Quentin Bertrand

Education & Experience

2024–now	**Permanent Researcher**, *Inria Lyon, Laboratoire Hubert Curien*, Saint-Étienne.
2021–2024	**Postdoctoral Researcher**, *Université de Montréal and Mila*, Montréal.
2018–2021	**PhD in Computer Science**, *Inria*, Saclay.
2017–2018	**MS in Computer Science**, *École Normale Supérieure*, Cachan.
2014–2017	**BS and MS in Engineering**, *École polytechnique*, Palaiseau.

Research Highlights

Current research. I recently joined Inria as a permanent researcher. I work on optimization for generative models with applications to physics. Before I was postdoctoral researcher at Mila under the supervision of Gauthier Gidel and Simon Lacoste-Julien. I work at the intersection of optimization and generative models:

- Representation Learning and Deep Generative Models:
    - I show that retraining generative models on their own data can yield a stable process[12], additionally I drew connection with reinforcement learning with human feedback [11].
    - I showed that representation learning based on sparse bilevel optimization yields disentangled representations [6].
    - I extended the notion of Elo score for cyclic games [10], which has applications to non-transitive reward models in RLHF.
- Optimization:
    - I showed that optimal algorithms for function value minimization are not optimal for unrolled-estimated Jacobians [9].
    - I developed a generic algorithm to efficiently solve sparse linear models [7], code.

Previous research. Prior to this position, I completed my PhD [3] in statistics and optimization under the supervision of Joseph Salmon and Alexandre Gramfort (core `scikit-learn` contributor). I worked on model calibration for high dimensional sparse linear regression applied to brain signals reconstruction [2]:

- Large-scale optimization:
    - Proposed Anderson extrapolation to accelerate coordinate descent algorithms [4].
    - Showed support identification and local linear convergence of coordinate descent [5].
- Automatic differentiation:
    - Developed algorithms for fast hyperparameter optimization of Lasso-type models [1].
    - Provided a high quality python package for model selection: `sparse-ho` [8].

Internships

2017	**Stanford Research Institute**, *Research Intern*, Menlo Park, CA.

- Worked on the DARPA project Probabilistic Programming for Advanced Machine Learning.
- Developed and implemented new algorithms to compute exact bounds in graphical models.

References

[1] Q. **Bertrand**, Q. Klopfenstein, M. Blondel, S. Vaiter, A. Gramfort, and J. Salmon. Implicit differentiation of lasso-type models for hyperparameter optimization. *ICML*, 2020.

[2] P.-A. Bannier, Q. **Bertrand**, J. Salmon, and A. Gramfort. Electromagnetic neural source imaging under sparsity constraints with sure-based hyperparameter tuning. *Medical Imaging meets NeurIPS*, 2021.

[3] Q. **Bertrand**. *Hyperparameter selection for high dimensional sparse learning: application to neuroimaging*. PhD thesis, Université Paris-Saclay, 2021.

[4] Q. **Bertrand** and M. Massias. Anderson acceleration of coordinate descent. *AISTATS*, 2021.

[5] Q. Klopfenstein, Q. **Bertrand**, A. Gramfort, J. Salmon, and S. Vaiter. Model identification and local linear convergence of coordinate descent. *(Accepted under minor revisions in Optimization Letters)*, 2022.

[6] S. Lachapelle, T. Deleu, D. Mahajan, I. Mitliagkas, Y. Bengio, S. Lacoste-Julien, and Q. **Bertrand**. Synergies between disentanglement and sparsity: a multi-task learning perspective. *arXiv preprint arXiv:2211.14666*, 2022.

[7] Q. **Bertrand**, Q. Klopfenstein, P.-A. Bannier, G. Gidel, and M. Massias. Beyond L1: Faster and better sparse models with skglm. *Advances in neural information processing systems*, 2022.

[8] Q. **Bertrand**, Q. Klopfenstein, M. Massias, M. Blondel, S. Vaiter, A. Gramfort, and J. Salmon. Implicit differentiation for fast hyperparameter selcetion in non-smooth convex learning. *J. Mach. Learn. Res.*, 2022.

[9] D. Scieur, Q. **Bertrand**, G. Gidel, and F. Pedregosa. The curse of unrolling: Rate of differentiating through optimization. *Advances in neural information processing systems*, 2022.

[10] Q. **Bertrand**, W. M. Czarnecki, and G. Gidel. On the limitations of Elo: Real-world games, are transitive, not additive. *AISTATS*, 2023.

[11] D. Ferbach, Q. **Bertrand**, A. J. Bose, and G. Gidel. Self-consuming generative models with curated data provably optimize human preferences. *arXiv preprint arXiv:2407.09499*, 2024.

[12] Q. **Bertrand**, A. J. Bose, A. Duplessis, M. Jiralerspong, and G. Gidel. On the stability of iterative retraining of generative models on their own data. *ICLR*, 2024.

Teaching

2022-2024   Adversarial Machine Learning, Université de Montréal, **Teaching Assistant**, **Guest Lecturer**, Prof.: G. Gidel.

2022	I was responsible for the deep learning part of the first all-in-French artificial intelligence MOOC. I shoot around ten videos of twenty minutes covering basic (what is a neural network), to advanced techniques (representation / transfer learning).
2020-2021	Optimization for Machine Learning, Data Science Summer School of École polytechnique, **Lecturer**, 6h.
2020-2021	Python for Data Science, MS X-HEC, **Teaching Assistant**, 40h.
2019-2021	Optimization for Data Science, MS Data Science, **Teaching Assistant**, 2*20h, Prof.: A. Gramfort and R. Gower.
2019-2020	Numerical Methods and Applications, BS ENSAE, **Teaching Assistant**, 30h, Prof.: S. M. Kaber.

Awards

2021-2022	Oustanding reviewer award at NeurIPS (top 8%).
2019	NeurIPS travel award, I was awarded a grant from GDRIA to visit Samuel Vaiter.

Miscellaneous

On my free time I like to swim (4h a week) and to play chess (2200 elo).