

CORALIA CARTIS

University of Oxford
Mathematical Institute
Balliol College

coralia.cartis@maths.ox.ac.uk
<https://www.maths.ox.ac.uk/people/coralia.cartis>
The Alan Turing Institute for Data Science, London

Academic Positions

- Professor of Numerical Optimization (since 09/2021); previously, Associate Professor of Numerical Optimization; Mathematical Institute, Oxford University 09/2013–present
Tutorial Fellow in Mathematics, Balliol College, University of Oxford 09/2013–present
On maternity leave from both roles: April – August, 2014
Turing Fellow, The Alan Turing Institute for Data Science, London 2016 – present
- Lecturer/Senior Lecturer (permanent post), School of Mathematics, University of Edinburgh 2007–2013
Visiting Research Scientist, STFC Rutherford Appleton Laboratory 2007–2012
Visiting Professor, University of Namur 2007–2012
- Research Scientist in Numerical Analysis (permanent post), Numerical Analysis Group, Rutherford Appleton Laboratory 2006–2007
- EPSRC Postdoctoral Research Associate, Computing Laboratory, Oxford University
PI: *Prof R. Hauser* 2004–2006

Education

UNIVERSITY OF CAMBRIDGE, Department of Applied Mathematics and Theoretical Physics, United Kingdom
PhD in Mathematics, Supervisor: *Professor M. J. D. Powell FRS* 2005
Certificate of Advanced Studies in Mathematics (Part III of the Mathematical Tripos) 1999
BABEȘ-BOLYAI UNIVERSITY, Faculty of Mathematics and Computer Science, Romania
BSc in Mathematics 1994–1998

Prizes and Awards

MPLS Outstanding Research Supervision Award 2024/25, University of Oxford.
SIAM Fellow, class of 2023, ‘for theoretical and practical developments in continuous optimization’, Society for Industrial and Applied Mathematics.
EUROPT Fellowship, 2023, ‘for outstanding researcher in continuous optimisation’, EURO Group for Optimization.
ICM (International Congress of Mathematicians), invited sectional speaker, 2022.
INFORMS Simulation Society, 2021 Outstanding Paper Prize.
Mathematical Programming Computation, 2019 Best Paper Prize.
Fellow of the Institute of Mathematics and its Applications (invited), 2018–present.
Turing Fellow, The Alan Turing Institute for Data Science, London, 2016–2024.
Leslie Fox Prize in Numerical Analysis, Second Place, IMA, UK, 2005.
Churchill College Pochobradsky Scholarship, Churchill College, University of Cambridge, 1999–2002.
Shell Centenary Scholarship, Cambridge Overseas Trust, University of Cambridge, 1998–1999.

RESEARCH

Research Interests

Development, analysis and implementation of algorithms for linear and nonlinear nonconvex optimization, suitable for large-scale problems. Complexity of optimization algorithms. Optimization for machine learning. Modelling and applications of optimization algorithms, including compressed sensing and climate modelling.

Publications

Google Scholar: +4900; h-index: 34; i10-index: 60.

- +50 journal articles (in top-quality journals such as *Math Programming*, *SIAM J Optimization*, *SIAM Review*, *IEEE IT*, *ACHA*, *J Climate*, *Found Comp Math*), 1 research monograph/graduate textbook, 1 survey article, 1 book chapter, 15 conference proceedings.

Journal Publications

Key papers are denoted in bold font. Underlined names denote my PhD students, postdocs and MSc students. The papers with Gould and Toint are a long term collaboration, with equal contributions. Authors names on papers typically appear alphabetically as it is common in mathematics.

- (53) *Second-order methods for quartically-regularised cubic polynomials, with applications to high-order tensor methods*, (with W Zhu), Mathematical Programming, 2025 (online).
- (52) *Cubic-quartic regularization models for solving polynomial subproblems in third-order tensor methods* (with W. Zhu). Mathematical Programming <https://doi.org/10.1007/s10107-024-02176-y>, 2025.
- (51) *Using shortened spin-ups to speed up ocean biogeochemical model optimization* (with S Oliver, S Khatiwala, C Cartis, B Ward, I Kriest) Journal of Advances in Modeling Earth Systems 16 (9), 2024.
- (50) *Convergent least-squares optimisation methods for variational data assimilation* (with MH Kaouri, AS Lawless, NK Nichols) Optimization 73(11):3451–3485, 2024.
- (49) *Nonlinear matrix recovery using optimization on the Grassmann manifold* (with F Goyens, A Eftekhari), Applied and Computational Harmonic Analysis (ACHA) 2022 (online).
- (48) *Does model calibration reduce uncertainty in climate projections?* (with SFB Tett, JM Gregory, N Freychet, MJ Mineter, L Roberts) Journal of Climate 35 (8), 2585-2602, 2022.
- (47) *A derivative-free optimisation method for global ocean biogeochemical models* (with S Oliver, I Kriest, SFB Tett and S Khatiwala) Geoscientific Model Development 15 (9), 3537-3554, 2022.
- (46) *Global optimization using random embeddings* (with E Massart and A Otemissov) Mathematical Programming, ISMP 2022 special issue (by invitation only as semi-plenary speaker at ISMP 2022, refereed) 49 pages, <https://doi.org/10.1007/s10107-022-01871-y>, 2022.
- (45) *Scalable subspace methods for derivative-free nonlinear least-squares optimization* (with L Roberts) Mathematical Programming, 64 pages, <https://doi.org/10.1007/s10107-022-01836-1>, 2022.
- (44) *Bound-constrained global optimization of functions with low effective dimensionality using multiple random embeddings* (with E Massart and A Otemissov) Mathematical Programming, 62 pages, <https://doi.org/10.1007/s10107-022-01812-9>, 2022.
- (43) ***A dimensionality reduction technique for unconstrained global optimization of functions with low effective dimensionality* (with A Otemissov), Information and Inference: a journal of the IMA, 34 pages, <https://doi.org/10.1093/imaiai/iaab011>, 2021.** This paper addresses the solution of the most challenging class of optimization problems, where the 'best' optimal points of an oscillatory landscape are sought. It precisely quantifies the case when the function possesses an invariant structure and only changes in an unknown subspace, showing that then, the problem solution only depends on the (low) dimension of this subspace rather than the (large) ambient dimension.
- (42) *Escaping local minima with local derivative-free methods: a numerical investigation* (with L. Roberts and O. Sheridan-Methven) Optimization, 31 pages, <https://doi.org/10.1080/02331934.2021.1883015>, 2020 (online).
- (41) *Adaptive regularization with cubics on manifolds* (with N Agarwal, N Boumal, B Bullins) Mathematical Programming, 49 pages, <https://doi.org/10.1007/s10107-020-01505-1>, 2020 (online).
- (40) *On monotonic estimates of the norm of the minimizers of regularized quadratic functions in Krylov spaces* (with N.I.M. Gould and M. Lange) BIT Numerical Mathematics 60:583–589, 2020.
- (39) *A concise second-order complexity analysis for unconstrained optimization using high-order regularized models* (with N. I. M. Gould and Ph. L. Toint), Optimization Methods and Software, 35(2):243–256, 2020.
- (38) *Sharp worst-case evaluation complexity bounds for arbitrary-order nonconvex optimization with inexpensive constraints* (with N. I. M. Gould and Ph. L. Toint), SIAM Journal on Optimization 30 (1):513–541, 2020.
- (37) *Improving the flexibility and robustness of model-based derivative-free optimization solvers* (with J Fiala, B Marteau, L Roberts) ACM Transactions on Mathematical Software (TOMS) 45 (3):1-41, 2019. Available codes, DFO-LS and Py-BOBYQA.
- (36) ***A derivative-free Gauss–Newton method* (with L Roberts) Mathematical Programming Computation 11 (4):631–674, 2019. Best paper prize 2019.** This paper with my PhD student Lindon significantly simplifies and improves state of the art algorithms that do not use derivatives and their application to parameter fitting/nonlinear least-squares problems. The DFO-LS code associated to this paper has been downloaded from Github more than 17,000 times and has been incorporated into the latest release of the NAG software library.
- (35) ***Global rates of convergence for nonconvex optimization on manifolds* (with N. Boumal and P.-A. Absil), IMA Journal of Numerical Analysis 39 (1):1–33, 2019.** This paper presents the first worst-case complexity bounds for state of the art optimization algorithms on manifolds, where the latter are addressed using geometry-aware Riemannian tools.
- (34) *Calibrating climate models using inverse methods: case studies with HadAM3, HadAM3P and HadCM3* (with S.F.B. Tett, K. Yamazaki, M.J. Mineter and N. Eizenberg), Geoscientific Model Development 10(9) : 3567 – 3589, 2019. Code/platform available upon request.

- (33) *Optimality of orders one to three and beyond: characterization and evaluation complexity in constrained non-convex optimization* (with N. I. M. Gould and Ph. L. Toint), *Journal of Complexity*, 53:68–94, 2019.
- (32) *Universal regularization methods: varying the power, the smoothness and the accuracy* (with N. I. M. Gould and Ph. L. Toint), *SIAM Journal on Optimization*, 29 (1): 595–615, 2019.
- (31) *Convergence rate analysis of a stochastic trust-region method via supermartingales* (with J. Blanchet, M. Menickelly and K. Scheinberg), *INFORMS Journal on Optimization* 1(2):92–119, 2019.
- (30) *Second-order optimality and beyond: characterization and evaluation complexity in convexly-constrained non-linear optimization* (with N. I. M. Gould and Ph. L. Toint), *Foundations of Computational Mathematics*, 18:1073–1107, 2018.
- (29) ***Global convergence rate analysis of unconstrained optimization methods based on probabilistic models* (with K. Scheinberg), *Mathematical Programming*, 169(2):337–375, 2018.** This paper analyses the worst case complexity of classical optimization algorithms when the local problem information is only occasionally accurate and shows that these algorithms are robust to such uncertainties under reasonable assumptions.
- (28) *Quantitative recovery conditions for tree-based compressed sensing* (with A. Thompson), *IEEE Transactions on Information Theory*, 63(3):1555–1571, 2017.
- (27) *Worst-case evaluation complexity of regularization methods for smooth unconstrained optimization using Hölder continuous gradients* (with N. I. M. Gould and Ph. L. Toint), *Optimization Methods and Software*, 32(6):1273–1298, 2017.
- (26) *Corrigendum: On the complexity of finding first-order critical points in constrained nonlinear optimization* (with N. I. M. Gould and Ph. L. Toint), *Mathematical Programming* 161(1):611–626, 2017.
- (25) *Optimal active set identification for interior point methods* (with Y. Yan), *Computational Optimization and Applications* 63:639–684, 2016. Code available, P-IPM.
- (24) ***A new and improved quantitative recovery analysis for iterative hard thresholding algorithms in compressed sensing* (with A. Thompson), *IEEE Transactions on Information Theory* 61(4):1–24 (d.c.), 2015.** This paper gives a novel perspective and significant improvement for the recovery guarantees of nonconvex gradient projection for sparse approximation problems.
- (23) *Branching and bounding improvements for global optimization algorithms with Lipschitz continuity properties* (with J. Fowkes and N. I. M. Gould), *Journal on Global Optimization* 61:429–457, 2015. oBB software package available on COIN-OR.
- (22) *On the evaluation complexity of constrained nonlinear least-squares and general constrained nonlinear optimization using second-order methods* (with N. I. M. Gould and Ph. L. Toint), *SIAM Journal on Numerical Analysis*, 53(2):836–851, 2015.
- (21) *Worst-case evaluation complexity of non-monotone gradient-related algorithms for unconstrained optimization* (with Ph. R. Sampaio and Ph. L. Toint) *Optimization* 64(5):1349–1361, 2015.
- (20) *On the complexity of finding first-order critical points in constrained nonlinear programming* (with N. I. M. Gould and Ph. L. Toint), *Mathematical Programming* 144(1):93–106, 2014.
- (19) *Can top of atmosphere radiation measurements constrain climate predictions? Part I: Tuning* (with S. F. B. Tett, M. J. Mineter, D. J. Rowlands and P. Liu), *Journal of Climate* 26(23):9348–9366, 2013.
- (18) *Can top of atmosphere radiation measurements constrain climate predictions? Part II: Climate sensitivity* (with S. F. B. Tett, D. J. Rowlands and M. J. Mineter), *Journal of Climate* 26(23):9367–9383, 2013.
- (17) *An exact tree projection algorithm for wavelets* (with A. Thompson), *IEEE Signal Processing Letters* 20(11): 1026–1029, 2013.
- (16) *On the evaluation complexity of cubic regularization methods for potentially rank-deficient nonlinear least-squares problems and its relevance to constrained nonlinear optimization* (with N. I. M. Gould and Ph. L. Toint), *SIAM Journal on Optimization*, 23(3):1553–1574, 2013.
- (15) *A note about the complexity of minimizing Nesterov’s smooth Chebyshev-Rosenbrock function* (with N. I. M. Gould and Ph. L. Toint), *Optimization Methods and Software* 28(3):451–457, 2013.
- (14) *An adaptive cubic regularization algorithm for nonconvex optimization with convex constraints and its function-evaluation complexity* (with N. I. M. Gould and Ph. L. Toint), *IMA Journal on Numerical Analysis* 32(4):1662–1695, 2012.
- (13) *Evaluation complexity of adaptive cubic regularization methods for convex unconstrained optimization* (with N. I. M. Gould and Ph. L. Toint), *Optimization Methods and Software* 27(2):197–219, 2012.

- (12) *On the oracle complexity of first-order and derivative-free algorithms for smooth nonconvex minimization* (with N. I. M. Gould and Ph. L. Toint), SIAM Journal on Optimization 22(1):66–86, 2012.
- (11) *Complexity bounds for second-order optimality in unconstrained optimization* (with N. I. M. Gould and Ph. L. Toint), Journal of Complexity 28(1):93–108, 2012.
- (10) *On the evaluation complexity of composite function minimization with applications to nonconvex nonlinear programming* (with N. I. M. Gould and Ph. L. Toint), SIAM Journal on Optimization 21(4):1721–1739, 2011.
- (9) *Adaptive cubic regularisation methods for unconstrained optimization. Part II: worst-case function-evaluation complexity* (with N. I. M. Gould and Ph. L. Toint), Mathematical Programming 130(2):295–319, 2011.
- (8) ***Adaptive cubic regularisation methods for unconstrained optimization. Part I: motivation, convergence and numerical results*** (with N. I. M. Gould and Ph. L. Toint), **Mathematical Programming** 127(2):245–295, 2011. This paper is the first in a body of work addressing the worst-case complexity of certain optimization algorithms, an essentially unprecedented analysis of their efficiency for nonconvex problems.
- (7) *Compressed sensing: how sharp is the restricted isometry property?* (with J. D. Blanchard and J. Tanner), SIAM Review 53(1):105–125, 2011.
- (6) *Phase transitions for greedy sparse approximation algorithms* (with J. D. Blanchard, J. Tanner and A. Thompson), Applied and Computational Harmonic Analysis 30:188–203, 2011.
- (5) *On the complexity of steepest descent, Newton’s and regularized Newton’s methods for nonconvex unconstrained optimization* (with N. I. M. Gould and Ph. L. Toint), SIAM Journal on Optimization 20(6):2833–2852, 2010.
- (4) *Convergence of a Regularized Euclidean Residual algorithm for nonlinear least-squares* (with S. Bellavia, N. I. M. Gould, B. Morini and Ph. L. Toint), SIAM Journal on Numerical Analysis 48(1): 1–29, 2010.
- (3) *Decay properties of restricted isometry constants* (with J. D. Blanchard and J. Tanner), IEEE Signal Processing Letters 16(7): 572–575, 2009.
- (2) *Trust-region and other regularisations of linear least-squares problems* (with N. I. M. Gould and Ph. L. Toint), BIT 49(1):21–53, 2009.
- (1) *Some disadvantages of a Mehrotra-type primal-dual corrector interior point algorithm for linear programming*, Applied Numerical Mathematics 59:1110–1119, 2009.

Book

Worst-case complexity of algorithms for nonconvex optimization, with N.I.M. Gould and Ph.L.Toint. Society for Industrial and Applied Mathematics (SIAM), in the *MOS-SIAM Series on Optimization*. Research monograph, capturing recent developments in the analysis of nonconvex optimization algorithms, July 2022 (+550 pages).

Survey Article (invited and refereed)

How much patience do you have? A worst-case perspective on smooth nonconvex optimization (with N. I. M. Gould and Ph. L. Toint), OPTIMA 88, 2012 (17 pages, feature article of the Mathematical Optimization Society Newsletter, invited personally to write this review of my research with Gould and Toint).

Book Chapters

Evaluation complexity bounds for smooth constrained nonlinear optimization using scaled KKT conditions and high-order models (with N. I. M. Gould and Ph. L. Toint) in Approximation and Optimization, pp. 5–26, eds. I Demetriou and P Pardalos, Springer, 2019.

Papers under Review (available online)

1. *Random Subspace Cubic-Regularization Methods, with Applications to Low-Rank Functions* (with Z Shao, E Tansley) arXiv preprint arXiv:2501.09734, 2025.
2. *Tensor-based Dinkelbach method for computing generalized tensor eigenvalues and its applications* (with H Chen, W Zhu) arXiv preprint arXiv:2501.09735, 2025.
3. *Efficient Implementation of Third-order Tensor Methods with Adaptive Regularization for Unconstrained Optimization* (with R Hauser, Y Liu, K Welzel, W Zhu) arXiv preprint arXiv:2501.00404, 2024.

4. *Randomized Subspace Derivative-Free Optimization with Quadratic Models and Second-Order Convergence*, (with L Roberts) *arXiv preprint arXiv:2412.14431*, 2024.
5. *Dimensionality Reduction Techniques for Global Bayesian Optimisation*, (with L Long, PF Shustin), *arXiv preprint arXiv:2412.09183*, 2024.
6. *Global convergence of high-order regularization methods with sums-of-squares Taylor models* (with W Zhu) *arXiv preprint arXiv:2404.03035*, 2024.
7. *Learning the subspace of variation for global optimization of functions with low effective dimension* (with X Liang, E Massart, A Otemissov), *arXiv preprint arXiv:2401.17825*, 2024.
8. *Registration of algebraic varieties using Riemannian optimization* (with F Goyens, S Chrétien), *arXiv preprint arXiv:2401.08562*, 2024.
9. *Randomised subspace methods for non-convex optimization, with applications to nonlinear least-squares* (with J Fowkes, Z Shao) <https://arxiv.org/abs/2211.09873>, 2022.
10. *Hashing embeddings of optimal dimension, with applications to linear least squares* (with J Fiala, Z Shao) *arXiv preprint arXiv:2105.11815*, 2021.

Conference Proceedings (refereed)

- (12) *The evaluation complexity of finding high-order minimizers of nonconvex optimization* (with N. I. M. Gould and Ph. L. Toint), Proceedings of the 2022 International Conference of Mathematicians (ICM 2022), online, 2022.
- (11) *Dimensionality reduction techniques for global optimization of functions with low effective dimensionality* (with E Massart and A Otemissov), ICML Workshop "Beyond first order methods in ML systems", 2020.
- (10) *Sparse sketching for sparse linear least squares* (with Z Shao) ICML Workshop "Beyond first order methods in ML systems", 2020.
- (9) *A randomised subspace Gauss-Newton method for nonlinear least-squares* (with J Fowkes and Z Shao) ICML Workshop "Beyond first order methods in ML systems", 2020.
- (8) *Scalable derivative-free optimization for nonlinear least-squares problems* (with T Ferguson and L Roberts) ICML Workshop "Beyond first order methods in ML systems", 2020.
- (7) *Smoothing of point clouds using Riemannian optimization* (with F Goyens and S Chretien) ICML Workshop "Beyond first order methods in ML systems", 2020.
- (6) *Nonlinear matrix recovery* (with F Goyens and A Eftekhari) NEURIPS Workshop "Beyond first order methods in ML" 2019.
- (5) *Worst-case evaluation complexity and optimality of second-order methods for nonconvex smooth optimization* (with N. I. M. Gould and Ph. L. Toint), Proceedings of the 2018 International Conference of Mathematicians (ICM 2018), Rio de Janeiro, 2018.
- (4) *Data assimilation approach to analysing systems of ordinary differential equations* (with W Arter, A Osojnik, G Madho, C Jones and S Tobias), 2018 IEEE International Symposium on Circuits and Systems (ISCAS), pp. 1-5, doi: 10.1109/ISCAS.2018.8351751, 2018.
- (3) *A new recovery analysis for iterative hard thresholding for compressed sensing* (with A. Thompson), Proceedings of Signal Processing with Adaptive Sparse Structured Representations (SPARS'11), 2011.
- (2) *Phase transitions for restricted isometry properties* (with J. D. Blanchard and J. Tanner), Proceedings of Signal Processing with Adaptive Sparse Structured Representations (SPARS'09), 2009.
- (1) *Finding a point in the relative interior of a polyhedron, with applications to compressed sensing* (with N. I. M. Gould), SPARS'09, 2009.

Preprints/Technical reports (available online; selected)

- (4) *Optimal Newton-type methods for nonconvex smooth optimization problems* (with N. I. M. Gould and Ph. L. Toint), 22 pages, available on Optimization Online, 2011.
- (3) *A new perspective on the complexity of interior point methods for linear programming* (with R. Hauser), Technical Report 07/05, Numerical Analysis Group, Computing Laboratory, Oxford University, 26 pages, 2007.

- (2) *Finding a point in the relative interior of a polyhedron* (with N. I. M. Gould), Technical Report RAL 2006-016, Rutherford Appleton Laboratory, 57 pages, 2006.
- (1) *On the convergence of a primal-dual second-order corrector interior point algorithm for linear programming*, Technical Report 05/04, Numerical Analysis Group, Computing Laboratory, 35 pages, 2005.

Software Some of my algorithms form the basis/have been incorporated into the GALAHAD optimization software library; see (Documentation for) packages WCP, ARC, GLRT, LSTR, LSRT and L2RT. See also <http://www.galahad.rl.ac.uk/authors.html>. Derivative-free codes DFO-LS and Py-BOBYQA have been coded into Fortran and included into the NAG software library and are also available from the NAG GitHub as Python codes; the number of total downloads of these codes from Github currently stands at +1Mil. For more information on available software please see the journal papers above (where we mention some of the codes associated to respective papers, where available).

Research Supervision/Management Experience

POSTDOCTORAL ADVISOR: *Dr Casey Garner*, NSF postdoctoral fellowship, 2025–2027
Dr Sadok Jerad, Innovate Hong Kong (InnoHK) funding, Oxford CIMDA (Centre for Intelligent Multidimensional Data Analysis); 2024–2025;
Dr Yang Liu, Innovate Hong Kong (InnoHK) funding, Oxford CIMDA (Centre for Intelligent Multidimensional Data Analysis); 2023–2025;
Dr Estelle Massart, NPL funding, 2020–2022 (now at UC Louvain, tenure-track);
Dr Jaroslav Fowkes, EPSRC-funded, 2011 – 2013; Emirates-funding, 2017–2020 (now at STFC Rutherford Appleton Laboratory);
Dr Kuniko Yamazaki, NERC-funded, 2014–2015 (now at Met Office)

Graduate Supervision Experience

PHD SUPERVISOR (principal, unless otherwise specified)

- *Kate Wenqi Zhu*, 2021–2025: *Tensor methods for nonconvex optimization problems*, Innovate Hong Kong (InnoHK) funding, Oxford CIMDA (Centre for Intelligent Multidimensional Data Analysis).
- *Constantin Puiu*, 2020–2024: *Natural gradient algorithms for training deep neural networks*; with industrial partner NAG (Numerical Algorithms Group) and Industrial Maths CDT; now in industry
- *Zhen Shao*, 2018–2022: *On random embeddings and their application to optimisation*; with industrial partner NAG (Numerical Algorithms Group) and Industrial Maths CDT; now in industry.
- *Sophy Oliver*, 2018–2021: *ocean biogeochemical optimisation in Earth system models*; NERC/Met Office funding; second supervisor (first supervisor: Samar Khatiwala, Earth Sciences); now Research Scientist in marine biogeochemistry at National Oceanography Centre, UK.
- *Florentin Goyens*, 2017–2021: *A Riemannian perspective on matrix recovery and constrained optimization*; Alan Turing Institute funding; now postdoctoral researcher in Belgium.
- *Maha Kaouri*, 2016–2021: *Optimization methods for data assimilation in weather forecasting*; second supervisor (first supervisor: Nancy Nichols and Amos Lawless, University of Reading)
- *Adilet Otemissov*, 2016–2020: *Dimensionality reduction techniques for global optimization problems* (University of Oxford); funded by the Alan Turing Institute. Now Assistant Prof (tenure track) at Nazarbayev University, Kazakhstan.
- *Lindon Roberts*, 2016–2019: *Efficient algorithms for derivative free optimization* (University of Oxford); with industrial partner NAG (Numerical Algorithms Group) and Industrial Maths (INFOMM) CDT; Leslie Fox Prize 2021; now Senior Lecturer at the University of Melbourne, Australia.
- *Yiming Yan*, 2010–2014: *Active-set prediction for interior point methods* (University of Edinburgh). Now in industry.

- *Andrew Thompson, 2008–2012: Quantitative analysis of algorithms for compressed signal recovery* (University of Edinburgh). Now permanent Research Scientist in Data Science at National Physical Laboratory (NPL), UK, since 2020.

MATHEMATICAL INSTITUTE, UG/PGT DISSERTATION SUPERVISION:

- Part B Extended Essay
- Part C/OMMS (Oxford Master in Mathematics) dissertations: Paulin Shek, Edward He, Ana Casapopol, Ewan Davies, Prit Pavani, Aikaterini Adamopoulou, Krit Patarapak, Karl Welzel, Qishun Xu; Benjamin Wagenvoort, Edward Tansley, Bianca Iantuc, Jan Guzik, Keying Xu, Ozcan Basdalyanii, Qianwei Jia, Ning Wang, Abdella Mohammed, Yubo Cai, Tobias Bretschneider.
- MSc programme in Mathematical Modelling and Scientific Computing: Maurits Kroese, Nathan Eizenberg, Lukas Mackinder, Matt Geleta, Marius Lange, Theodora Torcea, Tyler Ferguson, Constantin Puiu, Titus Pinta, Cem Gormezano, Meng Yu, Xinzhu Liang, Coco Yinfei Yang, Gabriel Pereira, Luo Long, Monique Wah, Joseph Webb.

RESEARCH PROJECTS SUPERVISION WITH INDUSTRY

CDT programme in Industrially Focused Mathematical Modelling (INFOMM), industrial mini-projects (including setting up the project set with company): Lindon Roberts (NAG), Ana Osojnik (CCFE, conference proceedings), Oliver Sheridan-Methven (NAG, research paper), Giuseppe Ughi (Williams F1), Alex Puiu (NAG), Zhen Shao (NAG, conference proceedings), Constantin Puiu (NAG).

Plenary at Conferences and Invited Talks at Workshops (selected; key presentations in bold)

- **ISMP (International symposium on mathematical programming), Montr, Canada, plenary**
- EUROPT (EURO Conference on Continuous Optimization), Budapest, 2023 - plenary fellowship lecture and summer school lecturer
- SAMPTA (Sampling Theory and Applications Conference), Yale University, 2023 - plenary
- Biennial Numerical Analysis Conference, Strathclyde, Scotland, 2023 - plenary
- Foundations of Computational Mathematics, Paris, 2023 - semi-plenary
- **ICM (International Congress of Mathematicians) 2022, invited sectional speaker**
- **ISMP (International symposium on mathematical programming), Beijing 2021, postponed to Aug 2022 online, due to Covid; semi-plenary**
- **EURO-k Conference, Athens, 2021 - plenary (hybrid)**
- 30 Years of Acta Numerica Conference, Bedlewo, Poland, 2022 - plenary
- **Congres SIMAI-MODE - the main annual meeting of French operations research and optimization community, 2022 - plenary**
- Workshop on Modern Optimization and Applications (MOA), China, 2021 (one of two main regular meetings of the Chinese optimization community; virtual) - plenary
- Mediterranean Machine Learning (M2L) school, Milano (virtual) - survey research talk, 2021
- Workshop on Mathematical Foundations of Optimization in Data Science, Cantab Capital Institute for Mathematics of Information, Cambridge, 2019 - keynote
- One World Optimization Seminar, 2020 (virtual)
- LMS-Bath Symposium on the Mathematics of Machine Learning, 2020 (virtual)
- Neurips Workshop on Optimization Methods for Machine Learning, Neurips 2021 (online) and 2022 (hybrid)
- ICML Workshops on Optimization Methods for Machine Learning, ICML, New York 2016, Stockholm 2018 and Vienna 2020 (virtual) - plenaries
- Turing Workshop OptML: Optimization for Machine Learning, Southampton University - plenary
- Complexity of Numerical Computation (in honour of Felipe Cucker), Berlin, 2019 (by invitation)
- Workshop on Games, Dynamics and Optimization, European Network, Cost Action, 2019 (Cluj-Napoca), 2020 (Rome, La Sapienza), 2022 (online)
- Annual Conference of the SIAM-IMA Cambridge Student Chapter, 2019 - plenary
- **IMA Conference on the Mathematical Challenges of Big Data, London, 2018 - plenary**
- TRIPODS Workshop on Optimization for Machine Learning (DIMACS/Simons Collaboration on Bridging Discrete and Continuous Optimization), Lehigh University, USA, 2018
- EUROPT (EURO Workshop on Continuous Optimization), Almeria, Spain, 2018 - plenary
- **BAMC (British Applied Mathematics Colloquium), St Andrews, Scotland, 2018 - plenary**

- **RAMP Symposium on Mathematical Programming (annual meeting of optimizers in Japan), Tokyo, 2017 - plenary**
- NAG Ltd Annual Meeting, highlight research talk, 2017
- Conference on Approximation and Optimization, National University of Athens, 2017 - plenary
- Workshop on Nonsmooth Optimization and its Applications, Hausdorff Centre for Mathematics, Bonn, 2017 and Schrödinger Institute, Vienna 2019
- FoCM Continuous Optimization, Complexity Workshops (since 2005, triannually)
- Workshop on Nonlinear Optimization and Its Applications, Fields Institute, Toronto, 2016
- **LMS/EMS Joint Meeting on Mathematics of Big Data, Edinburgh, 2015 - plenary**
- **PGMO Days on Optimization, Hadamard Foundation, Paris, 2015 - plenary**
- BIRS Workshop on Sparse Representations, Numerical Linear Algebra and Optimization, Banff Centre, 2014
- ESA Workshop on Correlated Observation Errors in Data Assimilation, University of Reading, 2014 - plenary
- NA-HPC Workshop on New Directions in Nonlinear Optimization, University of Manchester, 2014 - plenary
- MAORI Workshop on Optimization for Image and Signal Processing, Ecole Polytechnique, Paris, 2013
- **ICCOPT (International Conference on Continuous Optimization), 2013 - semi-plenary**
- SIAM UK Annual Meeting, Reading, 2013 - plenary
- 18th Belgian Mathematical Programming Workshop, La Roche-en-Ardenne (Belgium), March 2012 - plenary
- Numerical Methods for Continuous Optimization Workshop, Institute for Pure and Applied Mathematics (IPAM), UCLA, 2010

I have attended and gave invited minisymposia talks regularly at major international conferences in my field (ICCOPT, ISMP, SIAM Optimization, IMA conferences and more), as well as at some conferences/workshops related to climate and weather science (Climathnet, IUGG, Met Office Academic Partnership).

Invited research seminars/colloquia/research visits (since 2010; selected)

Oslo Optimization Seminar Series 2022; "Machine Learning NeEDS Mathematical Optimization" virtual seminar series 2021; One World Optimization Seminar, 2020 (virtual); Birmingham (2), Cambridge (4), Cardiff (3), Imperial College (2), Manchester, Nottingham, Reading (DARC, Mathematics of Planet Earth), Southampton, Strathclyde, Warwick, Oxford (Robotics Group Seminar, Engineering; Geophysical and nonlinear fluid dynamics seminar series, AOPP), Isaac Newton Institute Programmes (2), Florence, Politecnico Milano (MOX), Université Catholique de Louvain (Belgium) (3), Valladolid, Lisbon, Ecole Polytechnique de Montréal, Courant Institute (NYU), Lehigh, Madison-Wisconsin, Maryland at College Park, MIT (OPTML++), Northwestern, Pittsburgh, Princeton (Optimization series), Utah (2); Argonne National Laboratory (2), Rutherford Appleton Laboratory (Bath-RAL day, seminars), Samsung AI, and the UK Met Office (2) (Exeter)

Editorial activity: I am Associate Editor for

- *Mathematics of Computation* (IF 2.08; since 2021);
- *SIAM Journal on the Mathematics of Data Science* (recently established; since 2020);
- *SIAM Journal on Optimization* (IF: 2.87; one of top two journals in optimization; since 2019);
- *Mathematical Programming, Series A* (IF: 3.87; one of two top journals in optimization; 2018 – 2023);
- *IMA Journal of Numerical Analysis* (IF: 2.39; since 2017);
- *Optimization Methods and Software* (IF: 1.33; since 2015).

I was also Guest Editor (with Panayotis Mertikopoulos) for the Special Issue "Optimization and Data Science", *EURO Journal on Computational Optimization* (2022).

Leadership Activities (selected)

- **SIAG Optimization Outstanding Paper Prize:** chair of adjudicating committee 2026.
- **Leslie Fox Prize** for early career researchers in numerical analysis: jury member 2025, chair of jury 2027.
- **SIAM Wilkinson Prize** for early career researchers in scientific computing: selection committee, invited by SIAM (Society for Industrial and Applied Mathematics), 2024

- **FoCM Steve Smale Prize:** selection committee, invited by the Society for the Foundations of Computational Mathematics, 2023.
- **SIAM Activity Group on Optimization:** elected VP, 2023
- **SIAM conference on Optimization (SIAM OP):** co-chair, 2023 (Seattle)
- **SIAM Gene Golub Summer School** on *Theory and Practice of Deep Learning*, AIMS South Africa, co-organizer and lecturer, originally scheduled for July 2020 but postponed to July 2021 due to Covid, hybrid format (competitively awarded by SIAM)
- IMA Conference on Numerical Linear Algebra and Optimization, member of organizing committee, 2018, 2020.
- IMA Conference on Inverse Problems, member of organizing committee, 2019.
- EUROPT (European Working Group on Optimization) programme committee for its annual workshop, Glasgow, 2019.
- Turing Lecture of Prof Steve J Wright (Madison-Wisconsin), funding and organization, The Turing Institute, Oxford and Birmingham
- **SIAG/Optimization Prize**, one of two main prizes in optimization for recent contributions to optimization and applications: member of the selection committee, 2017. (invited by SIAM)
- **SIAM Conference on Optimization (SIAM OP):** member of the Organizing Committee, 2017 (Vancouver); +700 participants. (invited by SIAM)
- International Conference on Continuous Optimization (ICCOPT), one of the principal meetings in the area of numerical optimization: member of ICCOPT Steering Committee, and ICCOPT Streams Organizer, 2016 (Tokyo) and 2019 (Berlin); 600 and 800 attendees, respectively (invited by the Mathematical Optimization Society)
- *Continuous Optimization Workshop*, part of the Foundations of Computational Mathematics Conference: co-organizer, 2014 (Montevideo), 2017 (Barcelona), 2020 (Vancouver). (invited by FoCM)
- Organized *Leverhulme Lectures* and *Oliver Smithies Lectures* in the Mathematical Institute and Balliol College of visiting professors Philippe Toint (Namur) and Katya Scheinberg (Cornell), that popularized top quality research in optimization, machine learning and data assimilation to a wider audience (than immediate research group) including undergraduate students (2015 and 2017, respectively).
- **Industry:** Member of the Scientific Committee of the Smith Institute for Industrial Mathematics and System Engineering (www.smithinst.co.uk), 2012–2015, 2018–present (invited).
- **Industry:** Associate Member of the Numerical Algorithms Group (NAG) Ltd (invited)
- Member of the Organizing Committee (with Serge Gratton (Toulouse) and Nick Gould (RAL)) of *Workshop on Recent Advances in Optimization*, Toulouse, July 24–26, 2013 (part of the series *Sparse Days* and of a project on numerical optimization for geosciences); 50 delegates, 10 prominent international speakers.
- Member of the Organizing Committee (with Mike Davies (Engineering) and Jared Tanner), SPARS’11 (Signal Processing with Adaptive Sparse Structured Representations), Edinburgh, 27–30 June 2011; principal meeting of the Compressed Sensing community; successful funding application to ICMS (£20,000); 165 delegates.
- Organizer (with Martin Lotz), Maxwell Colloquium (Felipe Cucker, City University of Hong Kong) and Associated Workshop *Computational Complexity Challenges in Optimization*, May 12–13, 2011; successful funding application to the Maxwell Institute fund and NAIS (£3,500); 30 delegates, 5 prominent international speakers.
- In the last ten years, I frequently organized several mini-symposia at international optimization conferences such as SIAM Optimization, ICCOPT and Mathematical Programming Symposium, on topics related to my research.

External Appointments

Lectureship, Readership and Professorship hiring committees for University of Cambridge and University of Birmingham.

External PhD examiner for: *Aras Selvi* (supervisor: Prof Wolfram Wisemann), Imperial College, 2025; *Sadok Jerad* (supervisor: Prof Serge Gratton), University of Toulouse, 2024; Jonas Kohler (supervisor: Prof Aurelien Lucchi), ETH Zurich, 2022; *Tom Ragonneau* (supervisor: Prof Zaikun Zhang), Polytechnical University of Hong Kong, 2022; *Damiano Zeffiro* (supervisor: Prof Francesco Rinaldi), University of Padova, 2022; *Derek Driggs* (supervisor: Prof Carola-Bibiane Schoenlib), University of Cambridge, 2021; *Nikita Doikov* (supervisor: Prof Yurii Nesterov), University of Louvain-la-Neuve, Belgium, 2021; *Ruggiero Seccia* (supervisor: Prof Laura Palagi), La Sapienza, Rome (2021); Daniel Vasquez (supervisor: Prof Raghu Pasupathy), Purdue University, 2022; *Nicolas Loizou* (Supervisor: Prof Peter Richtarik), Edinburgh (2019), *Hiva Ghanbari* (Supervisor: Prof Katya Scheinberg), Lehigh University, 2018, *Adrien Taylor* (supervisor: Prof Francois Glineur), University of Louvain-la-Neuve, Belgium, 2016. *Sandra Astete-Morales* (supervisor: Prof Olivier Teytaud), Universite Paris-Sud, 2016. *Salah Beddiaf* (supervisor: Prof Michael

Bartholomew-Biggs), University of Hertfordshire, 2015. *Torsten Bosse* (supervisor: Prof Andreas Griewank), Humboldt University, Berlin, 2014. *Olivier Devolder* (supervisor: Prof Yurii Nesterov), University of Louvain-la-Neuve, Belgium, 2012. *Elena Bukina* (supervisors: Profs Luc Pronzato and Anatoly Zhigljavsky (Cardiff)), University of Nice Sophia Antipolis, France, 2012.

TEACHING

UNIVERSITY OF OXFORD, MATHEMATICAL INSTITUTE, LECTURING:

- *Optimization for Data Science*: 3rd year (Part B) Maths & Joint degrees **new** course: together with Prof Hauser, we designed a **new Part B lecture course** that complements both the numerical analysis and the data science offerings, attempting to equip the MI undergraduates with mathematical foundations for timely topics.
- *Continuous Optimization*: 4th year (Part C) Maths & Joint degrees undergraduate course and the MSc in Mathematical Modelling and Scientific Computing (MMSC) (13/14–present)
- *Integer Programming*: 3rd year (Part B) Maths undergraduate course (15/16)
- Intercollegiate and consultation classes for *Part C/MMCS Continuous Optimization*

UNIVERSITY OF OXFORD, BALLIOL COLLEGE, TUTORIALS: six hours/week for 24 weeks per academic year
Tutorials to first and second year undergraduates in *Probability, Introductory Calculus, Multivariable Calculus, Fourier Series & PDEs, Statistics & Data Science, Optimization, Constructive Maths, Numerical Analysis*.

One-to-one help when needed/requested for some Part B and Part C courses within my specialty

Training our undergraduates to read and present mathematical talks

Mentoring, welfare and career guidance for maths undergraduate students

During my lectureship at University of Edinburgh, School of Mathematics (2007–2013), I lectured in various aspects of optimization theory, algorithms and applications, as well as supervised 12 MSc dissertations for the MSc programme in Operational Research.