

Prof. Desmond J. Higham, FRSE
School of Mathematics
University of Edinburgh
Edinburgh EH9 3FD
Scotland, UK

Email: d.j.higham@ed.ac.uk
WWW: <https://www.maths.ed.ac.uk/~dhigham/>

Career Outline

2019– Professor of Numerical Analysis, University of Edinburgh
1999–2019 Professor of Mathematics, University of Strathclyde
1996–1999 Reader in Applied Mathematics, University of Strathclyde
1990–1996 Lecturer in Numerical Analysis, University of Dundee
1988–1990 Postdoctoral Fellow, University of Toronto

Higher Education

1986–88 Ph.D. (Numerical Analysis), University of Manchester
1985–86 M.Sc. (Numerical Analysis and Computing), University of Manchester
1982–85 B.Sc. First Class Hons. (Mathematics), University of Manchester

Fellowships, Awards and Prizes

2020 *Shephard Prize* from the London Mathematical Society
2015 EPSRC/RCUK Digital Economy Established Career Fellowship
2013 Royal Society Leverhulme Trust Senior Research Fellowship
2012 Royal Society Wolfson Research Merit Award
2011 Research Fellowship from The Leverhulme Trust
2011 Awarded *1966 Chair of Numerical Analysis* at University of Strathclyde
2009 Elected to an inaugural SIAM Fellowship *for contributions to numerical analysis and stochastic computation*
2008 Arne Magnus Distinguished Lecture Series, Colorado State University
2007 SIGEST article in SIAM Review
2006 Elected *Fellow of the Royal Society of Edinburgh*

- 2005** *Germund Dahlquist Prize* from the Society for Industrial and Applied Mathematics (SIAM)—an international award made every two years for research contributions in numerical methods for scientific computing
- 2004** Research Fellowship from The Royal Society of Edinburgh/Scottish Executive Education and Lifelong Learning Department
- 2002** Research Fellowship from The Leverhulme Trust

Research Interests

Numerical analysis, the design and evaluation of computational methods; especially **stochastic computation**, **network science**, **data analytics**, and their application to *cities*, *on-line technology* and *human behaviour*.

Research Funding: *Large Grants as Principal Investigator:*

- 2021:** £202,000 from the Engineering and Physical Sciences Research Council for the project *Mathematics of Adversarial Attacks* under the New Horizons scheme. Includes funding for a post-doctoral researcher.
- 2017:** €183,000 from European Commission/Horizon 2020. Marie Skłodowska-Curie action, providing two years of support for named postdoctoral researcher Dr Francesco Tudisco on the project *Models and Algorithms for Graph Centrality*.
- 2015:** £660,000 from the Research Councils UK Digital Economy Programme and the Engineering and Physical Sciences Research Council. Established Career Fellowship in *Data Analytics for Future Cities*. Includes funding for a post-doctoral researcher.
- 2014:** £20,000 from Stipso/Encompass. Research exploitation project to fund a post-doctoral worker in infographics.
- 2014:** £60,000 from Capita/Strathclyde Strategic Technology Partnership for a PhD studentship (co-supervised by Kerem Akartunali), on *Networks and Optimization for Future Cities*.
- 2013:** £40,000 from Royal Society/Leverhulme Trust for a Senior Research Fellowship on the project *Evolving Networks: Data to Knowledge*.
- 2012:** £50,000 from Engineering and Physical Sciences Research Council/Strathclyde Impact Acceleration Account/Strathclyde Leadership Development/Bloom Agency, Leeds. Research exploitation project to fund a post-doctoral worker.
- 2011:** £50,000 from Engineering and Physical Sciences Research Council/Strathclyde Knowledge Transfer Account/Beatson Institute for Cancer Research. Research exploitation project to fund a post-doctoral worker.
- 2011:** £30,000 from The Leverhulme Trust. Personal Research Fellowship for the project *Fundamental Issues in Stochastic Simulation for Systems Biology*.
- 2010:** £180,000 from Engineering and Physical Sciences Research Council and the Research Councils UK Digital Economy Programme, support for a post-doctoral research assistant on the project *MOLTEN: Mathematics Of Large Technological Evolving Networks*.

- 2010:** £50,000 from Engineering and Physical Sciences Research Council and Wyeth (now Pfizer) for the nine-month industrial secondment of a post-doctoral researcher in biological networks.
- 2009:** £60,000 from Engineering and Physical Sciences Research Council for a CASE PhD studentship, partnered by NAG, on *Multi-level Monte Carlo for Mathematical Finance*.
- 2007:** £275,000 from the Medical Research Council (Cognitive Systems Foresight Project call), support for a post-doctoral research assistant, equipment and travel on the project *Complex Brain Networks in Health, Development and Disease*.
- 2007:** £350,000 from Engineering and Physical Sciences Research Council (Fundamentals of Complexity Science call), support for a post-doctoral research assistant, PhD studentship, equipment and travel on the project *Theory and Tools for Complex Biological Systems*.
- 2004:** £160,000 from Engineering and Physical Sciences Research Council Life Sciences Interface & Mathematics Programme. Support for a post-doctoral research assistant, equipment and travel on the project *Network Simulations in Bioinformatics*.
- 2004:** £30,000 from The Royal Society of Edinburgh/Scottish Executive Education and Lifelong Learning Department. Personal Research Fellowship for the project *Computational Algorithms for Complex Interactions*.
- 2003:** £50,000 from Strathclyde/Glasgow University Synergy Initiative. PhD studentship in Bioinformatics.
- 2001:** £20,000 from The Leverhulme Trust. Personal Research Fellowship for the project *Mathematical Simulation and Randomness*.
- 1998:** £50,000 from Engineering and Physical Sciences Research Council Mathematics Program. Continued support for a post-doctoral research assistant, equipment and travel on the project *Time-Stepping and Nonlinear Dynamics*.
- 1996:** £70,000 from Engineering and Physical Sciences Research Council Mathematics Programme. Support for a post-doctoral research assistant, equipment and travel on the project *Time-Stepping and Nonlinear Dynamics*.
- 1995:** £30,000 from the Scottish Higher Education Funding Council. Support for a research assistant and equipment to develop a numerical analysis server for the World Wide Web.
- 1993:** £90,000 from Science and Engineering Research Council Mathematics Programme. Support for a post-doctoral research assistant, equipment and travel on the project *Dynamics of Time-Stepping in the Numerical Analysis of Differential Equations*.

Research Funding: Large Grants as Institutional Lead:

- 2017:** £690,000 from Engineering and Physical Sciences Research Council. Programme Grant for the project *Inference, Computation and Numerics for Insights into Cities (ICONIC)*. Joint with colleagues at Cambridge, Manchester and Oxford. Includes funding for a post-doctoral researcher. (Total grant £2.9 Million. Overall PI: Mark Girolami, Cambridge.)

Research Funding: Large Grants as Co-Investigator:

2011: £150,00 from EPSRC to support the *Scottish Mathematical Sciences Training Centre*.

2007: £20,000 from University of Strathclyde, Research Enhancement Initiatives Award, (joint with Gian-Luca Oppo and Paul Garside) to establish the *Institute of Complex Systems at Strathclyde*.

2006: £120,000 from Dr Hadwen Trust (led by Dr Heidi Johansen-Berg, University of Oxford) for post-doctoral research assistant, equipment and travel on the project *Computational Approach to Analysing Human Brain Networks and their Breakdown in Disease*.

Editorial Work

Editor-in-Chief of Society for Industrial and Applied Mathematics (SIAM) Review—this journal is consistently rated first, by impact factor, in applied mathematics. (Previously Section Editor of its Survey and Review section from 2011–2016.) In addition to leading the Editorial Board, scoping the latest developments in applied mathematics and ensuring the quality and balance of material in the journal, this role requires me to write an introduction to the highlighted *SIGEST* article in each issue that summarizes and contextualizes the work, and encourages potential readers.

On the Editorial Board of

Society for Industrial and Applied Mathematics (SIAM) Journal on Matrix Analysis and Applications

Institute of Mathematics and its Applications (IMA) Journal of Numerical Analysis

Previously on the Editorial Board of

Proceedings of the Royal Society A

Society for Industrial and Applied Mathematics (SIAM) Journal on Scientific Computing

Journal of Complex Networks

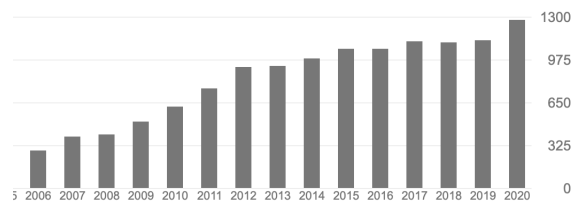
BIT Numerical Mathematics

Journal of Computational Finance

Applied Mathematics Research Express

Guest editor for the recent SIAM Journal on Scientific Computing special issue on *Planet Earth and Big Data* and the Royal Society Open Science special issue on *City Analytics*.

Citation Record



Google Scholar, December 2020.

Total citations 13,795, H-index 52.

Downloadable list of publications available at

<https://www.maths.ed.ac.uk/~dhigham/pubs.html>

Further Examples of Scientific Leadership

- Mathematical Sciences panel member for the next UK Research Excellence Framework (REF 2021)
- Member of London Mathematical Society Prize Committee
- Member of IMA Leslie Fox Prize Committee
- Member of Royal Society of Edinburgh Research Fellowship Awarding Committee
- Member of Artificial Intelligence Fellowship sifting panel at Alan Turing Institute
- Research Assessor for the Carnegie UK Trust
- Member of Newton Gateway to Mathematics Programme Committee (Isaac Newton Institute for Mathematical Sciences, Cambridge)
- Member of Knowledge Exchange Advisory Board of the International Centre for Mathematical Sciences, Edinburgh
- Member of EPSRC Peer Review College since its inception
- Past-President of UK and Ireland Section of SIAM
- Former Leader of Numerical Analysis and Scientific Computing research group at University of Strathclyde
- Former Deputy Head and Research Director at University of Strathclyde
- Co-organiser of *2017 SIAM Annual Meeting* in Pittsburgh
- Co-organiser of workshop on *Data Science and Crime*, Glasgow 2018
- Co-organiser of three workshops on *City Analytics*: Royal Society of Edinburgh in 2018, Alan Turing Institute in 2017 and Future Cities Catapult in 2015
- Organiser of three workshops on *Big Data and Social Media*: Glasgow, 2017 and 2013, and Edinburgh, 2013
- Co-organiser of one week meeting on *Mathematics for Measurement* at the International Centre for Mathematical Sciences, Edinburgh in 2017
- Co-organiser of workshops on *Network Science meets Matrix Functions* and *Networks: from Matrix Functions to Quantum Physics* in Oxford, 2017 and 2016
- Co-organiser of scoping workshop on *Urban Analytics* for Alan Turing Institute in 2015
- Co-organiser of workshop on *What Makes a Successful City?* in Glasgow, 2015
- Co-organiser of workshop on *Opportunities for Data Analytics in Future Cities Research* in Glasgow, 2014
- Inaugural Faculty Advisor for the Strathclyde SIAM/IMA Student Chapter
- External undergraduate examiner (Part B) in applied mathematics at University of Oxford, 2015–2017

- External referee for the MSc on *Mathematics of Cybersecurity*, University of Bristol
- After-dinner speaker at *25th Biennial Conference on Numerical Analysis*, Glasgow, 2013

Recent and Upcoming Invited Talks at Conferences/Workshops with expenses paid

- 2020** International Conference on Trustworthy AI, Skolkovo Inst. Sci. Tech., Moscow (moved online)
- 2020** Stability and Discretization Issues in Differential Equations, Budapest (postponed)
- 2020** IMA Early Career Mathematicians' Autumn Conference, Glasgow (moved online)
- 2020** Numerical Analysis and Optimization, Oman
- 2019** Scientific Computation using Machine-Learning Algorithms, Nottingham
- 2019** 17th International Conference of Numerical Analysis and Applied Mathematics, Rhodes
- 2019** Stochastic Processes and Applications, Edinburgh
- 2019** Pint of Science, Glasgow
- 2019** SIAM UK/Ireland Section Annual Meeting, Oxford
- 2019** Strathclyde Annual SIAM-IMA Student Chapter Meeting, Glasgow
- 2019** Dynamics, Equations and Applications, Krakow
- 2019** Threshold Networks, Nottingham
- 2019** Biennial Conference on Numerical Analysis (*A. R. Mitchell Lecture*), Glasgow
- 2019** Computational Math Day, Stirling
- 2018** Edinburgh Annual SIAM-IMA Student Chapter Meeting
- 2018** 11th Europe-Korea Conference on Science and Technology 2018, Glasgow
- 2017** Joint meeting of the Edinburgh Mathematical Society and Societat Catalana de Matemàtiques, Edinburgh
- 2017** Asymptotics for Stochastic Dynamical Systems, Swansea
- 2017** Industrial Mathematics in the Knowledge Transfer Network, London
- 2017** Glasgow Philosophical Society Lecture, during Glasow Science Festival
- 2017** Cafe Scientifique, Glasgow
- 2016** Mathematics of Complex Systems: from Precision Medicine to Smart Cities, Coimbra
- 2016** EPSRC meeting on New Approaches to Data Science, London
- 2016** Mathematical Models and Computational Methods for Complex Networks, Pisa
- 2016** Stochastic Dynamical Systems, Newton Institute, Cambridge

- 2016 Mathematics for Future Cities, Edinburgh International Science Festival
- 2016 Scottish Branch of the Institute for Mathematics and Its Applications Lecture, Glasgow
- 2015 European Conference on Numerical Mathematics and Advanced Applications (ENUMATH 2015), Ankara
- 2015 Dynamic Networks and Network Cyber-Security, Heilbronn Institute for Mathematical Research, Bristol
- 2015 New Directions in Numerical Computation, Oxford
- 2014 Numerical Algorithms and Intelligent Software, Edinburgh
- 2014 IMA Conference on the Mathematical Challenges of Big Data, London
- 2014 Complex Networks: Theory and Applications, Edinburgh
- 2014 High Dimensionality/Complexity (Final Conference of DFG Priority Programme SPP 1324), Marburg
- 2014 Twelfth International Conference of Numerical Analysis and Applied Mathematics, Rhodes
- 2014 Random Dynamics and Stochastic Numerics, Mannheim
- 2014 Mathematical and Numerical Modeling in Finance, Mittag-Leffler Institute, Stockholm
- 2013 Computational Linear Algebra and Optimization for the Digital Economy, ICMS, Edinburgh
- 2013 Dynamical Networks: From Data to Models (NetSci Satellite), Copenhagen
- 2013 Optimization and Big Data, ICMS, Edinburgh
- 2013 Large Evolving Networks, Heilbronn Institute, Bristol
- 2013 Numerical Methods for Stochastic Differential Equations, Vienna
- 2013 Information, Probability and Inference in Systems Biology, ICMS, Edinburgh
- 2013 Bifurcation Theory, Numerical Linear Algebra and Applications, Bath

Ph.D. students Supervised and General Topics

- Current** Ahmad Alsayed, *Dynamic Human Interaction Networks*
- 2019 Craig Gilmour, *Self-exciting Processes*
- 2013 Mikolaj Roj, *Multilevel Monte Carlo in Finance*
- 2011 Xiaolin Xiao, *Complex Brain Networks*
- 2010 Somkid Intep, *Stochastic Differential Equations with Switching*
- 2009 Alan Taylor, *Random Networks*
- 2008 Graeme Chalmers, *Jump-Diffusion Problems in Mathematical Finance*
- 2006 Julie Morrison, *Graph Computations in Bioinformatics*

2003 Alan Bryden, *Stability Issues in Stochastic Simulation*

2002 Edward McDonald, *Computing Lyapunov Exponents*

1998 Richard Wain, *Dynamics of Adaptive ODE Algorithms*

1997 Abdul-Hadi Alim A. Khader, *Simulating Integro-Differential Equations*

1996 Tasneem Sardar, *Dynamics of Timestepping*

Ph.D. students Co-Supervised and General Topics

Current Xue Gong, *Algorithms for Directed Networks* (jointly supervised by Kostas Zygalakis)

Current Tadas Krikstanavicius, *Data Assimilation/Active Subspaces* (jointly supervised by Alison Ramage)

Current Martin Paton, *Networks and Optimization* (jointly supervised by Kerem Akartunali)

2014 Martin McDonald, *Networks in Neuroscience and Genetics* (Medical Devices Doctoral Training Centre student, co-supervised by neuroscientists Ben Pickard and Judy Pratt at Strathclyde)

2010 Lukas Szpruch, *Stochastic Differential Equations* (jointly supervised by Xeurong Mao)

2010 Xu Gu, *Differential Equation Models in Cell Biology* (main supervisor was David Gilbert)