

BENJAMIN AUBIN

Intern at Facebook AI Research, NY & Paris

Ph.D in Machine Learning, Institut de Physique Théorique, CEA Saclay & ENS Paris

Alumni of Ecole Polytechnique, Paris

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Currently intern at Facebook AI Research, I have just completed my PhD and am looking for a position in fundamental research or R&D in machine learning to start in early 2021.

🔍 RESEARCH INTERESTS

Design algorithm that implicitly learn causal/invariant representations. Natural Language Processing. Statistical physics of disordered systems, information theory, statistical inference and message-passing algorithms and their applications to theoretical machine learning.

🎓 EDUCATION

📅 2017 - 2020 **Ph.D. in Machine Learning** Institute for Theoretical Physics, Saclay

Mean-field methods and algorithmic perspectives for high-dimensional machine learning

Supervisors: Lenka Zdeborova & Florent Krzakala

📅 2016 - 2017 **M.Sc. in Theoretical Physics** Ecole Normale Supérieure, Paris

Masters of Science in Theoretical Physics, International Center for Fundamental Physics (ICFP)

Track: Macroscopic physics and complex systems

📅 2013 - 2016 **M.Sc & B.Sc. in Engineering** Ecole Polytechnique, Paris

Leading French Graduate School of Engineering

Statistical physics, Quantum physics, Applied mathematics, Computer science

📅 2011 - 2013 **C.P.G.E** Lycée Henri IV, Paris

Preparation for national competitive entrance examination to leading French "Grandes Ecoles"

Specializing in mathematics, physics and chemistry

📅 2010 **Scientific baccalaureate** Lycée Jean Giraudoux, Chateauroux

🏛️ ACADEMIC EXPERIENCE

📅 Mar - Jun 2017 **Master thesis** Institute for Theoretical Physics (IPhT), Paris

Storage capacity of symmetric binary perceptrons

Supervisor: Lenka Zdeborova & Florent Krzakala

📅 Apr - Aug 2016 **Master thesis** Massachusetts Institute of Technology, Boston, USA

Snell's law and walking droplets

Supervisors: John W.M Bush & Pierre-Thomas Brun

📅 Sep - Apr 2016 **Scientific project** Laboratoire de Physique des Solides, Orsay, France

Theoretical electronic band structure of new two-dimensional quantum materials

Supervisors: Mark Goerbig & Gilles Montambaux

🧰 INDUSTRY EXPERIENCE

📅 Mar - Dec 2020 **Research internship** Facebook AI Research (FAIR), New York, USA

Designing gradient-based algorithms that implicitly learn invariant representations for out-of-distribution generalization

Supervisor: Léon Bottou, David Lopez-Paz

✂ SKILLS & STRENGTHS

Statistical physics Disordered systems Message passing algorithms High-dimensional probabilities
Machine learning Deep learning
Machine learning
Python Julia Pytorch Scikit-Learn TensorFlow
Devops
Git, Github Bash, PBS Docker, Kubernetes Rust
Frontend
HTML CSS JS React.js ReactNative
Backend
Java C++ Matlab PHP, SQL
Others
Latex, Beamer, Overleaf Dropbox, Slack Office Suite Adobe Creative Suite

📖 LIST OF PUBLICATIONS

Conference Proceedings

- Aubin, Benjamin, Słowik Agnieszka, et al. (2020). "Linear unit-tests for invariance discovery". In: *Accepted to Causal Discovery & Causality-Inspired Machine Learning Workshop at Neural Information Processing Systems 2020*.
- Aubin, Benjamin, Florent Krzakala, and al. (2020). "Generalization error in high-dimensional perceptrons: Approaching Bayes error with convex optimization". In: *Accepted to Neural Information Processing Systems 2020*. arXiv: [2006.06560](https://arxiv.org/abs/2006.06560) [stat.ML].
- Abbara, Alia, Aubin, Benjamin, and al. (2019). "Rademacher complexity and spin glasses: A link between the replica and statistical theories of learning". In: *Mathematical and Scientific Machine Learning 2020*. arXiv: [1912.02729](https://arxiv.org/abs/1912.02729) [cond-mat.dis-nn].
- Aubin, Benjamin, Bruno Loureiro, Antoine Baker, et al. (2019). "Exact asymptotics for phase retrieval and compressed sensing with random generative priors". In: *Mathematical and Scientific Machine Learning 2020*. arXiv: [1912.02008](https://arxiv.org/abs/1912.02008) [math.ST].
- Aubin, Benjamin, Bruno Loureiro, Antoine Maillard, et al. (2019). "The spiked matrix model with generative priors". In: *Advances in Neural Information Processing Systems 32*, pp. 8364–8375. arXiv: [1905.12385](https://arxiv.org/abs/1905.12385) [math.ST].
- Aubin, Benjamin and al. (2018). "The committee machine: Computational to statistical gaps in learning a two-layers neural network". In: *Advances in Neural Information Processing Systems 31*, pp. 3227–3238. arXiv: [1806.05451](https://arxiv.org/abs/1806.05451) [cs.LG].

Journal Articles

- Baker, Antoine, Aubin, Benjamin, and al. (2020). "TRAMP: Compositional Inference with TRee Approximate Message Passing". In: *Submitted to Journal of Machine Learning Research*. arXiv: [2004.01571](https://arxiv.org/abs/2004.01571) [stat.ML].
- Aubin, Benjamin, Will Perkins, and Lenka Zdeborová (June 2019). "Storage capacity in symmetric binary perceptrons". In: *Journal of Physics A: Mathematical and Theoretical* 52.29, p. 294003. DOI: [10.1088/1751-8121/ab227a](https://doi.org/10.1088/1751-8121/ab227a).

🔗 CODING PROJECTS

- Tree Approximate Message Passing (TRAMP): Open source implementation of Gaussian expectation propagation for any tree-like probabilistic graphical model - Documentation <https://sphinxteam.github.io/tramp.docs>
- Linear unit-tests for invariance discovery: Implementation of several simple linear unit-tests to benchmark variants of gradient-based empirical risk minimization that implicitly remove spurious features and rely only on invariant features - Accepted to Causal Discovery & Causality-Inspired Machine Learning workshop at NeurIPS 2020 <https://github.com/facebookresearch/InvarianceUnitTests>

LANGUAGES

French



English



German



FELLOWSHIP

- 2017-2020: PhD scholarship - Ministerial allowance

TEACHING EXPERIENCE

- 2014 - 2020: Oral examination in CPGE Lycée Henri IV - Lycée Saint-Louis, Paris - Physics L1-L3: classical and quantum mechanics, optics, thermodynamics, electromagnetism
- Spring 2018: Teaching assistant - École Centrale Paris - Statistical physics and applications M1

EXTRA EDUCATIONAL EXPERIENCE

- 2019: HDP A - High dimensional probability and algorithms
- 2019: INRIA - A numerical introduction to optimal transport
- 2018: Beg Rohu - Deep Learning and Statistical Physics
- 2017: Boulder School - Frustrated and Disordered Systems
- 2017: Les Houches - Statistical physics, Learning, Inference and Networks
- 2014: Military and human education, leadership training - 1er Régiment de Chasseurs Parachutistes, Pamiers, France

TALKS & SCIENTIFIC VISITS

- 2020: MSML - Conference - Talk: Rademacher complexity and spin glasses: A link between the replica and statistical theories of learning
- 2020: MSML - Conference - Talk: Exact asymptotics for phase retrieval and compressed sensing with random generative priors
- 2019: NeurIPS - Conference - Poster presentation: The spiked matrix model with generative priors
- 2019: NeurIPS - Workshop Deep Inverse - Precise asymptotics for phase retrieval and compressed sensing
- 2019: IMBM Istanbul - Workshop on Theoretical Advances in Deep Learning - Talk: Are generative priors the new sparsity?
- 2019: KITP Conference - Rough Landscapes: From Physics to Algorithms - Tutorial: Approximate message passing algorithm
- 2018: NeurIPS - Conference - Spotlight presentation & poster: The committee machine: Computational to statistical gaps in learning a two-layers neural network
- 2018: Cargese - Statistical physics and machine learning back together - Poster: Storage capacity in symmetric binary perceptrons
- 2018: Duke University - Deep Learning Theory reading group - Talk: Rademacher Complexity and Spin Glasses: The Hidden link between Replica and Statistical Learning Theories