Quentin Bertrand

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

I am currently 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 developed a generic algorithm to efficiently solve sparse linear models [9], code.
- I extended the notion of Elo score for cyclic games [8].

Prior to this position, I completed my Ph. D. [6] 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 [5]:
- Coordinate descent algorithms:
  - Proposed Anderson extrapolation to accelerate coordinate descent algorithms [7].
  - Showed support identification and local linear convergence of coordinate descent [2].
- Model calibration as an hyperparameter optimization problem:
  - Developed algorithms for fast hyperparameter optimization of Lasso-type models [4].
  - Provided a high quality python package for model selection: `sparse-ho` [10].
- 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* [3].
  - 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] Q. Klopfenstein, Q. **Bertrand**, A. Gramfort, J. Salmon, and S. Vaiter. Model identification and local linear convergence of coordinate descent. *(Submitted to*

Optimization Letters), 2020.

[3] M. Massias, Q. **Bertrand**, A. Gramfort, and J. Salmon. Support recovery and sup-norm convergence rates for sparse pivotal estimation. *AISTATS*, 2020.

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

[5] 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.

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

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

[8] 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.

[9] Q. **Bertrand**, Q. Klopfenstein, P.-A. Bannier, G. Gidel, and M. Massias. Beyond L1: Faster and better sparse models with skglm. *arXiv preprint arXiv:2204.07826*, 2022.

[10] 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.

Teaching

2021-2023 Game Theory for Machine Learning, Université de Montréal, **Teaching Assistant**, Prof.: G. Gidel.

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 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 and to play chess (2200 elo).