

# CEDRIC GERBELOT-BARRILLON

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## RESEARCH INTERESTS

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

## ACADEMIC POSITIONS

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**Courant Instructor - Courant Institute of Mathematical Sciences, New York, USA** 2022-now  
Research and teaching in mathematics and computer science.

## EDUCATION

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**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

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- Ben Arous, G., Gerbelot, C. and Piccolo, V., High-dimensional optimization for 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

<b>Joint Statistical Meetings (JSM), Portland, USA</b>	August 2024
Conference - invited speaker	
<b>EPFL workshop on Machine Learning Theory, Lausanne, Switzerland</b>	May 2024
Conference - invited speaker	
<b>NYU students and postdocs probability seminar, New York, USA</b>	April 2024
<b>Harvard Probability and Statistics seminar series, Cambridge, USA</b>	March 2024
<b>Summer school on statistical physics and machine learning, Cargese, Corsica</b>	August 2023
Conference - invited speaker	
<b>High Dimensional Statistics and Random Matrices, Porquerolles, France</b>	June 2023
Conference - invited short talk	
<b>Princeton Workshop on Physics for Neural Networks, Princeton, USA</b>	April 2023
Conference - invited speaker	
<b>NYU working group on generative models seminar</b>	November 2022
<b>NYU CDS group seminar</b>	October 2022
<b>NYU Courant postdoc seminar</b>	October 2022
<b>Summer School on Statistical Physics and Machine Learning, Les Houches, France</b>	August 2022
<b>DYOGENE group seminar, INRIA, Paris, France</b>	March 2022
<b>Neurips 2021 (virtual)</b>	December 2021
Contributed talk	
<b>Neurips@Paris workshop, Sorbonne Universite</b>	December 2021
<b>DeepMath 2021 Conference, virtual</b>	October 2021
Contributed talk	
<b>Workshop on Stochastic and Learning Algorithms, CIRM, Luminy, France</b>	September 2021
<b>Theory of Deep Learning Workshop, Isaac Newton Institute, (virtual)</b>	August 2021
Contributed talk	
<b>ICTP Youth in High Dimensions conference, Trieste, Italy</b>	April 2021
Conference - invited speaker	
<b>EPFL, Spoc+IdePhics+Pcsl group seminar, Lausanne, Switzerland</b>	March 2021
<b>Workshop on Statistical Physics and Machine Learning, Les Houches, France</b>	August 2020
Summer workshop - participant and contributed talk	
<b>ICTP Quantitative life sciences/Mathematics seminar, Trieste (virtual)</b>	November 2020
<b>SPHINX group seminar, Ecole Normale Supérieure, Paris, France</b>	October 2020
<b>33rd Conference on Learning Theory, Graz, Austria (virtual)</b>	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

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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

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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

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- **Journals** - Journal of Statistical Mechanics: Theory and Experiment, 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.
- **Conferences** - Advances in Neural Information Processing Systems (Neurips) 2021/2022, International Conference on Machine Learning (ICML) 2022/2023

## TEACHING (INSTRUCTOR)

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

## AWARDS AND FELLOWSHIPS

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- 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

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