Etienne Lempereur

PhD in Machine Learning

Ecole Normale Supérieure
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Scholar *Github* *Linkedin*

Education

2020–2021 **ICFP Physics Master's Degree**, *ENS*.
Soft Matter and Biological Physics

2019 **Double Bachelor Maths-Physics**, *ENS*.

2018 **Ecole Normale Supérieure**, *ENS*.
Ranked 4th at the ENS ULM Maths-Physics entrance examination

2016–2017 **MPSI-MP***, *Lycée Louis Le Grand*.

Summer 2017 **L1 Degree in Law**, *La Sorbonne*.

2016 **Baccalauréat Scientifique**.

Professional Experience

2023–Present **PhD in Applied Mathematics**, *ENS*, Directed by **Stéphane Mallat**.
Modelling, Learning and Sampling High Dimensional Maximum Entropy Distributions

2024–2026 **A.I. Consultant**, *BNP Paribas*.

May – Aug. 2022 **Research Internship**, *Flatiron Institute, CCM*, New York.
Under the supervision of **Stéphane Mallat** and **Shirley Ho**
Forecast models for cosmology

Sept. 2021 – Mar. 2022 **Internship – Deep Learning for Finance**, *Capital Fund Management*.
Under the direction of **Samuel Vazquez** (Head of Directional Alpha)
Deep learning models for stock market prediction

Apr. – Jul. 2021 **Research Internship**, *CFM Chair of Econophysics & Complex Systems, Ecole Polytechnique*.
Under the direction of **Michael Benzaquen**, **Alexandre Darmon** and **Samy Lakhal**
Quantitative aesthetics through statistical physics and machine learning

Mar. – Jul. 2020 **Research Internship**, *Rudolf Peierls Centre for Theoretical Physics, University of Oxford*.
Under the direction of **Ard Louis**
Comparison of gradient descent and genetic algorithms over supervised machine learning

Summer 2019 **Research Internship**, *Paris NanoSciences Institute*.
Under the direction of **Jean Noël Aqua**
Study of Ostwald ripening over an assembly of quantum dots

Publications

2023 **Conditionally Strongly Log-Concave Generative Models**, *Proceedings of the 40th International Conference on Machine Learning (**ICML**)*.
Guth*, Lempereur*, Bruna, Mallat, arXiv:2306.00181

2024 **Hierarchic Flows to Estimate and Sample High-dimensional Probabilities**, *Applied and Computational Harmonic Analysis, Volume 83*.
Lempereur, Mallat, arXiv:2405.03468

2025 **Effective Energy, Interactions and Out-of-Equilibrium Nature of Scalar Active Matter**, ***Nature** Communications Physics, volume 8, 499*.
Brossollet*, Lempereur*, Mallat, Biroli, arXiv:2412.15175

2026 **MGD: Moment Guided Diffusion for Maximum Entropy Generation**, *Arxiv Preprint*.
Lempereur, Cuvelle-Magar, Coeurdoux, Mallat, Vanden-Eijnden, arXiv:2602.17211

2026 **Training-Free Generative Modeling via Kernelized Stochastic Interpolants**, *Arxiv Preprint*.
Coeurdoux, Lempereur, Cuvelle-Magar, Eboli, Mallat, Borovykh, Vanden-Eijnden, arXiv:2602.20070

Teaching

2022–2023 **Chargé de TD**, *CPES – Maths*, Lycée Henri IV.

2018–2023 **Maths/Physics Examiner**, *MPSI – MP**, Lycées Louis Le Grand, Saint-Louis, Charlemagne.

Computing Skills

Python TensorFlow, PyTorch libraries

M.L. Score Diffusion, Stochastic Interpolants, Signal Processing

Data Capacity to construct (data scraping) and work with large databases

Language Skills

French First language

English Fluent

Spanish Bilingual