Robert M. Gower

Curriculum Vitae

CONTACT INFORMATION

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NATIONALITY Brazilian and British

JOBS & EDUCATION

09/2017 – **Assistant Professor in Machine Learning**, Telécom-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 N. Gazagnadou, **R.M.G**, J. Salmon, Optimal mini-batch and step sizes for SAGA, *arXiv:1902.000713*

R.M.G, , N. Loizou, X. Qian, A. Sailanbayev, E. Shulgin, P. Richtárik, SGD: general analysis and improved rates, *arXiv:1901.09401*

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

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 Cincias 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, 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**), 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
Third order methods using slices of the tensor and AD developments

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

Poster Sessions

2015 Data Science Research Day, Edinburgh, UK
Randomized methods for inverting matrices

2014 Computational Linear Algebra and Optimization for the Digital Economy, Edinburgh
Automatic high order tensor derivatives

2011 Brazilian Society on Applied and Computational Mathematics
Águas de Lindóia, Brasil
A new automatic differentiation mode for sparse Hessian matrices

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 *Automatic differentiation of Hessian matrices*

2007 R**$6k** Undergraduate research scholarship, São Paulo Research Foundation
Efficient calculation of derivatives through graph colouring

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
Conference on Neural Information Processing Systems (Neurips)
International Conference on Machine Learning (ICML)
Journal of Machine Learning Research (JMLR)
SIAM Journal on Scientific Computing (SOIPT)
Optimization Methods and Software, Taylor & Francis
Computational and Applied Mathematics, Springer
Mathematical Programming, Springer Computation
BIT Numerical Mathematics, Springer
Numerical Algorithms, 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.