Robert M. Gower

Curriculum Vitae November 13, 2022

CONTACT INFORMATION
E-mail: gowerrobert@gmail.com
Website: https://gowerrobert.github.io

NATIONALITY Brazilian and British

RESEARCH INTERESTS Stochastic optimization, adaptive methods for deep learning, convergence of algorithms, gradient based methods and second order methods.

JOBS & EDUCATION

11/2021 – **Research Scientist**, Flatiron Institute, New York.

06/2021 – 11/2021 **Visiting Scientist**, Google Research, New York.

09/2017 – 06/2021 **Assistant Professor in Machine Learning**, Institut Polytechnique de Paris, Telécom-Paristech, Paris, France.

01/2020 – 08/2020 **Visiting Scientist**, Facebook, New York.

08/2016 – 09/2017 **Laureate fellowship** of the Fondation Sciences Mathématiques de Paris, École Normale Supérieure and Inria.

09/2012 – 06/2016 **Ph.D.** in Optimization and Operations Research, **The University of Edinburgh**, UK

05/2011 – 07/2012 **Market Model Analyst**, Itaú-Unibanco, São Paulo, Brazil

03/2009 – 04/2011 **M.Sc.** in Applied Math, **The University of Campinas**, São Paulo, Brazil

03/2005 – 03/2009 **B.Sc.** in Applied and Computational Math, **The University of Campinas**, São Paulo, Brazil

PRIZES AND FUNDING

2020 Top 10% reviewer for Neurips, awarded free ticket and registration.

2019 $**20k** The Thomas Jefferson Fund grant for the project entitled: "Matrix equations for big data compression"

$**72k** Cifre Facebook Research Funding

Top 5% reviewer for ICML, awarded free ticket and registration.

2018 €**8k** Labex Mathématique Hadamard fund for the project "Scalable stochastic variance reduced gradient methods"

2017 The bi-annual Leslie Fox Prize for Numerical Analysis, **2nd place**

2016 €**122k** The Fondation Sciences Mathématiques de Paris Fellowship at Inria/ENS

2014 **Best talk prize** at the Irish SIAM student meeting

Teaching Awards nominated for the 2014 Edinburgh University Students' Association Teaching Awards by student vote.

2012 **£85,1k** Ph.D. scholarship, University of Edinburgh, School of Mathematics

2009 – 2015 **£10k** in total of undergraduate (FAPESP), graduate (Laura Wisewell fund, CNPq) scholarships and travel awards (ICML 2015 travel award).

PAPERS **11** journal papers, **13** conference proceedings, **11** preprints and reports

2022 **R. M. G.** , Mathieu Blondel, Nidham Gazagnadou, Fabian Pedregosa. Cutting Some Slack for SGD with Adaptive Polyak Stepsizes, *arXiv/2202.12328*

2021 **R.M.G.**, Aaron Defazio, Michael Rabbat. Stochastic Polyak Stepsize with a Moving Target, *arXiv:2106.11851*.

Nidham Gazagnadou, Mark Ibrahim, **R. M. G.** RidgeSketch: A Fast sketching based solver for large scale ridge regression, *SIMAX*

Rui Yuan, **R. M. G.**, Alessandro Lazaric A general sample complexity analysis of vanilla policy gradient, *AISTATS*.

Jiabin Chen, Rui Yuan, Guillaume Garrigos, **R.M.G.** SAN: Stochastic Average Newton Algorithm for Minimizing Finite Sums, *Proceedings of the 21st International Conference on Artificial Intelligence and Statistics (AISTATS)*.

2020 **R. M. G.**, Mark Schmidt, Francis Bach, Peter Richtarik. Variance-Reduced Methods for Machine Learning, *Proceedings of the IEEE*, 2020.

Rui Yuan, Alessandro Lazaric, **R.M.G.** Sketched Newton-Raphson, ICML 2020 workshop "Beyond first order methods in ML systems", *SIOPT*.

Ahmed Khaled, Othmane Sebbouh, Nicolas Loizou, **R.M.G** , Peter Richtárik. Unified Analysis of Stochastic Gradient Methods for Composite Convex and Smooth Optimization, *arXiv:2006.11573*.

R.M.G, Othmane Sebbouh, Nicolas Loizou. SGD for Structured Nonconvex Functions: Learning Rates, Minibatching and Interpolation, *Proceedings of the 21st International Conference on Artificial Intelligence and Statistics (AISTATS)*.

Aaron Defazio, **R.M.G**. The Power of Factorial Powers: New Parameter settings for (Stochastic) Optimization, *ACML*.

Othmane Sebbouh, **R.M.G** , Aaron Defazio. Almost sure convergence rates for Stochastic Gradient Descent and Stochastic Heavy Ball, *Conference on Learning Theory (COLT)*, 2021

Dmitry Kovalev, **R.M.G** , Peter Richtárik, Alexander Rogozin. Fast Linear Convergence of Randomized BFGS, *arXiv:2002.11337*.

2019 **R.M.G** , Denali Molitor, Jacob Moorman, and Deanna Needell, Adaptive sketch-and-project methods for solving linear systems, *SIAM Journal on Matrix Analysis and its applications*.

O. Sebbouh, N. Gazagnadou, S. Jelassi, F. Bach, **R.M.G**. Towards closing the gap between the theory and practice of SVRG, *Advances in Neural Information Processing Systems* (Neurips).

R.M.G, D. Kovalev, F. Lieder, P. Richtárik, RSN: Randomized Subspace Newton, *Advances in Neural Information Processing Systems* (Neurips).

N. Gazagnadou, **R.M.G**, J. Salmon, Optimal mini-batch and step sizes for SAGA, *Proceedings of the 33rd International Conference on Machine Learning* (ICML).

R.M.G, N. Loizou, X. Qian, A. Sailanbayev, E. Shulgin, P. Richtárik, SGD: general analysis and improved rates, (long oral presentation)*Proceedings of the 33rd International Conference on Machine Learning* (ICML).

2018 A. Bibi, A. Sailanbayev, B. Ghanem, **R.M.G** and P. Richtárik, Improving SAGA via a probabilistic interpolation with gradient descent, *arXiv:1806.05633*.

R.M.G, P. Richtárik and F. Bach, Stochastic quasi-gradient methods: variance reduction via Jacobian sketching, *Mathematical Programming*.

R.M.G, F. Hanzely, P. Richtárik and S. Stich, Accelerated stochastic matrix inversion: general theory and speeding up BFGS rules for faster second-order optimization, *Advances in Neural Information Processing Systems* (Neurips).

B. K. Abid and **R.M.G**, Greedy Stochastic algorithms for entropy-regularized optimal transport problems, *Proceedings of the 21st International Conference on Artificial Intelligence and Statistics* (AISTATS).

R.M.G, N. Le Roux and F. Bach, Tracking the gradients using the Hessian: A new look at variance reducing stochastic methods, (long oral presentation) *Proceedings of the 21st International Conference on Artificial Intelligence and Statistics (AISTATS)*.

A. L. Gower, **R.M.G**, J. Deakin, W. J. Parnell and I. D. Abrahams, Learning about random media from near-surface backscattering: using machine learning to measure particle size and concentration, *Europhysics Letters, Volume 122, Number 5.*

2017 **R.M.G** and P. Richtárik, Randomized quasi-Newton updates are linearly convergent matrix inversion algorithms, *SIAM Journal on Matrix Analysis and its applications*, 38(4), 1380-1409.

2016 **R.M.G** and P. Richtárik, Linearly Convergent Randomized Iterative Methods for Computing the Pseudoinverse, *arXiv:1612.06255*.

R.M.G, Donald Goldfarb and P. Richtárik, Stochastic Block BFGS: Squeezing More Curvature out of Data, In *Proceedings of the 33rd International Conference on Machine Learning* (ICML).

2015 **R.M.G** and P. Richtárik, Stochastic dual ascent for solving linear systems, *arXiv:1437459*.

R.M.G and P. Richtárik. Randomized iterative methods for linear systems, *SIAM Journal on Matrix Analysis and its applications* 36(4), 1660-1690. **Most Downloaded Paper from the SIMAX website** (Dec 2020).

2014 **R.M.G** and A. L. Gower. High order reverse automatic differentiation with emphasis on the third order, *Mathematical Programming Series A* 155(1), 81-103.

R.M.G and J. Gondzio, Action constrained quasi-Newton methods, *ERGO*14-020.

R.M.G, *et. al.* Chapter: Drawing a track map In: Train Positioning Using Video Odometry *The MIIS Eprints Archive*.

R.M.G and M. P. Mello, Computing the sparsity pattern of Hessians using automatic differentiation, *ACM Transactions on Mathematical Software*, 40(2).

2012 **R.M.G** and M. P. Mello A new framework for Hessian automatic differentiation *Optimization Methods and Software*, 27(2).

Talks

Over **30 talks** in international conferences, seminars and workshops including.

2019 Parietal team seminar, Inria, Saclay

International Conference on Continuous Optimization (ICCOPT), invited session, Berlin.

Journée Statistique et Apprentissage, L'Institut des Hautes Études Scientifiques.

2018 The 21st International Conference on Artificial Intelligence and Statistics (AISTATS), **semi plenary presentation** and two posters, Lanzarote, Canary Islands

Séminaire Parisien d'Optimisation, Institut Henri Poincaré

International Symposium of Mathematical Optimization, invited session on Fast Converging Stochastic Optimization Algorithms, Bordeaux

Seminar for the Machine Learning and Optimization group, EPFL

2017 PGMO days, EDF'Lab Paris-Saclay

Thirty-first Conference on Neural Information Processing Systems (Neurips), Poster, Vancouver.

Optimization 2017, Faculdade de Ciências of the Universidade de Lisboa, invited talk, Lisboa

The 27th Biennial Numerical Analysis Conference, Randomized Iterative Methods for Computing the Pseudoinverse, University of Strathclyde, Glasgow

18th IMA Leslie Fox Prize talk in Numerical Analysis, awarded 2nd place, University of Strathclyde, Glasgow

France/Japan Machine Learning Workshop, Ecóle Normale Supérieure, Paris

Optimization, machine learning, and pluri-disciplinarity workshop, Paris, Inria Grenoble Rhone-Alpes, September 21-22.

Probabilistic Numerics seminar, Max-Planck-Institute Tubingen

Operations Research seminar, Center for Operations Research and Econometrics, Université catholique de Louvain

2016 Computational Mathematics and Applications seminar, Rutherford Appleton Laboratory

Télécom ParisTech, Machine Learning and Statistics seminar, Paris

International Conference on Continuous Optimization, Tokyo

5th IMA Conference on Numerical Linear Algebra and Optimization, University of Birmingham International Conference on Machine Learning (**ICML**), New York

Cambridge Image Analysis group seminar, University of Cambridge
Randomized iterative methods for linear systems

Inria, SIERRA team seminar, Paris, *Randomized iterative methods for linear systems and inverting matrices*

2015 Distributed machine learning and optimization, Alan Turing Scoping Workshop, Edinburgh, UK
Distributed Randomized Iterative Methods for Linear Systems

The International Symposium on Mathematical Programming, Pittsburgh, USA.
Action constrained quasi-Newton methods

Optimization and Big Data 2015, Edinburgh, UK
Randomized iterative methods for linear systems and inverting matrices

2014 Irish Applied Mathematics Research Students' Meeting, Galway, Ireland.
Hunting inverses of matrix fields
[Best Talk Prize]

Postgraduate Mathematics Colloquium, Edinburgh, UK
The history of optimization in blood and booze

Cambridge Mathematics Society Research in the UK Afternoon, Cambridge, UK
Unconstrained optimization methods

European Workshop on Advances in Continuous Optimization, Perpignan.
Generalizations of the quasi-Newton methods using an image constraint

2013 International Conference on Continuous Optimization, Lisbon, Portugal
Third order methods and third order derivatives

EURO-INFORMS Joint International Meeting, Rome, Italy
Third order methods using slices of the tensor and AD developments

2011 28th Brazilian Colloquium on Mathematics, IMPA, Rio de Janeiro, Brazil
Automatic differentiation of Hessian matrices

Teaching

I have given over 360 hours of Lectures on Optimization, Numerical Analysis, and Machine Learning. Prior to that, as a graduate student at the University of Edinburgh, I gave over 350 hours of tutorials and lectures.

2019 – 2020 Fall, *Machine Learning in High Dimensions*, graduate, Télécom Paris [12hr].

2017 – 2020 Fall, *Optimization and Numerical Analysis*, undergraduate, Télécom Paris [24hr].

2017 – 2020 Fall, *Optimization for Data Science*, Data Science masters, Institut Polytechnique de Paris [36hr].

2019 Winter, *Stochastic Optimization for Machine Learning*, African Master's of Machine Intelligence at AIMS, Rwanda [14hr].

2017– 2019 Summer school lectures on *Stochastic Optimization for Machine Learning* at
2018 Yerevan State University, Armenia.

2017 The University of Novi Sad, Serbia.

2010 – 2015 Over 350 hours of tutorials and lectures as a graduate student at The University of Edinburgh including tutoring as a Junior teaching fellow, special needs tutorials for students within Autism spectrum, linear algebra, calculus, financial mathematics, operations research, optimization theory, proofs and problem solving.

Academic Services

Editorial work and reviewing for:

Action Editor, *Transactions of Machine Learning Research* (TMLR)
Editorial Board Reviewers, *Journal of Machine Learning Research* (JMLR)
Senior Program Committee, *International Joint Conference on Artificial Intelligence* (IJCAI), 2020
Reviewer *Conference on Neural Information Processing Systems* (Neurips)
International Conference on Machine Learning (ICML)
Journal of Machine Learning Research (JMLR)
Proceedings of the IEEE
IEEE Transactions on Signal Processing
SIAM Journal on Scientific Computing (SISC)
SIAM Journal on Optimization (SIOPT)
Optimization Methods and Software, Taylor & Francis
Computational and Applied Mathematics, Springer
Mathematical Programming, Springer Computation
BIT Numerical Mathematics, Springer
Numerical Algorithms, Springer