Raphaël Berthier

Curriculum Vitae

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Research

- Since 2021 **Post-doctoral researcher in the Collaboration on the Theoretical Foundations of Deep Learning (funded by the National Science Foundation and the Simons Foundation)**, hosted at EPFL (Lausanne, Switzerland), in collaboration with Emmanuel Abbe and Andrea Montanari.
- 2018-2021 PhD in the SIERRA team (INRIA, DI ENS, CNRS, in Paris) under the supervision of Francis Bach and Pierre Gaillard

Subject: analysis and acceleration of gradient descents and gossip algorithms.

Spring 2017 Internship in Stanford University, under the supervision of Andrea Montanari, 4 months

Subject: compressed sensing and approximate message passing algorithms.

Studies

- 2014-2018 Studies at the Ecole Normale Supérieure Ulm (Paris)
- 2016-2017 Master 2 in probabilities and statistics, University Paris-Sud (Orsay)
- 2015-2016 Master 1 in fundamental mathematics, ENS Ulm
- Summer 2015 Internship at Qucit (start-up in Bordeaux, France), 2 months Subject: statistical inference of urban movements, in particular using databases of bicyclesharing systems.
 - 2014-2015 **Bachelor of Science in mathematics and in computer science**, "Licence" in *french*, ENS Ulm
 - July 2014 Admitted to the Ecole Normale Supérieure (Paris), competitive exam, section mathematics physics computer science
 - 2012-2014 **Preparation for the competitive exam of the ENS**, *mathematics and physics section*, preparation school of the Lycée Marcelin Berthelot, Saint-Maur-des-Fossés
 - 2012 **Baccalauréat (french high-school degree)**, Scientific and international english sections

Publications and preprints

- 2023 **P. Marion and R. Berthier**, *Leveraging the two timescale regime to demonstrate convergence of neural networks*, preprint arXiv 2304.09576
- 2023 R. Berthier, A. Montanari and K. Zhou, *Learning time-scales in two-layers neural networks*, preprint arXiv 2303.00055

- 2023 **R. Berthier**, *Incremental learning in diagonal linear networks*, Journal of Machine Learning Research (JMLR), 24(171):1–26.
- 2022 **R. Berthier and M. Li**, *Acceleration of gossip algorithms through the Euler-Poisson-Darboux equation*, IMA Journal of Applied Mathematics, 87(6):985–1009.
- 2021 **C. Gerbelot and R. Berthier**, *Graph-based approximate message passing iterations*, accepted for publication in Information and Inference: a Journal of the IMA, preprint arXiv 2109.11905.
- 2021 M. Even, R. Berthier, F. Bach, N. Flammarion, P. Gaillard, H. Hendrikx, L. Massoulié and A. Taylor, A continuized view on Nesterov acceleration for stochastic gradient descent and randomized gossip, outstanding paper award and oral at Advances in Neural Information Processing Systems (NeurIPS)
- 2020 **R. Berthier, F. Bach and P. Gaillard**, *Tight nonparametric convergence rates for stochastic gradient descent under the noiseless linear model*, Advances in Neural Information Processing Systems (NeurIPS)
- 2020 **R. Berthier, F. Bach and P. Gaillard**, *Accelerated gossip in networks of given dimension using Jacobi polynomial iterations*, SIAM Journal on Mathematics of Data Science, 2(1):24–47.
- 2018 **R. Berthier, A. Montanari and P.-M. Nguyen**, *State evolution for approximate message passing with non-separable functions*, Information and Inference: a Journal of the IMA, 9(1):33–79.

Invited seminars

- Oct. 2022 CIRM, Marseille, "Learning and optimization in Luminy" conference
- Dec. 2021 NeurIPS oral, A continuized view on Nesterov acceleration for stochastic gradient descent and randomized gossip, joint work with M. Even, F. Bach, N. Flammarion, P. Gaillard, H. Hendrikx, L. Massoulié and A. Taylor
- Aug. 2020 Les Houches, France, "Statistical physics and machine learning" summer school

Research talks

- Apr. 2023 University of Toronto, seminar of the team of Murat Erdogdu (virtual)
- Jan. 2023 Laboratoire de Mathématiques d'Orsay, Université Paris-Saclay, seminar of the statistics team
- Jan. 2023 Télécom Paris, seminar of the team "Signal, Statistique et Apprentissage" (S2A)
- Dec. 2022 LAMSADE, Dauphine university, Paris, MILES team seminar
- Apr. 2022 UC Louvain, Louvain-la-Neuve, Mathematical Engineering department (INMA) seminar
- Feb. 2022 Stanford University, Information Systems Laboratory Colloquium
- Dec. 2021 Simons institute, Berkeley, Deep Learning Theory Symposium
- Oct. 2021 EPFL, Lausanne, FLAIR meeting
- Aug. 2020 Bernoulli-IMS One World Symposium 2020
- Nov. 2019 New York University, MIC group meeting

- Nov. 2017 École Normale Supérieure, Paris, Golosino seminar
- Nov. 2017 Institut Henri Poincaré, Paris, SMILE seminar
- Oct. 2017 INRIA Paris, seminar of the SIERRA team

Teaching

- 2022 Lecturer in inference on graphs, doctoral level, EPFL, Lausanne
- 2022 Lecturer in probability and statistics theory, bachelor level, EPFL, Lausanne
- 2019-2021 **Teaching assistant in statistical learning** Ecole Normale Supérieure, Paris
- 2019-2020 Lecturer in linear algebra Pluridisciplinary Cycle in Economics and Social sciences, PSL Research University, Paris
- 2014-2017 Oral examinations in mathematics in "classe préparatoire" (equivalent to first and second year university students in mathematics) at the school Louis-le-Grand, in Paris, at the school Marcelin Berthelot, in Saint-Maur-des-Fossés, France.