

# Robert M. Gower

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*Curriculum Vitae*

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NATIONALITY      British and Brazilian

INTERESTS      Optimization, machine learning, randomized and stochastic algorithms

EMPLOYMENT

2016 – 2018 Post-doctoral Laureate, École Normale Supérieure and INRIA, Paris, France  
Funded by the Foundation Sciences Mathématiques de Paris to work in the SIERRA team under Prof. Francis Bach’s supervision.

2012 – 2016 Teaching assistant, University of Edinburgh, UK

2011 – 2012 Market Model Validation Analyst, Itaú-Unibanco, Brazil  
Validating hypothesis, the mathematics and implementation of exotic market models. Developed an internal platform for calculating the price of exotic derivatives.

ACADEMIC HISTORY      **Ph.D.** in Mathematics      09/2012 – 06/2016  
**The University of Edinburgh, UK**  
*Sketch-and-project methods in optimization and numerical linear algebra*  
Advisers: Dr. [Peter Richtárik](#) and Prof. Jacek Gondzio

**M.Sc.** in Applied Mathematics, GPA 97.2%      03/2009 – 05/2011  
**University of Campinas, São Paulo, Brasil**  
*Automatic Differentiation of Hessian Matrices*  
Adviser: Prof. Margarida Pinheiro Mello  
Candidacy exams in matrix analysis, functional analysis and  $\mathbb{R}^n$  analysis

**B.Sc.** in Applied Mathematics      03/2005 – 12/2008  
**University of Campinas, São Paulo, Brasil**  
Minor in Numerical Analysis  
*Efficient calculation of derivatives through graph coloring*  
Adviser: Prof. Margarida Pinheiro Mello

## PAPERS

- R.M. Gower and P. Richtárik  
 Linearly Convergent Randomized Iterative Methods for Computing the Pseudoinverse  
 arXiv:1612.06255, 2016
- R.M. Gower, Donald Goldfarb and P. Richtárik  
 Stochastic Block BFGS: Squeezing More Curvature out of Data  
 In *Proceedings of the 33rd International Conference on Machine Learning*, 2016
- R.M. Gower and P. Richtárik  
 Randomized quasi-Newton updates are linearly convergent matrix inversion algorithms  
 arXiv:1602.01768, 2016
- R.M. Gower and P. Richtárik  
 Stochastic dual ascent for solving linear systems  
 arXiv:1437459, 2015
- R.M. Gower and P. Richtárik  
 Randomized iterative methods for linear systems  
*SIAM Journal on Matrix Analysis and its applications* 36(4), 1660-1690, 2015  
**2nd Most Downloaded Paper from the SIMAX website** (March 2017)
- R.M. Gower and A.L. Gower  
 High order reverse automatic differentiation with emphasis on the third order  
*Mathematical Programming Series A* 155(1), 81-103, 2014
- R.M. Gower and Jacek Gondzio  
 Action constrained quasi-Newton methods  
 arXiv:1412.8045, 2014
- R.M. Gower, *et. al.*  
 Chapter: Drawing a track map  
 In: [Train Positioning Using Video Odometry](#)  
*The MIIS Eprints Archive*, 2014
- R.M. Gower and M.P. Mello  
 Computing the sparsity pattern of Hessians using automatic differentiation  
*ACM Transactions on Mathematical Software*, 40(2), 2014
- R.M. Gower and M.P. Mello  
 A new framework for Hessian automatic differentiation  
*Optimization Methods and Software*, 27(2), 2012

## PRIZES

- 2017 Selected as one of six **finalists** for the prestigious bi-annual Leslie Fox best paper in numerical analysis award. Final results in [June 2017](#).
- 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

- 2017 Optimization, machine learning, and pluri-disciplinarity workshop. Inria Grenoble - Rhone-Alpes

- Probabilistic Numerics seminar, Max-Planck-Institute Tubingen, January 25-27.
- Operations Research seminar, Center for Operations Research and Econometrics, Université catholique de Louvain, December 13, 2016
- 2016 Computational Mathematics and Applications seminar, Rutherford Appleton Laboratory, November 24, 2016
- Télécom ParisTech, Machine Learning and Statistics seminar, Paris, November 10
- International Conference on Continuous Optimization, Tokyo, August 6-11
- 5th IMA Conference on Numerical Linear Algebra and Optimization, University of Birmingham, September 7-9
- International Conference on Machine Learning (**ICML**), poster and talk, New York, June 19-23
- 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*
- 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.
- FUNDING
- 2016 **€60k** The Foundation 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, Brazilian National Council for Scientific and Technological Development, 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  
*Taylor & Francis*, Optimization Methods and Software  
*Springer*, Computational and Applied Mathematics  
*Springer*, Mathematical Programming Computation  
*Springer* BIT Numerical Mathematics  
*Springer*, Numerical Algorithms