

Raphaël Berthier

Curriculum Vitae

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🌐 <https://raphael-berthier.github.io/>

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 bicycle-sharing 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

- 2022 **R. Berthier**, *Incremental Learning in Diagonal Linear Networks*, preprint HAL hal-03764301, submitted.
- 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*, preprint arXiv 2109.11905, submitted.
- 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.