

CEDRIC GERBELOT-BARRILLON

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RESEARCH INTERESTS

Probability and statistics in high dimension, statistical physics of disordered systems, machine learning theory

ACADEMIC POSITIONS

Assistant Professor, Unités de Mathématiques Pures et Appliquées, Ecole Normale Supérieure de Lyon, France 2024-

Courant Instructor - Courant Institute of Mathematical Sciences, New York, USA 2022-2024

EDUCATION

PhD - Ecole Normale Supérieure de Paris, France 2022

Mathematical physics and computer science.

Thesis : *Statistical learning in high dimensions : a rigorous statistical physics approach*

Advisors : Pr. Florent Krzakala (ENS-EPFL) and Pr. Marc Lelarge (ENS-INRIA).

MSc in Applied Mathematics - Ecole Normale Supérieure de Paris-Saclay, France 2019

Mathématiques, Vision, Apprentissage - Highest honors (mention très bien).

Engineer degree - Ecole Supérieure de Physique et de Chimie Industrielle, Paris, France 2019

Highest honors (mention très bien).

PUBLICATIONS

* denotes alphabetical ordering

- Ben Arous, G., Gerbelot, C* and Piccolo, V., Permutation Recovery of Spikes in Noisy High-Dimensional Tensor Estimation, *Preprint* (2024)
- Ben Arous, G., Gerbelot, C* and Piccolo, V., Stochastic Gradient Descent in High Dimensions for Multi Spiked Tensor PCA, *Preprint* (2024)
- Ben Arous, G., Gerbelot, C* and Piccolo, V., Langevin Dynamics for High Dimensional Optimization: The Case of Multi-Spiked Tensor PCA, *Preprint* (2024)
- Gerbelot, C., Avetik Karagulyan, Stefani Karp, Kavya Ravichandran, Menachem Stern and Nathan Srebro (2023) Applying statistical learning theory to deep learning, *Journal of Statistical Mechanics : Theory and Experiment, Special Issue Les Houches 2022 Lecture Notes*
- Gerbelot, C., Troiani, E., Mignacco, F., Krzakala, F., Zdeborova, L. (2024) Rigorous dynamical mean field theory for stochastic gradient descent methods. *SIAM Journal on Mathematics of Data Science (SIMODS)*
- Daniels, M., Gerbelot, C., Krzakala, F., Zdeborova, L. (2022). Multi-layer State Evolution Under Random Convolutional Designs, *Advances in Neural Information Processing Systems (Neurips)*
- Cornacchia, E., Mignacco, F., Veiga, R., Gerbelot, C., Loureiro, B., Zdeborova, L. (2022). Learning Curves for the Multiclass Teacher-Student Perceptron. *Machine Learning: Science and Technology*.

- Loureiro, B., Gerbelot, C., Refinetti, M., Krzakala, F, Zdeborova, L. (2022). Fluctuations, Bias, Variance & Ensemble of Learners: Exact Asymptotics for Convex Losses in High-Dimension. *International Conference on Machine Learning (ICML)*.
- Gerbelot, C. and Berthier, R. (2023). Graph-based approximate message passing iterations. *Information and Inference : a Journal of the IMA*.
- Loureiro, B., Sicuro, G., Gerbelot, C., Pocco, A., Krzakala, F, Zdeborova, L. (2021). Learning Gaussian Mixtures with Generalized Linear Models : Precise Asymptotics in High-dimensions. *Advances in Neural Information Processing Systems (Neurips)*, *Spotlight presentation*.
- Loureiro, B., Gerbelot, C, Cui, H, Goldt, S, Mezard, M, Krzakala, F, Zdeborova, L (2021). Capturing the learning curves of realistic data sets with a teacher-student model. *Advances in Neural Information Processing Systems (Neurips)*.
- Gerbelot, C., Abbara, A., & Krzakala, F. (2020). Asymptotic errors for teacher student convex generalized linear models (Or: How to prove Kabashima's replica formula). *IEEE Transactions on Information Theory*.
- Gerbelot, C., Abbara, A., & Krzakala, F. (2020). Asymptotic errors for convex penalized linear regression beyond Gaussian matrices. *Conference On Learning Theory (COLT)*. PMLR, vol 125,1682-1713
- Ilton, M., Couchman, M. M., Gerbelot, C., Benzaquen, M., Fowler, P. D., Stone, H. A., ... & Salez, T. (2016). Capillary leveling of freestanding liquid nanofilms. *Physical review letters*, 117(16), 167801.

SEMINARS, CONFERENCES AND SUMMER SCHOOLS

Séminaire de Probabilités ICJ/UMPA	January 2025
Courant Institute Probability Seminar	October 2024
NYU CDS Postdoc Seminar	September 2024
Joint Statistical Meetings (JSM), Portland, USA	August 2024
Conference - invited speaker	
EPFL workshop on Machine Learning Theory, Lausanne, Switzerland	May 2024
Conference - invited speaker	
NYU students and postdocs probability seminar, New York, USA	April 2024
Harvard Probability and Statistics seminar series, Cambridge, USA	March 2024
Summer school on statistical physics and machine learning, Cargèse, Corsica	August 2023
Conference - invited speaker	
High Dimensional Statistics and Random Matrices, Porquerolles, France	June 2023
Conference - invited short talk	
Princeton Workshop on Physics for Neural Networks, Princeton, USA	April 2023
Conference - invited speaker	
NYU working group on generative models seminar	November 2022
NYU CDS group seminar	October 2022
NYU Courant postdoc seminar	October 2022
Summer School on Statistical Physics and Machine Learning, Les Houches, France	August 2022
DYOGENE group seminar, INRIA, Paris, France	March 2022
Neurips 2021 (virtual)	December 2021
Contributed talk	
Neurips@Paris workshop, Sorbonne Université	December 2021
DeepMath 2021 Conference, virtual	October 2021
Contributed talk	
Workshop on Stochastic and Learning Algorithms, CIRM, Luminy, France	September 2021
Theory of Deep Learning Workshop, Isaac Newton Institute, (virtual)	August 2021
Contributed talk	

ICTP Youth in High Dimensions conference, Trieste, Italy	April 2021
Conference - invited speaker	
EPFL, Spoc+IdePhics+Pcsl group seminar, Lausanne, Switzerland	March 2021
Workshop on Statistical Physics and Machine Learning, Les Houches, France	August 2020
Summer workshop - participant and contributed talk	
ICTP Quantitative life sciences/Mathematics seminar, Trieste (virtual)	November 2020
SPHINX group seminar, Ecole Normale Supérieure, Paris, France	October 2020
33rd Conference on Learning Theory, Graz, Austria (virtual)	July 2020
Conference - contributed talk	
ICTP Workshop Youth in High Dimensions, Trieste, Italy (virtual)	April 2020
Conference - participant	
PRAIRIE AI Summer School, INRIA, Paris, France	October 2019
NTT Basic Research Labs seminar, Atsugi, Japan	August 2017

MACHINE LEARNING CONFERENCES

Advances in Neural Information Processing Systems (Neurips)	2021/2022
International Conference on Machine Learning (ICML)	2021
Conference on Learning Theory (COLT)	2020

VISITS AND INTERNSHIPS

Guest Scientist, ICTP Trieste	Summer 2021
<i>Work on the cavity method for rotationally invariant models, with Dr. Jean Barbier</i>	
Guest PhD Student, EPFL, Information, Physics and Computation Lab	2020-2022
<i>Information, Physics and Computation Lab, with Pr. Florent Krzakala</i>	
Invited researcher, The University of Tokyo, LIMMS laboratory	Summer 2019
<i>Stochastic modeling of electron transfer between moving molecules, with Dr. Nicolas Clément.</i>	
Research Intern, Ecole Normale Supérieure de Paris	Spring 2019
<i>Statistical learning, inference and statistical physics, with Pr. Florent Krzakala.</i>	
Visiting Student Research Collaborator, Princeton University	Spring 2018
<i>Viscous eddies in biharmonic axisymmetric flows, with Pr. Jens Eggers and Pr. Howard Stone.</i>	
Research Intern, NTT Basic Research Labs Atsugi	Summer/Fall 2017
<i>Full counting statistics of electron transport between moving molecules, with Dr. Nicolas Clément.</i>	
Research Intern CNRS Gulliver Laboratory Paris	Summer 2016
<i>Capillary levelling of freestanding liquid nanofilms, with Pr. Elie Raphael and Dr. Thomas Salez.</i>	

REVIEWING

- **Journals** - IEEE Transactions on Information Theory, The Annals of Statistics, Information and Inference : a journal of the IMA, Journal of Machine Learning Research, Physical Review E, Journal of Statistical Mechanics: Theory and Experiment.
- **Conferences** - Advances in Neural Information Processing Systems (Neurips) 2021/2022, International Conference on Machine Learning (ICML) 2022/2023

TEACHING (INSTRUCTOR)

NYU - Undergraduate Mathematical Statistics	Spring 2024
NYU - Graduate Essentials of Probability	Spring 2023
NYU - Graduate Computational Statistics	Fall 2022, Fall 2023

AWARDS AND FELLOWSHIPS

- Courant Instructor fellowship 2022-2025, Courant Institute of Mathematical Sciences
- Neurips 2021 Outstanding Reviewer Award

- EDPIF (Ecole Doctorale de Physique en Ile-de-France) doctoral fellowship 2019-2022
- ESPCI Alumni - Best Industrial Research Internship Award 2018

LANGUAGES

French (native), **English** (fluent), **German** (intermediate)