Krzakala Florent

Researcher unique identifiers: Arxiv ,Google scholar (12000+ citation, H-index: 58), ORCID
Date of birth: 22/03/1976 Nationality: French Web site: florentkrzakala.com

- **EDUCATION**

2011 Habilitation, Université Paris 6 UPMC, France
2002 PhD thesis, Université Paris 11 Orsay, France
1999 Master Physics, Université Paris 11, Orsay, France

- **POSITIONS**

Since 2020 Full Professor EE & Physics, Ecole Polytechnique Fédérale de Lausanne, Switzerland
2013-2020 Full Professor, Sorbonne Université & Ecole Normale Supérieure, Paris
2016-2020 Holder of the Chaire ENS-CFM on data science in Ecole Normale Supérieure, Paris
2004-2013 Associate professor in Ecole Supérieure de Physique et Chimie ESPCI Paris, France
2002-2004 Post-doc in the group of Prof. Parisi @ Universita di Roma La Sapienza, Italy

- **MAJOR INVITED POSITION ABROAD**

Spring 2019 Invited Researcher @ KITP Santa Barbara USA
Spring 2018 Invited Prof. semester @ Duke University, USA, Mathematics Department
Spring 2016 Invited Researcher semester @ Berkeley University, USA, Simons Institute for Computing
2008 & 2009 Invited Researcher semester @ Los Alamos Nat. Lab. CNLS, New Mexico, USA

- **FELLOWSHIPS AND AWARDS**

2018 Prix Atos-Joseph Fourier 2018 in Artificial Intelligence
2015 - 2020 Member of the Institut Universitaire de France, Paris
2012 - 2017 PI ERC Consolidator grant project SPARCS 307087

- **SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS**

Past Phd Students

- Marylou Gabrié (*PhD 2015-2018)* now **professor** @Ecole Polytechnique, Paris, France
- Jean Barbier (*PhD 2012-2015)* now **professor** @ICTP Trieste, Italy
- Sun Yifan (*PhD* 2012) now **lecturer** @Renmin University, China
- Alaa Saade (*PhD 2012-2016)* now **researcher** @ Google Deepmind Paris, France
- Christophe Schülke (*PhD 2012-2016)* now **researcher** @ Philips research
- Andre Manoel *(PhD 2012)* now **data scientist** @Microsoft Research, MSR Redmond, USA
- Mathieu Hemery (*PhD 2012-2015*) *now* **postdoc** @ INRIA, France
- Jonathan Dong (*PhD* 2017-2020) *now* **postdoc** @ EPFL, Swiss
- Alia Abarra (*PhD 2017-2020) now* **postdoc** @ EPFL, Swiss
- Antoine Maillard (*PhD 2017-2021) now* **postdoc** @ ETH, Swiss
- Cedric Gerbelot (*PhD 2018-2022)* now **instructor** @Courrant Institute, NYU
- Ruben Ohana *(PhD 2018-2022)* now **postdoc** @Simons Institute NYU
- Maria Refinetti (*PhD 2018-2022*), now **researcher** @ GResearch

Past Postdoctoral fellows

- Gabriel Sicuro *(Postdoc 2020-2021)* now **lecturer@**King's college**,** London, UK
- Sebastian Gold (*Postdoc 2018-2020*) now **professor**@SISSA Trieste, Italy
- Laura Foini (*Postdoc 2016-2017*) now **researcher**@CNRS *Saclay,* France
- Eric Tramel, (*Postdoc 2012-2016)*, now **researcher** @Amazon Research, USA
- Angelique Drémeau (*Post-doc 2014*) now **professor**@ENSTA Bretagne, France
- Pan Zhang (*Postdoc 2012-2013)*, now **professor** @ Inst. of Theo. Physics in Beijing, China
- Luca Saglietti (*(Postdoc 2019-2020)* now **lecturer@**Boconni**,** Milan, Italy
- Boshra Rajaei (*Postdoc 2015*) now **professor**@Sadjad University, Iran
- Alejandro Lage-Castellanos (*Postdoc 2017)* now **professor** @University of Havana, Cuba
- Francesco Caltagirone (*Postdoc 2015)* now **researcher**@ Huawei research (Paris, France)
- Bruno loureiro (*Postdoc 2019-2022*) now **researcher**@CNRS *ENS PARIS,* France

Current Phd Students: *Davide Ghio, Luca Pesce, Matteo Vilucchio*
Current Postdoc Students: *Pierre Mergny, Ludovic Stephan, Damien Barbier*

- **TEACHING ACTIVITIES :** Lectures as university professor on physics, mathematics, computer science & machine learning in ***EPFL Lausanne*** (since 2021)**,** ***Sorbonne Université*** & ***Ecole Normale Supérieure*** Paris (2013-2020) and ***ESPCI Paristech*** (2004-2014). I gave many invited lectures in *summer schools* internationally in USA (Aspen, Boulder, Berkeley), China (Beijing), India (Bangalore), Italy (Trieste) & France (Les Houches). I also taught invited long lectures in statistical inference & computer science in international universities such as ***Tokyo University*** in Japan & ***Duke University*** in USA, and taught Machine Learning for private companies, such as Capital Fund Management.

•ORGANISATION OF INTERNATIONAL SCIENTIFIC MEETINGS: 8 conferences and 5 schools

- 8/2023: *Theory of machine learning* (~100 participants) in Cargese **[link]**
- 8/2022: One month school on *Theory of Machine learning* (~70 participants) in Les Houches **[link]**
- 8/2020: 2 weeks school on *Theory of Machine learning* (~40 participants) in Les Houches **[link]**
- 8/2018: *Statistics physics and machine learning* (~100 participants) in Cargese **[link]**
- 2/2017: *Statistical physics, Learning, Inference and Networks*, Les Houches ~70 participants**[link]**
- 6/2016 : *Physics methods in biology & computer science, Sat. of StatPhys2016,* in ENS, ~100 parts **[link]**
- 8/2014 : 2 weeks School on *Spin glasses,* (~100 participants) in Cargese (Corsica) **[link]**
- 9/2013 : School on *Optimization & message passing* (~70 participants) Les Houches **[link]**
- 2/2012: *Bridging Stat. physics, optimization, inference & learning*, Les Houches ~70 participants
- 12/2011 : *Disordered systems and the Jamming Transition,* IHP Paris, ~70 participants **[link]**
- 6/2011: *Conference on Physics and Biological Systems*, Orsay ~50 participants
- 11/2010: *Statistical Physics of Complexity, & Biological information,* Orsay ~50 participants
- 7-12/32010 : School on *Stat. Phys. of Biological information* (~70 participants) Les Houches

•INSTITUTIONAL RESPONSIBILITIES & REVIEWING ACTIVITIES

2018 – Editorial Board, *Journal of Statistical Mechanics* / IOP Publishing
2016 – 2020 Organizer of the data science colloquium in Ecole Normale Paris: **link: youtube channel**
2016 – Scientific Advisory Board & cofounder in **LightOn Inc**
2015 – 2017 Editorial Board, Scientific Report/ Nature Publishing
2013 Scientific Evaluation (HCERS), University of Grenoble/ France

Reviewer for physics journals (Nature, *PNAS*, Phys. Review,…) as well as in machine learning & computer science conferences (ICML, NeurIPS, ICLR, ISIT, RANDOM, IASTAT, COLT,…). Area Chair for Neurips. Reviewer for grant agencies, incl. ERC starting & advanced grants in PE1, PE2, PE6 & PE7, & French Agence Nationale de la Recherche (ANR). Member of 14 Ph.D & Habilitation committees, 7 as president.

•MAJOR COLLABORATIONS: I have published and collaborated with hundreds of colleagues & students from many countries. My main collaborators have been Marc Mézard (ENS, Paris); Cris Moore (Santa Fe, U.S.A.); Sylvain Gigan (ENS, Paris) & Lenka Zdeborova (CNRS, France). I have been blessed to collaborate earlier with the **highest-cited theoretical physicist & Nobel price winner** (Giorgio Parisi, in Rome, H-index 127) and more recently the **highest-cited machine learning statistician** (Michael Jordan, in Berkeley, H-index 194). I had successful collaborations with many well-known **mathematicians & computer scientists** such as Elchanan Mossel (MIT, USA), Alice Guionnet (ENS Lyon), Yue Lu (Harvard, USA) & Amin Coja-Oghlan (Frankfurt, Germany), **Statisticians & machine learning experts** such as Andrea Montanari (Stanford, USA) & Michael Jordan (Berkeley, USA) as well as **theoretical physicists** such as David Sherrington (Oxford, UK), Jorge Kurchan (ENS, Paris), Hidetoshi Nishimori (TokyoTech, Japan) and Massimo Vergassola (UC San Diego).

•PUBLICATION TRACK: I have published more than 150 articles in peer-reviewed international journals and conference proceedings with **12000+** citations on Google Scholar. My h-index is **58** as of March 2023, and my i10-index is 153 (121 including publ. in the last 5 years). I take interdisciplinary literally & published in major journals in physics (*Phys. Rev. Lett; Phys Rev. X*), information theory (*IEEE Trans. Inf. Theory*), mathematics (*Advances in mathematics, Annals of Statistics*) & high-impact generalist journals (*Proc. Nat. Acad. Sci.*). I also published in the most selective conferences in machine learning (*NIPS, ICML*), statistical learning theory (*COLT*), computer science (*STOC*), information theory (*ISIT, ITW*) & signal processing (*ICASPP*).

•INVITED PRESENTATION TO CONFERENCE, SCHOOLS AND UNIVERSITIES

I have given hundreds of **seminars in major universities & research centers** in physics, mathematics, computer science, electrical engineering, or statistics departments: *Princeton, Berkeley, Rudgers, Harvard, MIT, Chicago, Duke, Los Alamos, Santa Fe, New York University, ICTP Trieste, Rome, ETH Zurich, EPF Lausanne, London, Cambridge, Tokyo, etc*. and presented my work in many **international conferences & workshops** in physics, computer science & applied mathematics. I have been invited by universities to spend periods ranging from a month *(Trieste, Torino, Beijing, Tokyo, Santa Fe, Boulder)* to a full semester *(Los Alamos, Berkeley, Duke, KITP, Santa Barbara)*. Recent talks and seminars includes:

- **TOPML 2021,** *invited talk* **Generalization in Machine Learning** [video]
- **09/2021** Seminar in Simons Institute of computing @ UC Berkeley [video]
- **Alan Turing Institute in London 2020,** *invited talk* **Statistics and computation** [video]
- **NeurIPS 2019,** *invited talk* @ NeurIPS workshop **Science meets Engineering of Deep Learning** [video]
- **1-4/2018** Lectures series *Topics in Probability theory* @ Duke University, USA **[course link]**
- **STOC 2018**: Symposium on theory on computing, workshop, Los Angeles 201

Teaching records

2007-2014 - ESPCI ParisTech (undergrad):

Period	Subject	Level	Type	Number of hours
2006-2013	Statistical Physics	L3	Tutorats	20h/year
2007-2013	Mathematics	L3/M1	Tutorats & exercices	20h/year
2008-2012	Quantum Mechanics	L3	Tutorats & exercices	30h/year
2004-2013	Computer Science	L3	Lectures & exercices	120h/year

2013-2020 Université Pierre & Marie Curie, Sorbonne Universités (undergrad):

Period	Subject	Level	Type	Number of hours
2013	Physics 101	L1	Exercices	30h/year
2014-2015	Numerical methods	L3	Exercices	26h/year
2016	Waves mechanics	L2	Exercices	26h/year
2013-2015	Statistical physics	L3	Lectures	60h/year
2018-2019	Thermodynamics	L3	Exercices	30h/year
2019-2020	Machine Learning	M1	Lectures	40h/year

2020-2022 Ecole Federal Polytechnique de Lausanne (undergrad):

Period	Subject	Level	Type	Number of hours
2020- …	Quantum Mechanics	L3, Physics	Lectures	40h/year
2020- …	Statistics & ML	M1, EE	Lectures	26h/year
2020- …	Statistical Physics of computations	M1, Physics	Lectures	26h/year

Master lectures Sorbonne University (2016-2020): "Computational science" **[link]**, in the international master of complex systems **[link]**, 60h/year since 2016.

Post-graduate lectures in Ecole Normale Supérieure (2013-…):

Every year since 2014, I teach a new advanced lecture for post-graduate students in Ecole Normale Supérieure, for 30h/year:

* 2014: Statistical inference **[link]**
* 2015: Introduction to statistical learning **[link]**
* 2016: Machine Learning for Physicists **[link]**
* 2017: Deep learning: do-it-yourself **[link]** (this has been -to the best of my knowledge- the first lecture in *Deep Learning* proposed in Paris in a doctoral school)
* 2019: Introduction to machine learning: from random forrest to reinforcement learning **[link]**
* 2020: Statistical learning theory (in preparation)

Master lectures EPFL (2020- …): "Statistical physics of learning" **[link]**

Lecture given internationally in university & summer school

* Beijing (**China**), Spring School 2008 (8h) **[link]**
* Tokyo (**Japan**) Graduate lecture @ Tokyo University 2010 (8h)
* Les Houches (**France**), Predoctoral School On Statistical Physics 2015 (12h) **[link]**
* Cargese (**France**) 2015 (6h)
* Trieste (**Italy**), ICTP, Spring College School 2015 (8h) **[link]**
* Bangalore (**India**) ICTS, Winter School December 2016 (6h) **[link video]**
* UC Boulder, *Colorado* (**USA**): Juillet 2017 Summer School (8h) **[link video]**
* EPFL (Lausanne, **Switzerland**) Novembre 2017: Graduate lecture Physique/Math (16h)
* Duke University, *North Carolina* (**USA**):Math Graduate lecture, Spring 2018 (30h) **[link]**

Funding ID (last 12 years)

2022-2026: SNSF Grant "OPtimal Estimation in RAndom Generative mOdelS" **(1 000 000€)**
2019-2023: Chaire Prairie "Institut Interdisciplinaire d'Intelligence Artificielle" **(450 000€)**
2019-2021: AAP IRIS SDDS (co-PI) "Sciences des données et données de la science" **(67 500€)**
2019 : Google Cloud Research grant (20000$)
2016-2020: Holder of the chair ENS-CFM "Modèles et Sciences des données" **(200 000€/year)**
2018-2021: Agence Nationale de la Recherche Project PAIL (PI) **(270 000€)**
2018-2019: DARPA project PIMLICo (co-PI) **(121 000 $)**
2017 : Microsoft Azure Research Award (5000$)
2011-2017: ERC Consolidator (PE7) SPARCS **(1 370 000€)**
2015-2016: PSL PSI:Paris (co-PI) (**67500€**)
2012-2013: Institut des systèmes complexes, Paris (PI)(**67500€**)
2009-2010: MIT-France Seed Fund grant for Quantum Adiabatic Algorithm (co-PI) (**15000€**)

Publication list: published books, journals articles & proceedings

As of March 2023, I have published 86 papers in international peer-reviewed journals, 79 papers in international peer reviewed conference proceedings, wrote two reviews, participated in a book, edited 2, wrote 3 popularisation articles, and a patent. Details follows:

- ***Popularisation***

[3] **Artificial intelligence: From electronics to optics [link]**
S. Gigan, F. Krzakala, L. Daudet & I. Carron, Photoniques Numéro 104, Septembre-Octobre 2020

[2] **Quels algorithmes pour quelles données? [link]**
Florent Krzakala et Lenka Zdeborová La Recherche, vol 537, Juillet-Aout 2018

[1] **Un algorithme issu de la physique pour traitement du signal [link]**
Florent Krzakala La Recherche, vol 461, Février 2012

- ***Books & long Reviews***

I have written two long reviews on different aspects of my research:

[5] **Statistical physics of inference: Thresholds and algorithms [link]**
Lenka Zdeborová, Florent Krzakala Advances in Physics Volume 65, 5 (2016)

[4] **The Quantum Adiabatic Algorithm applied to random optimization problems: the quantum spin glass perspective [link]**
V. Bapst, L. Foini, F. Krzakala, G. Semerjian, F. Zamponi Physics Reports 523, 127 (2013)

I edited the lecture notes of the Les Houches school I organised in 2013

[3] **Statistical Physics, Optimization, Inference, and Message-Passing Algorithms: Lecture Notes of the Les Houches School of Physics [link]**: by F. Krzakala, F. Ricci-Tersenghi, L. Zdeborová, R. Zecchina , Eric W. Tramel and Leticia F. Cugliandolo Oxford publishing (2013)

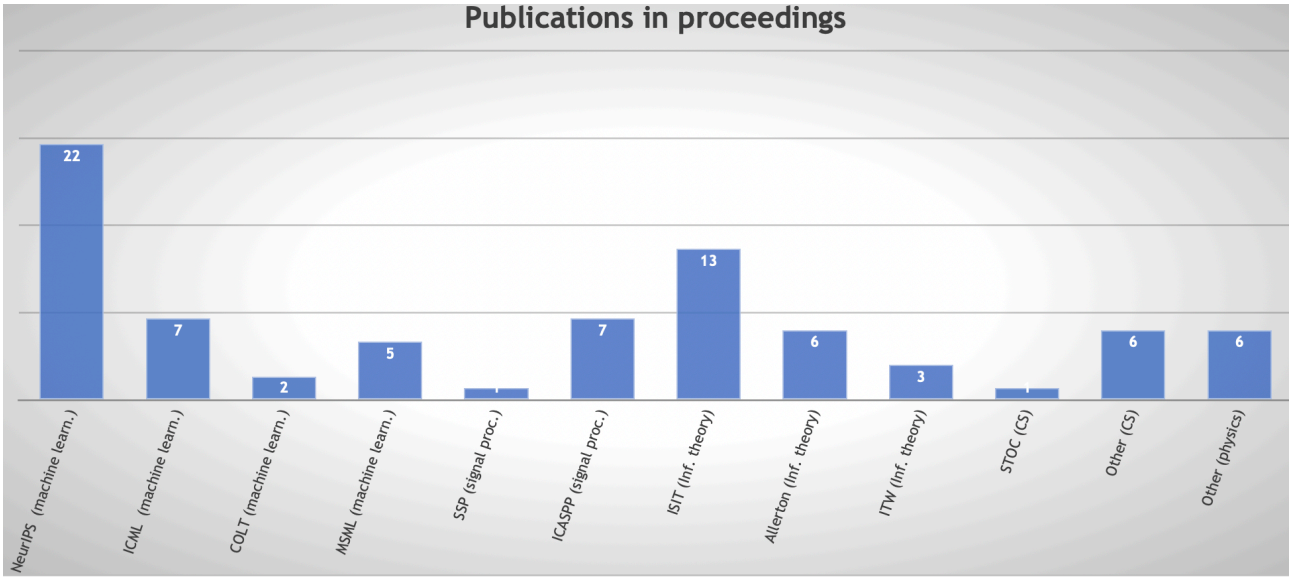
I guess-edited a special issue of Journal of Statistical Mechanics in Machine Learning

[2] **Machine Learning 2019, Journal of Statistical Mechanics: Theory and Experiment [link]**
Edited by F. M. Mezard, R. Zecchina, Y. Kabashima, B. Kappen, F. Krzakala & M. Opper.

I cowrote one chapter of the Les Houches school lecture notes I participated in 2002

[1] **Hiking through glassy phases: physics beyond aging [link]** L. Berthier, V. Viasnoff, O. White, V. Orlyanchik, FK, Lecture notes, Les Houches, July 2002 in *"Slow relaxations and nonequilibrium dynamics in condensed matter*"; Eds: J.-L. Barrat, J. Dalibard, M. Feigelman, J. Kurchan (Springer, Berlin, 2003)

- ***Conference proceedings***



As of March'23 I have published 79 papers in international peer-reviewed conferences proceedings, mainly in machine learning, information theory, signal processing & computer science.

[79] **Phase diagram of Stochastic Gradient Descent in high-dimensional two-layer neural networks** R. Veiga, L. Stephan, B. Loureiro, FK, L. Zdeborová, **[link]** *Advances in Neural Information Processing Systems,* NeurIPS'22

[78] **Subspace clustering in high-dimensions: Phase transitions & Statistical-to-Computational gap** L. Pesce, B. Loureiro, FK, L. Zdeborová, **[link]** *Advances in Neural Information Processing Systems,* NeurIPS'22

[77] **Multi-layer State Evolution Under Random Convolutional Design** M. Daniels, C. Gerbelot, F. Krzakala, L. Zdeborová **[link]** *Advances in Neural Information Processing Systems,* NeurIPS'22

[76] **Optimal denoising of rotationally invariant rectangular matrices** E. Troiani, V. Erba, FK, A. Maillard, L. Zdeborová, [link] Proc. of the 2nd Mathematical and Scientific Machine Learning Conference (MSML 2022), PMLR 190:97-112, 2022.

[75] **Fluctuations, Bias, Variance & Ensemble of Learners: Exact Asymptotics for Convex Losses in High-Dimension** B.. Loureiro, C. Gerbelot, M. Refinetti, G. Sicuro, F. Krzakala, **[link]** Proceedings of the 38th International Conference on Machine Learning (ICML '22).

[74] **Secure Coding via Gaussian Random Fields** **[link]** A. Bereyhi, B. Loureiro, F. Krzakala, R. R. Müller, H. Schulz-Baldes IEEE International Symposium on Information Theory (ISIT) (2022)

[73] **Adversarial Robustness by Design Through Analog Computing And Synthetic Gradients** **[link]** A. Cappelli, R. Ohana, J. Launay, L. Meunier, I. Poli, F. Krzakala, Proc. of the 2022 IEEE Inter. Conference on Acoustics, Speech & Signal Processing (ICASSP '22)

[72] **LightOn Optical Processing Unit: Scaling-up AI and HPC with a Non von Neumann co-processor** C. Brossollet *et al* [link] Proceedings IEEE Hot Chips 33, 2021

[71] **The Gaussian equivalence of generative models for learning with shallow neural networks** S. Goldt, B. Loureiro, G. Reeves, F. Krzakala, M. Mézard, L. Zdeborová [link] Proc. of the 2nd Mathematical and Scientific Machine Learning Conference (MSML 2021), PMLR 145:1-28, 2021

[70] **Construction of optimal spectral methods in phase retrieval**
A. Maillard, F. Krzakala, Y. M. Lu, L. Zdeborová, [link] Proc. of the 2nd Mathematical and Scientific Machine Learning Conference (MSML 2021), PMLR 145:1-28, 2021

[69] **Learning Gaussian Mixtures with Generalized Linear Models: Precise Asymptotics in High-dimensions** B.. Loureiro, G. Sicuro, C. Gerbelot, A. Pacco, F. Krzakala, L. Zdeborová **[link]**
Advances in Neural Information Processing Systems, NeurIPS'21

[68] **Generalization Error Rates in Kernel Regression: The Crossover from the Noiseless to Noisy Regime** H. Cui, B. Loureiro, F. Krzakala, L. Zdeborová **[link]**
Advances in Neural Information Processing Systems, NeurIPS'21

[67] **Learning curves of generic features maps for realistic datasets with a teacher-student model** B. Loureiro, C. Gerbelot, H. Cui, S. Goldt, F. Krzakala, M. Mézard, L. Zdeborová **[link]**
Advances in Neural Information Processing Systems, NeurIPS'21

[66] **Classifying high-dimensional Gaussian mixtures: Where kernel methods fail and neural networks succeed** M. Refinetti, S. Goldt, F. Krzakala, L. Zdeborova **[link]**
Proceedings of the 38th International Conference on Machine Learning (ICML '21).

[65] Complex Dynamics in Simple Neural Networks: Understanding Gradient Flow in Phase Retrieval **[link]** S. Sarao Mannelli, G. Biroli, C. Cammarota, F. Krzakala, P. Urbani, L. Zdeborová
Advances in Neural Information Processing Systems, NeurIPS'20

[64] **Dynamical mean-field theory for stochastic gradient descent in Gaussian mixture classification** **[link]** Francesca Mignacco, Florent Krzakala, Pierfrancesco Urbani, Lenka Zdeborová; *Advances in Neural Information Processing Systems,* NeurIPS'20

[63] **Phase retrieval in high dimensions: Statistical and computational phase transitions** **[link]**
A. Maillard, B. Loureiro, F. Krzakala, L. Zdeborová, *Advances in Neural Information Processing Systems,* NeurIPS'20

[62] **Reservoir Computing meets Recurrent Kernels and Structured Transforms** **[link]**
Jonathan Dong, Ruben Ohana, Mushegh Rafayelyan, Florent Krzakala,
Advances in Neural Information Processing Systems, *oral presentation* at NeurIPS 2020

[61] **Generalization error in high-dimensional perceptrons: Approaching Bayes error with convex optimization** **[link]** B. Aubin, F. Krzakala, Y. M. Lu, L. Zdeborová
Advances in Neural Information Processing Systems, NeurIPS'20

[60] **Direct Feedback Alignment Scales to Modern Deep Learning Tasks & Architectures** **[link]** J. Launay, I. Poli, F. Boniface, F. Krzakala, *Advances in Neural Information Proc. Syst.,* NeurIPS'20

[59] **Asymptotic errors for convex penalized linear regression beyond Gaussian matrices** Cédric Gerbelot, Alia Abbara, Florent Krzakala
Proceedings of the 33rd Annual Conference on Learning Theory (COLT 2020).

[58] **Exact asymptotics for phase retrieval and compressed sensing with random generative prior** [link] B. Aubin, B. Loureiro, A. Baker, F. Krzakala, L. Zdeborová, Proc. of the 1st Mathematical and Scientific Machine Learning Conference (MSML 2020), PMLR 107:55-73, 2020

[57] **Rademacher complexity and spin glasses: A link between the replica and statistical theories of learning** [link] A. Abbara, B. Aubin, F. Krzakala, L. Zdeborová, Proc. of the 1st Mathematical and Scientific Machine Learning Conference (MSML 2020), PMLR 107:27-54, 2020

[56] **The role of regularization in classification of high-dimensional noisy Gaussian mixture** Francesca Mignacco, Florent Krzakala, Yue Lu, Pierfrancesco Urbani & Lenka Zdeborova
Proceedings of the 37th International Conference on Machine Learning (ICML '20).

[55] **Generalisation error in learning with random features and the hidden manifold model** Federica Gerace, Bruno Loureiro, Florent Krzakala, Marc Mezard & Lenka Zdeborova
Proceedings of the 37th International Conference on Machine Learning (ICML '20).

[54] **Double Trouble in Double Descent: Bias and Variance(s) in the Lazy Regime** Stéphane d'Ascoli Maria Refinetti, Giulio Biroli, Florent Krzakala
Proceedings of the 37th International Conference on Machine Learning (ICML '20).

[53] **Kernel computations from large-scale random features obtained by Optical Processing Units** **[link]** R. Ohana, J. Wacker, J. Dong, S. Marmin, F. Krzakala, M. Filippone, L. Daudet, Proc. of the 2020 IEEE Inter. Conference on Acoustics, Speech & Signal Processing (ICASSP '20)

[52] **The spiked matrix model with generative priors** **[link]**
Benjamin Aubin, Bruno Loureiro, Antoine Maillard, Florent Krzakala, Lenka Zdeborová; *Advances in Neural Information Processing Systems,* NeurIPS'19

[51] **Dynamics of stochastic gradient descent for two-layer neural networks in the teacher-student setup** **[link]** S. Goldt, M. S. Advani, A. M. Saxe, F. Krzakala, L. Zdeborová, Advances in Neural Information Processing Systems, *oral presentation* at NeurIPS 2019

[50] **Who is Afraid of Big Bad Minima? Analysis of Gradient-Flow in a Spiked Matrix-Tensor Model** **[link]** S. Sarao Mannelli, G. Biroli, C. Cammarota, F. Krzakala, L. Zdeborová, Advances in Neural Information Processing Systems, *spotlight presentation* @ NeurIPS 2019

[49] **Passed & Spurious: analysing descent algorithms and local minima in spiked matrix-tensor model** **[link]** S. Sarao Mannelli, F. Krzakala, P. Urbani, L. Zdeborová, Proceedings of the 36th International Conference on Machine Learning (ICML '19), PMLR 97:4333-4342, 2019.

[48] **Entropy and mutual information in models of deep neural networks, [link]**
M. Gabrié, A. Manoel, C. Luneau, J. Barbier, N. Macris, F. Krzakala, L. Zdeborová , Advances in Neural Information Processing Systems, 1821-1831 spotlight presentation @ NeurIPS'18

[47] **The committee machine: Computational to statistical gaps in learning a two-layers neural network [link]** B. Aubin, A. Maillard, J. Barbier, F. Krzakala, N. Macris, L. Zdeborová, Advances in Neural Information Processing Systems, *spotlight presentation* @NeurIPS'18

[46] **Estimation in the spiked Wigner model: A short proof of the replica formula [link]**
A. El Alaoui & F. Krzakala IEEE International Symposium on Information Theory (ISIT) (2018)

[45] **Optimal Errors and Phase Transitions in High-Dimensional Generalized Linear Models [link]** J. Barbier, F. Krzakala, N. Macris, L. Miolane, L. Zdeborová
Proceedings of the 31st Conference On Learning Theory, PMLR 75:728-731, 2018.(COLT 2018)

[44] **The Mutual Information in Random Linear Estimation Beyond i.i.d. Matrices [link]**
Jean Barbier, Nicolas Macris, Antoine Maillard, Florent Krzakala
IEEE International Symposium on Information Theory (ISIT), (2018)

[43] **Scaling Up Echo-State Networks With Multiple Light Scattering [link]**
Jonathan Dong ; Sylvain Gigan ; Florent Krzakala ; Gilles Wainrib
2018 IEEE Statistical Signal Processing Workshop (SSP) (2018)

[42] **Streaming Bayesian inference: theoretical limits and mini-batch approximate message-passing [link]** A. Manoel, F. Krzakala, E. W. Tramel, L. Zdeborová , 55th Conference on Communication, Control, and Computing (Allerton), Monticello, IL, USA, 1048-1055 (2017)

[41] **Decoding from Pooled Data: Phase Transitions of Message Passing [link]**
Ahmed El Alaoui, Aaditya Ramdas, Florent Krzakala, Lenka Zdeborová, Michael I. Jordan
IEEE International Symposium on Information Theory (ISIT), pages: 2780 - 2784 (2017)

[40] **Multi-Layer Generalized Linear Estimation [link]**
Andre Manoel, Florent Krzakala, Marc Mézard, Lenka Zdeborová
IEEE International Symposium on Information Theory (ISIT), pages: 2098-2102 (2017)

[39] **Statistical and computational phase transitions in spiked tensor estimation [link]**
Thibault Lesieur, Léo Miolane, Marc Lelarge, Florent Krzakala, Lenka Zdeborová
IEEE International Symposium on Information Theory (ISIT), pages: pp. 511-515. (2017)

[38] **Information-theoretic thresholds from the cavity method [link]**
A. Coja-Oghlan, F. Krzakala, W. Perkins, L. Zdeborová, In Proceedings of 49th Annual ACM SIGACT Symposium on the Theory of Computing, Montreal, Canada, June 2017 (STOC'17)

[37] **Fast Randomized Semi-Supervised Clustering [link]**
A. Saade, F. Krzakala, M. Lelarge, L. Zdeborová, International Meeting on "High-Dimensional Data-Driven Science"(HD^3-2017), Journal of Physics: Conf. Series 1036 (2018) 012015

[36] **Phase transitions and optimal algorithms in high-dimensional Gaussian mixture clustering [link]** T. Lesieur, C. De Bacco, J. Banks, F. Krzakala, C. Moore, L. Zdeborová 2016 54th Annual Allerton Conference on Communication, Control, and Computing (Allerton)

[35] **The Mutual Information in Random Linear Estimation** [link]
Jean Barbier, Mohamad Dia, Nicolas Macris, Florent Krzakala 2016 54th Annual Allerton Conference on Communication, Control, and Computing (Allerton), Pages: 625 - 632

[34] **Mutual information for symmetric rank-one matrix estimation: A proof of the replica formula** [link] Jean Barbier, Mohamad Dia, Nicolas Macris, Florent Krzakala, Thibault Lesieur, Lenka Zdeborová Advances in Neural Information Processing Systems 29 (NIPS 2016)

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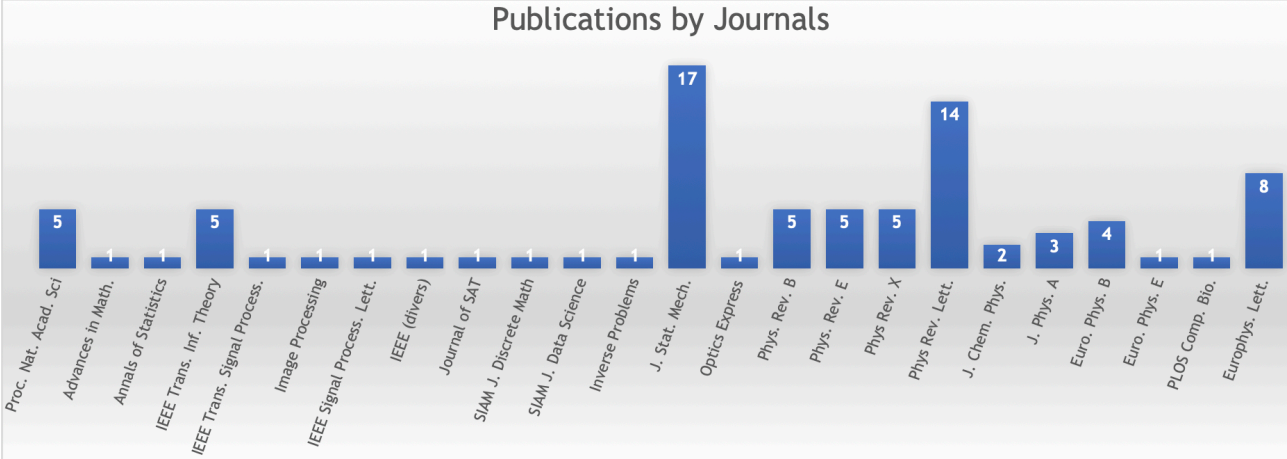

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List of seminars and conferences (more or less complete)

2023

Oberwolfach (Germany), March, ***Invited speaker*** at Random Graphs: Combinatorics, Complex Networks and Disordered Systems [link]
Les Houches (France), February, ***Invited speaker*** at statphysneuros2023 [link]

2022

Erice (Italy), January, *Invited* ***keynote*** at MECO47
Harvard May *(by zoom)*, ***Invited talk***
Cortona (Italy), April, *Invited lecturer* @ School of Mathematics of Spin Glasses, Cortona
Paris, January, *Invited talk* at Systèmes Aléatoires Inhomogènes. Institut Henry Pointcaré, France

2021

Bielefeld August, Conference on Mathematics of deep learning, ZIF, Germany
Rice, April, Workshop on the Theory of Overparameterized Machine Learning *(zoom)* [video]
Paris March, *invited talk* at in Lagrange Mathematics and Computation Research Center *(zoom)*
New York February, *invited talk* at NYU/Simons institute *(zoom)*

2020

NeurIPS'20, Vancouver, December, six papers, including an *oral presentation*
Harvard November *(by zoom)*, *invited talk* @ New Technologies in Mathematics Seminar [video]
Lisbon October *(by zoom)*, *invited talk* @ Seminar in Math., Physics & Machine Learning [video]
Berkeley September *(by zoom)*, International Semester on Probability, Geometry, and Computation in High Dimensions, *invited talk*
Berkeley September *(by zoom)*, International Semester on Probability, Geometry, and Computation in High Dimensions, set of lecture "Statistical Physics and Computation in High Dimension".
Les Houches August, set of lecture @ school Statistical Physics & Machine Learning [video]
Lausanne February, colloquium of the EE department in EPFL
London, January, *invited talk* @ Alan Turing Institute Statistics and computation [video]

2019

NeurIPS'19, Vancouver, *Invited talk @ the workshop on "Deep learning & Engineering"* [video]
NeurIPS'19, Vancouver, December, three papers with *oral & spotlight presentations*
Lausanne November, colloquium of the IC department in EPFL

Paris November, French-German conference in AI
San Sebastian September, *seminar* for in the ELLIS meeting on machine learning
Istanbul July, *seminar* in the Workshop on Theoretical Advances in Deep Learning.
Lausanne June, *seminar* for the 'theory of neural network' group in EPFL
New York April, *invited talk* at the Flatiron institute [video]
Les Houches March, *invited talk* at the 4th *Optimization & Statistical Learning* workshop.
Duke University March, *seminar* at the physics department
New York March, *seminar* @ MaD seminar, NYU Center of Datascience
Santa Barbara February, *invited talk* at the KITP institute [video]
Santa Barbara January, *talk* at the KITP institute [video]

2018

NeurIPS'18, Montreal, December, two papers with both *spotlight presentations*
Trieste, October *invited seminar* at SISSA
Rome, September *invited seminar* at workshop in honour of Giorgio Parisi's birthday
Banff (Canada), *invited talk* at the workshop Spin glass and related topic
Montreal ICMP August *invited talk* at the International Conference on Mathematical Physics
Lausanne June, *invited lecture* @ ***Bernoulli institute*** *EPFL "Applications of partition function"*
Beg ROHU *invited lecture* @ summer school on Statistical Physics of Machine Learning
STOC'18, LA (USA): *invited talk* @ Workshop *Comput. Threshold for Average-Case Problems*
London, *invited talk* @ Workshop on applied machine learning, Imperial College
Florence, *invited talk* @ Workshop on Computational Pptics
Paris *invited talk* at workshop Wendy in IHP
Duke Lectures series *Statistical physics of Learning* @ Duke University, USA [course link]
2017

Boulder (CO USA), August Lectures series *Statistical mechanics, Glasses & Inference* [video link]
Lausanne, September Lectures series *Physics, Statistics & Machine Learning* @ EPFL
San Jose (USA) June, *workshop at the American institute of mathematics*
Berkeley (USA) June, *invited talk* @ Simons Institute.
Kyoto (Japan), September, *invited talk @ workshop*
Paris March, *invited seminar* for the Smile group
San Diego (USA) February *Talk* at Information Theory and Application workshop
Bangalore (India) **Lectures series** *Statistical physics of Learning* [course link]

2016

NeurIPS'16, Barcelona, December, one paper presented
Duke November Two *invited seminars* at Duke University, Durham
Cambridge September, *talk* at the ITW 2016 conference
Aalborg (Danemark) July, *invited Keynote Talk* at **ITWIST2016** [link]
Frankfurt July, *invited talk* @ " Phase transitions in discrete structures" Goethe University.
Paris July, *invited talk* at the "Journees Claude Shannon" at LINCS
Paris May, *invited talk* @ IHP/Microsoft Workshop on *Community detection & Phase Transitions*"
Berkeley (USA) May, *invited talk* "Random phase transitions"workshop @ Simons Institute. **[link]**
NASA (USA) April 2016 seminar in the quantum theory group in Montain View.
San Diego (USA) February *Talk* at Information Theory and Application workshop
Berkeley (USA) January *invited talk* at the Bootcamp on "phase transitions" @ Simons Institute.

2015

NIPS 2015, Montreal December**,** one paper presented
Lyon GRESTSI, September ***invited plenary*** *Talk* in Lyon. **[video link]**
Cargese (Corsica) September, 2H *invited lecture* at school on random graphes.
Harvard (USA) August, *invited talk* at the Conference on Big Data**[video link]**
Les Houches (France) June, *12H invited lecture* at Physics school of Les Houches, for the International Doctoral Training in Statistical Physics 2015
Trieste (Italy) June, *10H invited lecture* at the International Centre for Theoretical Physics, for the Spring College on the Physics of Complex Systems 2015
Paris ENS May, *seminar* in the DI (computer Science department).

Cargese (France) May, *invited seminar* at the workshop "Wave physics"
Paris (IT) February, *invited talk* at the IHP Workshop "Community detection"
Berkeley (USA) February, *invited talk* at the Workshop "Coding theory" @ Simons Institute
Bardinecchia (IT) February, *invited talk* at the Workshop "Biological network" Paris (IT)

2014

NIPS 2014, Montreal December**,** one paper presented
Paris November, *invited talk* at the IHP Workshop "random matrices"
MIT (USA) August, *seminar*
Boston (USA Juin, *talk* at the CCP 2014 conference
Honolulu (USA June, *talk* at the ISIT 2014 conference
Warwick (UK) May, *invited talk* Phase trans. in discr. structures & comp. problems @EPSRC
Paris March , *seminar* at Ecole Centrale.

2013

NIPS 2013, lake Tahoe December**,** one paper presented
Paris November, *seminar* at the APC, Paris
Paris November, *invited talk* at the GDR Phenix-ISIS
Gottingen November, *invited talk* at the Workshop "Compressive Sensing"
Sevilla September, *talk* at the ITW 2013 conference
Sappuro, Japan, July, *invited talk* at "Inference, Computation, and Spin Glasses"
Seoul, Korea, July, *talk* at the STATPHYS 25 conference
Lausanne June, *talk* at the SPARS2013 conference in EPFL
Vancouver May, *talk* at the ICASSP 2013 conference
New york May, *seminar* at the physics institute in NYU.

2012

Paris December, talk at the Tomographic Reconstruction Workshop in Paris
Paris November, seminar at the institut de Simulation de Jussieu.
Oldenburg (Germany) November, seminar in the physics department.
Rennes November, seminar in INRIA.
Allerton October, talk at the 50th Conference on Communication, Control, and Comp..
Aspen (CO USA), August, Workshop in the Center of Physics. seminar
Los Alamos (NM USA), August, seminar: Colloquium CNLS in Los Alamos LANL
Paris (France), Juin, invited public talk at the Journées "Complexité/désordre".
Paris (France)), Juin, invited talk at Interdisciplinary Workshop on Inference.
Paris (France), Juin, seminar at Capital Fund Management.
Paris (France), May, invited talk in IHP Disordered Quantum Systems meeting.
Nancy (France), May, invited talk at SPLDS 2012.
Philips Research (France), April, seminar at the Suresnes department.
Lyon (France),March, seminar at the ENS Lyon.
Saclay (France),March, seminar at the Service of Astrophysics.
Saclay (France),January, seminar Triangle de la physique.

2011

Paris (France), December, *invited talk* at Unifying concept in glass physics IV.
Paris (France),November, *seminar* at ESPCI.
Rome (Italy), March, *seminar* at University of Roma La Sapienza.
Bardonecchia (Italy) Feb., *invited talk* workshop Stat. phys. complexity, opti. & systems biology.

2010

Tokyo, November, *invited talk* at the workshop on complex system in Tokyo.
Harvard (USA), October, *seminar* Squishy Physics talks.
Orsay September, workshop on Statistical physics, complexity, opt. & biological information, talk.
Hong Kong, July, STATPHYS 25: Complexity, Computation and Information, *talk*.
Beijing(China), July, Beihang University, *invited seminar.*
Beijing(China), July, STATPHYS 24 Satellite : Statistical Physics & Computer Science, i*nvited talk*
Trieste ICTP, June, *invited talk* @ Workshop Quantum Stat. Mech. Computation & Information

Saclay (France) , Mai, Ipht, groupe des systemes vitreux *seminar*.
Los Alamos (NM USA), April, Condensed matter group *seminar*.
Los Alamos (NM USA), April Quantum lunch *seminar*.

2009

Trieste ICTP, November *seminar* in the Statistical Physics Group.
Barcelona, October, *invited talk* @ Workshop on Tech. & Challenges from Statistical Physics
Chicago (USA), October, seminar in the center of physics.
Santa Fe (NM USA), September, *invited talk* @ conference of "Physics of algorithms".
Los Alamos (NM USA), April, seminar in (CNLS) Los Alamos Nat. Lab.
MIT Cambridge (USA), February, visiting scientist in the Cent. Theor. Physics
Amherst (USA), February, seminar in the Theoritical physics department

2008

Kyoto (Japan), November 2008, *invited talk* at the Unifying concept in glass physics.
Kyoto (Japan), November 2008, *talk* in the French-Japan meeting at the Yukawa Institute.
Los Alamos (NM USA), October 2008, *seminar* in Los Alamos Nat. Lab.
Santa Fe (NM USA), October 2008, *seminar* in the Santa Fe Institute.
Princeton (NJ USA), October 2008, *seminar* in the center of physics
Rutgers University (NJ USA), October 2008, *invited talk* in the DIMACS workshop.
Los Alamos (NM USA), October 2008, *seminar* in Los Alamos Nat. Lab.
Aspen (CO USA), June 2008, Workshop in the Center of Physics.
Los Alamos (NM USA), May 2008, *seminar* in Los Alamos Nat. Lab.
Stockholm(Sweden), May 2008, Workshop on Physics and Computation, *invited talk.*
Beijing(China), March 2008, Workshop on Collective Dynamics of info. System, *invited lecture.*

2007

Braga(Portugal), November 2007, Workshop on complex network, invited talk. Kyoto(Japan),
Kyoto September 2007, International Workshop on Statistical-Mechanical Informatics, invited talk.
Genova, July 2007, STATPHYS 23, poster
Paris, June 2007, Summer school on Spin Glasses 2007, invited lecture.
Zurich, April 2007, ETH Theory Seminar.
Lyon, March 2007, seminar at ENS.
Paris, January 2007, Journees de Physique Statistique 2007, at ESPCI, talk.
Torino, Januray 2007, seminar in the at ISI.

2006

Koln, July 2006, seminar in the physics department.
Paris, January 2006, Journées de Physique Statistique 2006, at ESPCI, talk.

2005

Lyon, Novermber 2005, CECAM Tutorial on polymers and colloids
Luxembourg, September 2005, School on aging and glassy dynamics, talk+proceedings.
Leuven, ITF, September 2005, Random Graph 2005, invited talk.
Lyon, CECAM, April 2005, Conference on Monte-Carlo Methods, talk.
Roma, Universita La Sapienza, March 2005, seminar.
Les Houches, February 2005 Winter School on complex system.

2004

Trieste (Italie), september 2004 Complex system meeting, *talk*.
Tokyo (Japan), July 2004 STATPHYS22 Satelite meeting, *talk*.
Bangalore (India), June 2004 Unifying concept in glass physics *invited talk*.
Nancy, May 2004 Workshop on Ageing and slow dynamics, *talk*.
Paris, May 2004, *seminar* at ESPCI PCT.

Rome, La Sapienza, March 2004, *seminar*.
Paris, Saclay, CEA Spht, January 2004, CEA Spht, *seminar*.
Paris, Orsay, LPT, January 2004, LPT and LPTMS, *seminar*.

2003

Cagliari (Italia), September, General SPHINX Meeting, *talk*.
Salerno, May, Physics department, *seminar*.
Paris, LPTL, May, *seminar*.
Napoli, April, Physics department, *seminar*.
Saarbrucken, MECO 28, March, *talk*.
Montpellier, March, *seminar* at laboratoire des verres.
Les Houches, March School on complexity, *talk*.

2002

Rome Complexity meeting, September, poster.
Marseille JMC8, August Journées de la matière condensée, *talk*.
Les Houches, July Summer school on theoritical physics of aging, *poster+proceedings* [link].
Rome SMC, February Unifying concept in glass physics II, *poster*.
Paris, February, *seminar* at ESPCI PCT.
Paris, January, Journees de Physique Statistique 2002, at ESPCI, *talk*.

2001

Barcelona, December 2001, *seminar* at Departament de Fisica Fonamental.
Orsay, September 2001, *seminar* at LPTMS.
Il Ciocco (Italia), September 2001, General SPHINX Meeting, *talk*.
Montpellier, January 2001, Structure et Dynamique des systèmes désordonnés

XXth century

Saclay, June 2000, The Fifth Claude Itzykson Meeting, *poster*.
Orsay, April 2000, *seminar* at LPTMS, Orsay
Nancy, February 2000, 25 MECO Meeting, *poster*.
Paris, February 2000, Journées de physique statistique 2000, *talk*.
Trieste ICTP, September 1999 Unifying concept in glass physics, participant