

# Quentin Bertrand

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## Education & Experience

- 2021–now **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 am a postdoctoral researcher at [Mila](#) under the supervision of [Gauthier Gidel](#) and [Simon Lacoste-Julien](#). I work at the intersection of game theory and optimization for fast hyperparameter optimization. In particular:

- I extended the notion of [Elo score for cyclic games](#) [9].
- I developed a [generic algorithm to efficiently solve sparse linear models](#) [10], [code](#).
- I showed that optimal algorithms for [function value minimization are not optimal for unrolled-estimated Jacobians](#) [12].
- I showed that representation learning based on [sparse bilevel optimization yields disentangled representations](#) [8].

**Previous research.** Prior to this position, I completed my PhD [5] 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 [4]:

- Coordinate descent algorithms:
  - Proposed [Anderson extrapolation to accelerate coordinate descent](#) algorithms [6].
  - Showed [support identification and local linear convergence of coordinate descent](#) [7].
- Model calibration as an hyperparameter optimization problem:
  - Developed algorithms for [fast hyperparameter optimization of Lasso-type models](#) [3].
  - Provided a [high quality python package](#) for model selection: `sparse-ho` [11].
- Model calibration as a statistical problem:
  - Theoretically studied the [statistical influence of smoothing parameters](#) for the *square-root Lasso* and the *multivariate square-root Lasso* [2].
  - Formulated optimization problems to handle sparse linear regression with correlated noise as smoothing-based optimization problems, [1], [code](#).

## Work Experience

- 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**, M. Massias, A. Gramfort, and J. Salmon. Handling correlated and repeated measurements with the smoothed multivariate square-root lasso. *NeurIPS*,

2019.

- [2] M. Massias, Q. **Bertrand**, A. Gramfort, and J. Salmon. Support recovery and sup-norm convergence rates for sparse pivotal estimation. *AISTATS*, 2020.
- [3] Q. **Bertrand**, Q. Klopfenstein, M. Blondel, S. Vaiteer, A. Gramfort, and J. Salmon. Implicit differentiation of lasso-type models for hyperparameter optimization. *ICML*, 2020.
- [4] 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.
- [5] Q. **Bertrand**. *Hyperparameter selection for high dimensional sparse learning: application to neuroimaging*. PhD thesis, Université Paris-Saclay, 2021.
- [6] Q. **Bertrand** and M. Massias. Anderson acceleration of coordinate descent. *AISTATS*, 2021.
- [7] Q. Klopfenstein, Q. **Bertrand**, A. Gramfort, J. Salmon, and S. Vaiteer. Model identification and local linear convergence of coordinate descent. (*Accepted under minor revisions in Optimization Letters*), 2022.
- [8] 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.
- [9] Q. **Bertrand**, W. M. Czarnecki, and G. Gidel. On the limitations of Elo: Real-world games, are transitive, not additive. *arXiv preprint arXiv:2206.12301*, 2022.
- [10] 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.
- [11] Q. **Bertrand**, Q. Klopfenstein, M. Massias, M. Blondel, S. Vaiteer, A. Gramfort, and J. Salmon. Implicit differentiation for fast hyperparameter selection in non-smooth convex learning. *J. Mach. Learn. Res.*, 2022.
- [12] 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.

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## Teaching

- 2022-2023 [Game Theory for Machine Learning](#), Université de Montréal, **Teaching Assistant, Guest Lecturer**, Prof.: [G. Gidel](#).
- 2022 I was responsible for the [deep learning part of the first artificial intelligence MOOC all in French](#). 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](#).

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## Awards

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

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## Miscellaneous

On my free time I like to swim and to play chess ([2200 elo](#)).