: 29.29/30, Final mark: 110/110 cum laude.

MENTORSHIP

Yaprak Onder (Oxford undergraduate) *2023*
Currently Ph.D. student at Harvard University.

Costantino Di Bello (Université Paris-Saclay master's) *2021*
Currently Ph.D. student at the University of Potsdam.
This internship resulted in the publication Phys. Rev. E **108**, 014112 (2023).

Marco Biroli (École normale supérieure de Paris master's) *2021*
Currently Ph.D. student at Paris-Saclay University.
This internship resulted in the publication J. Phys. A **55**, 244001 (2022).

ACADEMIC SERVICE AND OUTREACH

Volunteer, Squishy Science Sunday (outreach activity at the APS March Meeting) *Mar. 2025*

Assessor for master project *Apr. 2024*
Oxford Interdisciplinary Bioscience DTP

Reviewer *Mar. 2021 - Present*
SciPost, Cambridge University Press, Nat. Commun., PRL, PRE, J. Phys. A: Math. Theor., J. Stat. Mech, Physica A.

Interviewer, University College (Oxford) *Dec. 2022*
Undergraduate Physics admissions

Organizer, Cross-TP discussions *Oct. 2022 - Mar. 2023*
Journal club across all areas of Theoretical Physics in Oxford

Organizer, Fête de la science (outreach activity for high-school students) *Oct. 2021*

PUBLICATIONS (* KEY PAPERS)

25. **F. Mori** and F. Mignacco. "Analytic theory of dropout regularization", Phys. Rev. E **112**, 045301 (2025).
24. **(*)** F. Mignacco and **F. Mori**, "A statistical physics framework for optimal learning", preprint arXiv:2507.07907 (2025).
23. R. J. Ewart, P. Reichherzer, S. Ren, S. Majeski, **F. Mori**, M. L. Nastac, A. F. A. Bott, M. W. Kunz, A. A. Schekochihin, "Cosmic-ray transport in inhomogeneous media", preprint arXiv:2507.19044 (2025).
22. **(*)** **F. Mori**, S. Sarao Mannelli, and F. Mignacco. "Optimal Protocols for Continual Learning via Statistical Physics and Control Theory," ICLR 2025 and J. Stat. Mech. 084004 (2025).

    - Accepted for poster presentation at the NeurIPS 2024 workshop Mathematics of Modern Machine Learning.

    - Accepted for poster presentation at COSYNE 2025.
21. **(*)** **F. Mori** and L. Mahadevan, "Optimal switching strategies for navigation in stochastic settings", J. R. Soc. Interface 22 (227), 20240677 (2025).
20. **F. Mori**, S. N. Majumdar, and P. Vivo. "Cost of excursions until first crossing of the origin for random walk and Lévy flights: An exact general formula", Phys. Rev. Research **6**, 043053 (2024).
19. K. S. Olsen, D. Gupta, **F. Mori**, S. Krishnamurthy, "Thermodynamic cost of finite-time stochastic resetting", Phys. Rev. Research **6**, 033343 (2024).
18. A. Mummery, **F. Mori**, and S. Balbus, "The dynamics of accretion flows near to the innermost stable circular orbit", Mon. Not. R. Astron. Soc. **529**, 1900 (2024).
17. **(*)** **F. Mori**, S. Bhattacharyya, J. M. Yeomans, and S. P. Thampi, "Viscoelastic confinement induces periodic flow reversals in active nematics", Phys. Rev. E **108**, 064611 (2023).
16. S. N. Majumdar, **F. Mori**, and P. Vivo, "Nonlinear-Cost Random Walk: exact statistics of the distance covered for fixed budget", Phys. Rev. E **108** (6), 064122 (2023).
15. C. Di Bello, A. K. Hartmann, S. N. Majumdar, **F. Mori**, A. Rosso, and G. Schehr, "Current fluctuations in stochastically resetting particle systems", Phys. Rev. E **108**, 014112 (2023). **Highlighted as an Editors' Suggestion.**
14. S. N. Majumdar, **F. Mori**, and P. Vivo, "The cost of diffusion: nonlinearity and giant fluctuations", **Phys. Rev. Lett. 130**, 237102 (2023).
13. **(*)** B. De Bruyne and **F. Mori**, "Resetting in Stochastic Optimal Control", Phys. Rev. Research **5**, 013122 (2023).
12. **(*)** **F. Mori**, K. S. Olsen, and S. Krishnamurthy, "Entropy production of resetting processes", Phys. Rev. Res. **5**, 023103 (2023).

11. **F. Mori**, S. N. Majumdar, and G. Schehr, "Time to reach the maximum for a stationary stochastic process", Phys. Rev. E **106**, 054110 (2022).
10. M. Biroli, **F. Mori**, and S. N. Majumdar, "Number of distinct sites visited by a resetting random walker", J. Phys. A: Math. Theor. **55**, 244001 (2022).
9. **F. Mori**, G. Gradenigo, and S. N. Majumdar, "First-order condensation transition in the position distribution of a run-and-tumble particle in one dimension ", J. Stat. Mech. 103208 (2021).
8. **(*) F. Mori**, S. N. Majumdar, and G. Schehr, "Distribution of the time of the maximum for stationary processes", Europhys. Lett. **135**, 30003 (2021). **Highlighted as an Editors' Choice.**
7. **F. Mori**, P. Le Doussal, S. N. Majumdar, and G. Schehr, "Condensation transition in the late-time position of a run-and-tumble particle", Phys. Rev. E **103**, 062134 (2021).
6. S. N. Majumdar, **F. Mori**, H. Schawe, and G. Schehr, "Mean perimeter and area of the convex hull of a planar Brownian motion in the presence of resetting", Phys. Rev. E **103**, 022135 (2021).
5. **F. Mori**, P. Le Doussal, S. N. Majumdar, and G. Schehr, "Universal properties of a run-and-tumble particle in arbitrary dimension", Phys. Rev. E **102**, 042133 (2020). **Highlighted as an Editors' Suggestion.**
4. B. Lacroix-A-Chez-Toine, **F. Mori**, "Universal survival probability for a correlated random walk and applications to records" J. Phys. A: Math. Theor. **53**, 495002 (2020).
3. **(*) F. Mori**, P. Le Doussal, S. N. Majumdar, and G. Schehr, "Universal survival probability for a d-dimensional run-and-tumble particle", **Phys. Rev. Lett. 124**, 090603 (2020).
2. **F. Mori**, S. N. Majumdar, and G. Schehr, "Distribution of the time between maximum and minimum of random walks", Phys. Rev. E **101**, 052111 (2020).
1. **(*) F. Mori**, S. N. Majumdar, and G. Schehr, "Time between the maximum and the minimum of a stochastic process", **Phys. Rev. Lett. 123**, 200201 (2019).

INVITED TALKS

Statistical Physics & Machine Learning: moving forward *2025*
Institut d'Études Scientifiques de Cargèse (France).

Paris Biological Physics Community Day *2024*
École normale supérieure (Paris).

Workshop: Stochastic Systems in Active Matter *2024*
Isaac Newton Institute (Cambridge).

Workshop: New Vistas in Stochastic Resetting *2024*
The Higgs Centre for Theoretical Physics (Edinburgh).

Saturday Mornings of Theoretical Physics (outreach activity for Oxford Physics alumni) *2023*
University of Oxford.

Theoretical Physics Colloquium *2022*
University of Oxford.

Large Deviations, Extremes and Anomalous Transport in Non-equilibrium Systems *2022*
The Erwin Schrödinger International Institute for Mathematics and Physics (Austria).

Nordita Scientific Program "Are there universal laws in nonequilibrium physics" *2022*
Nordita Institute, Stockholm (Sweden).

INVITED SEMINARS

Mathematical Physics Group Seminar *2025*

University of Bologna.

Disordered System Seminar *2022 and 2025*
King's College London.

Condensed Matter Seminar *2025*
University of Massachusetts Amherst.

Soft Matter Seminar *2025*
University of California, Berkeley.

ML Nosh Lunch Seminar *2025*
University of Oxford.

Soft Matter Group Away Day *2024*
University of Oxford.

Soft Matter Seminar *2023*
University of California, Santa Barbara.

Soft Condensed Matter Seminar *2023*
New York University.

IPhT Seminar *2023*
Institut de Physique Théorique, Saclay.

LOMA Seminar *2023*
Laboratoire Ondes et Matière d'Aquitaine, Bordeaux.

Statistical Physics and Complexity Webinar Series *2022*
University of Edinburgh.

LuxStatMech seminar *2022*
University of Luxembourg.

LPTMC seminars *2022, 2023, and 2024*
Laboratoire de Physique Théorique de la Matière Condensée, Paris.

SIFS Young Seminar *2022*
Italian Society of Statistical Physics.

ICTS Statistical Physics Journal Club *2021*
International Centre for Theoretical Sciences, Bangalore.

CONTRIBUTED TALKS

Journée "Physique et Vivant" *2023*
Institut Jacques Monod (Paris).

Nordita Workshop: Fluctuations and First-Passage Problems *2023*
Nordita Institute, Stockholm (Sweden).

4th Course on Multiscale Integration in Biological Systems *2021*
Institut Curie, Paris (France).

Journée Systèmes & Matière Complexes *2021*
Université Paris-Saclay, Paris (France).

CONFERENCES AND SCIENTIFIC PROGRAMS

APS March Meeting *2025*

Anaheim (USA).

KITP program: Deep Learning from the Perspective of Physics and Neuroscience *2024*
KITP, Santa Barbara (USA).

APS March Meeting *2024*
Minneapolis (USA).

Computational and Systems Neuroscience (COSYNE) *2023*
Montréal (Canada).

SUMMER SCHOOLS

Cargese summer school: Energy, Information and Evolution in Biology *2024*
Cargese Institute for Scientific Studies (France)

Les Houches summer school: Theoretical Biophysics *2023*
Les Houches Physics School (France)

Les Houches summer school: Statistical Physics & Machine learning *2022*
Les Houches Physics School (France)

Beg Rohu Summer School: Statistical mechanics & emergent phenomena in biology *2021*
Beg Rohu (France)

Fundamental Problems in Statistical Physics XV *2021*
Brunico (Italy)

Spring College on the Physics of Complex Systems *2019*
ICTP (Trieste, Italy)