

Robert M. Gower

Curriculum Vitae

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INFORMATION *Website:* <https://gowerrobert.github.io>

NATIONALITY Brazilian and British

JOBS & EDUCATION 09/2017 – **Assistant Professor in Machine Learning**, Télécom-Paristech, within the LCTI laboratory, Paris, France

08/2016 – 09/2017 **Post-doctoral Laureate** École Normale Supérieure and INRIA. Funded by Fondation Sciences Mathématiques de Paris grant

09/2012 – 06/2016 **Ph.D.** in Mathematics, **The University of Edinburgh**, UK

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

03/2009 – 05/2011 **M.Sc.** in Applied Mathematics, **University of Campinas**, SP

03/2005 – 12/2008 **B.Sc.** in Applied Mathematics, **University of Campinas**, SP

PAPERS 2019 O. Sebbouh, N. Gazagnadou, S. Jelassi, F. Bach, **R.M.G.**, Towards closing the gap between the theory and practice of SVRG, (submitted).

R.M.G., D. Kovalev, F. Lieder, P. Richtárik, RSN: Randomized Subspace Newton, (submitted) *arXiv:1905.10874*

N. Gazagnadou, **R.M.G.**, J. Salmon, Optimal mini-batch and step sizes for SAGA, *ICML 2019*.

R.M.G., N. Loizou, X. Qian, A. Sailanbayev, E. Shulgin, P. Richtárik, SGD: general analysis and improved rates, (long Oral presentation) *ICML 2019*

2018 A. Bibi, A. Sailanbayev, B. Ghanem, RMG and P. Richtárik, Improving SAGA via a probabilistic interpolation with gradient descent, (submitted) *arXiv:1806.05633*

R.M.G., P. Richtárik and F. Bach, Stochastic quasi-gradient methods: variance reduction via Jacobian sketching, (submitted) *arXiv:1805.02632*

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*

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*, PMLR, 84:1505-1512

R.M.G., N. Le Roux and F. Bach, Tracking the gradients using the Hessian: A new look at variance reducing stochastic methods, *Proceedings of the 21st International Conference on Artificial Intelligence and Statistics*, PMLR, 84:707-715

- 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, (*in review*) *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*
- 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 (May 2017)
- 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)
- PRIZES
- 2019 Top 5% reviewer in ICML, awarded free registration.
- 2017 **2nd place** in the bi-annual Leslie Fox best paper in numerical analysis award
- 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.
- TALKS
- 2018 AISTATS, **oral presentation** and two posters, Lanzarote, Canary Islands
- 2017 PGMO days, EDF'Lab Paris-Saclay
- Optimization 2017, Faculdade de Ciências of the Universidade de Lisboa, Lisboa
- The 27th Biennial Numerical Analysis Conference, Randomized Iterative Methods for Computing the Pseudoinverse, University of Strathclyde, Glasgow
- 18th IMA Leslie Fox Prize in Numerical Analysis, awarded 2nd place, University of Strathclyde, Glasgow

- SIAM Optimization 2017, Vancouver, Canada
- France/Japan Machine Learning Workshop, Ecôle 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**), poster and talk, New York
- Cambridge Image Analysis group seminar, University of Cambridge
Randomized iterative methods for linear systems
- INRIA Rocquencourt, 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 <i>Third order methods using slices of the tensor and AD developments</i>
	2011	28th Brazilian Colloquium on Mathematics, IMPA, Rio de Janeiro, Brasil <i>Automatic differentiation of Hessian matrices</i>
POSTER SESSIONS	2015	Data Science Research Day, Edinburgh, UK <i>Randomized methods for inverting matrices</i>
	2014	Computational Linear Algebra and Optimization for the Digital Economy, Edinburgh <i>Automatic high order tensor derivatives</i>
	2011	Brazilian Society on Applied and Computational Mathematics Águas de Lindóia, Brasil <i>A new automatic differentiation mode for sparse Hessian matrices</i>
FUNDING	2016	€122k The Fondation Sciences Mathématiques de Paris Post-doctoral program
	2015	£800 Laura Wisewell Travel Scholarships, EUROPT Florence and EURO Rome
	2013	£800 Laura Wisewell Travel Scholarships, ISMP Pittsburgh
	2012	£85,1k Ph.D. scholarship, University of Edinburgh, School of Mathematics €84k Ph.D. scholarship, Hardiman Foundation National University of Ireland - Application No: 075 I declined this Ph.D. funding in favour of the funded Ph.D in the University of Edinburgh £55,1k Ph.D. scholarship, Brazilian National Council for Scientific and Technological Development, CNPq - 200440/2012-8 I declined this Ph.D. in favour of the funded Ph.D. in the University of Edinburgh
	2009	R\$29k M.Sc. scholarship, São Paulo Research Foundation CNPq - 09/04785-7 <i>Automatic differentiation of Hessian matrices</i>
	2007	R\$6k Undergraduate research scholarship, São Paulo Research Foundation <i>Efficient calculation of derivatives through graph colouring</i>
OUTREACH	2013	Maths and Magic During the 2013 Edinburgh Innovative Learning week, I helped run a workshop on elusive magic tricks based on mathematics
	2013	Secondary school advanced highers revision Tutored local secondary school students preparing for a university entry examination in mathematics (Scottish Advanced Highers)
ACADEMIC SERVICES		Reviewer for <i>Conference on Neural Information Processing Systems</i> (Neurips) <i>International Conference on Machine Learning</i> (ICML) <i>Journal of Machine Learning Research</i> (JMLR) <i>SIAM Journal on Scientific Computing</i> (SOIPT) <i>Optimization Methods and Software</i> , Taylor & Francis <i>Computational and Applied Mathematics</i> , Springer <i>Mathematical Programming</i> , Springer Computation <i>BIT Numerical Mathematics</i> , Springer <i>Numerical Algorithms</i> , Springer

- TEACHING
- 2017 Lectured a 5 hour course on Stochastic Optimization for Machine Learning at the Spring School on Optimization and Data Science, University of Novi Sad, Serbia.
 - 2014 – 2015 Lectured M.Sc. Revision course
Created exams, worksheets and lectured a 12 hours revision course for newly admitted M.Sc. students in Operations Research.
 - 2013 – 2014 Junior Teaching Fellow
Appointed to organize workshops in linear algebra and calculus, tailored through requests made by students through an online system
 - 2013 Special needs tutorials
Tutored a course in proofs and problem solving for a group of students with Asperger's Syndrome and Autism spectrum disorders.
 - 2012 – 2015 Teaching Assistant
With a teaching scholarship, I tutored undergraduate courses in linear algebra, calculus, proofs and problem solving, and graduate course in fundamentals of optimization, fundamentals of operations research, optimization methods in finance and computing for operational research.
 - 2010 – 2011 Teaching Assistant/ Lecturer
Financial Mathematics and Combinatorial Programming - State University of Campinas, Brazil.
 - 2010 – 2011 Continued education for state school teachers
Tutored probability for the continued education of state school mathematics teachers of São Paulo.