

Aretha Leonore Teckentrup

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PERSONAL INFORMATION

Date of birth

29 January 1986

Nationality

German

EMPLOYMENT

Lecturer in Mathematics of Data Science

University of Edinburgh (UK), October 2016 - present

Turing Fellow (50% FTE)

Alan Turing Institute (UK), October 2016 - present

Postdoctoral Research Associate

University of Warwick (UK), September 2014 - September 2016

With Professor Andrew Stuart, funded by EPSRC grant EP/K034154/1

Postdoctoral Research Associate

Florida State University (USA), July 2013 - July 2014

With Professor Max Gunzburger, funded by AFOSR grant FA9550-11-1-0149

EDUCATION

PhD Mathematics, *Multilevel Monte Carlo Methods and Uncertainty Quantification*

University of Bath (UK), October 2009 - June 2013

Supervisor: Professor Robert Scheichl

MMath Mathematics (*with first class honours*)

University of Bath (UK), October 2005 - June 2009

RESEARCH INTERESTS

- Problems at the Interface of Numerical Analysis, Statistics and Data Science
- Uncertainty Quantification for Complex Systems
- Bayesian Approach to Inverse Problems governed by Differential Equations
- Analysis of Gaussian Process Regression
- Multilevel Sampling Methods for Uncertainty Quantification
- Multivariate Interpolation and Approximation

HONOURS AND AWARDS

- Inaugural SIAG/UQ Early Career Prize, 2018
- SciCADE New Talent Award (second prize), 2017
- Leslie Fox Prize (second prize) in Numerical Analysis, 2017
- Invited to organise a Young Researcher mini-symposium on *Computational Techniques for Bayesian Inverse Problems* at the 88th GAMM annual meeting 2017

PUBLICATIONS

Journal Publications

- A.M. Stuart and A.L. Teckentrup. *Posterior Consistency for Gaussian Process Approximations of Bayesian Posterior Distributions*. *Mathematics of Computation*(87), 721-753, 2018.
- R. Scheichl, A.M. Stuart and A.L. Teckentrup. *Quasi-Monte Carlo and Multilevel Monte Carlo Methods for Computing Posterior Expectations in Elliptic Inverse Problems*. *SIAM/ASA Journal on Uncertainty Quantification*, 5(1), 493518, 2017.
- T.J. Dodwell, C. Ketelsen, R. Scheichl, A.L. Teckentrup. *A Hierarchical Multilevel Markov Chain Monte Carlo Algorithm and Applications to Uncertainty Quantification in Subsurface Flow*. *SIAM/ASA Journal on Uncertainty Quantification* 3(1):1075-1108, 2015.
- A.L. Teckentrup, P. Jantsch, C.G. Webster, M. Gunzburger. *A Multilevel Stochastic Collocation Method for Partial Differential Equations with Random Input Data*. *SIAM/ASA Journal on Uncertainty Quantification*, 3(1):1046-1074, 2015.
- A.L. Teckentrup, R. Scheichl, M.B. Giles and E. Ullmann. *Further Analysis of Multilevel Monte Carlo Methods for Elliptic PDEs with Random Coefficients*. *Numerische Mathematik*, 125(3):569-600, 2013.
- J. Charrier, R. Scheichl and A.L. Teckentrup. *Finite Element Error Analysis of Elliptic PDEs with Random Coefficients and its Application to Multilevel Monte Carlo Methods*. *SIAM Journal on Numerical Analysis*, 51(1):322-352, 2013.
- K.A. Cliffe, M.B. Giles, R. Scheichl and A.L. Teckentrup. *Multilevel Monte Carlo Methods and Applications to Elliptic PDEs with Random Coefficients*. *Computing and Visualization in Science*, 14(1):3-15, 2011.

Refereed Conference Proceedings

- A.L. Teckentrup. *Multilevel Monte Carlo Methods for Highly Heterogeneous Media*. Proceedings of the Winter Simulation Conference 2012, <http://informatics-sim.org/>.

Preprints

- H.C. Lie, T.J. Sullivan, A.L. Teckentrup. *Random forward models and log-likelihoods in Bayesian inverse problems*. Available as preprint arXiv:1712.05717.
- M.M. Dunlop, M. Girolami, A.M. Stuart, A.L. Teckentrup. *How deep are deep Gaussian processes?* Available as preprint arXiv:1711.11280.
- M. Park and A.L. Teckentrup. *Improved Multilevel Monte Carlo Methods for Finite Volume Discretisations of Flow in Randomly Layered Media*. Available as preprint arXiv:1506.04694.
- M. Gunzburger, A.L. Teckentrup. *Computing Approximate Optimal Point Sets for Total Degree Polynomial Interpolation in Moderate Dimensions*. Available as preprint arXiv:1407.3291.

Theses

- A.L. Teckentrup. *Multilevel Monte Carlo Methods and Uncertainty Quantification*. PhD thesis, University of Bath, June 2013.

TEACHING EXPERIENCE**Lecturer**

University of Edinburgh (UK), Academic year 2017/18, Second year undergraduate course entitled *Several Variable Calculus and Differential Equations*

University of Edinburgh (UK), Academic years 2016/17, Second year undergraduate course entitled *Facets of Mathematics*

University of Warwick (UK), Academic years 2014/15 - 2015/16, Third year undergraduate course entitled *Matrix Analysis and Algorithms*

Short Course Instructor

One-day short course on "Introduction to the Bayesian Approach to Inverse Problems", Loka Brunn (Sweden), August 2016, taught jointly with Dr Claudia Schillings

One-day short course on "Introduction to the Bayesian Approach to Inverse Problems", University of Edinburgh (UK), May 2017, taught jointly with Dr Claudia Schillings

Teaching Assistant

University of Bath (UK), Academic years 2008/09 through 2012/13, Tutorials for first and second year undergraduate courses on numerical analysis and MATLAB

RESEARCH SUPERVISION EXPERIENCE**Masters Projects**

University of Warwick (UK), Academic year 2014/15, Final year undergraduate Masters (MMath) project of Erlend Skaldehaug Riis, entitled *Bayesian Inverse Problems for Non-Linear Partial Differential Equations*, supervised jointly with Professor Andrew Stuart

Research Study Groups

University of Warwick (UK), Academic year 2014/15, Postgraduate research study group on *Reduced Order Models in Uncertainty Quantification*, supervised jointly with Dr Claudia Schillings

INVITED SEMINAR PRESENTATIONS

2017 University of Birmingham (UK), Heriot-Watt University (UK), Imperial College London (UK), University of Bath (UK)

2016 University of Manchester (UK), University of Strathclyde (UK), University of Leeds (UK)

2015 University of Leeds (UK), University of Nottingham (UK)

2013 Oak Ridge National Laboratory (USA), University of Reading (UK)

2011 Lawrence Livermore National Laboratory (USA)

SELECTED INVITED WORKSHOP/CONFERENCE PRESENTATIONS

- 2018 Workshop on Surrogate Models for UQ in Complex Systems (Newton Institute, UK), SIAM Annual Meeting (University of Southampton, UK)
- 2017 LMS-EPSRC Durham Symposium on Model Order Reduction (University of Durham, UK), NASPDE '17 (Johannes Kepler University Linz, Austria), Conference on Scaling Cascades in Complex Systems (Free University Berlin, Germany)
- 2016 Dagstuhl Seminar on Uncertainty Quantification and High Performance Computing (Schloss Dagstuhl, Germany), NASPDE'16 (Gothenburg, Sweden), Uncertainty Quantification workshop (Institute Mittag-Leffler, Sweden), UK-Russia workshop on Uncertainty Quantification in Inverse Modelling (Novosibirsk, Russia)
- 2015 2nd GAMM AGUQ Workshop on Uncertainty Quantification (Technical University Chemnitz, Germany), Annual meeting of "Porous media: Processes and Mathematics" (PMPM) network 2015 (Edinburgh, UK)
- 2014 NAIS workshop on Spatial Statistics and Uncertainty Quantification on Supercomputers (University of Bath, UK), Reading-Warwick Data Assimilation meeting (University of Warwick, UK)
- 2013 NASPDE'13 (INRIA Rennes, France)

SELECTED MINI-SYMPOSIUM PRESENTATIONS

- 2017 SciCADE '17 (University of Bath, UK), 27th Biennial Numerical Analysis Conference (University of Strathclyde, UK),
- 2016 MCQMC'16 (Stanford University, USA), MAFELAP '16 (Brunel University, UK), SIAM UQ '16 (Lausanne, Switzerland)
- 2015 SCICADE '15 (University of Potsdam, Germany), ICIAM '15 (Beijing (China), SIAM CSE '15 (Salt Lake City, USA)
- 2014 FoCM '14 (Universidad de la Republica, Uruguay), MCQMC'14 (Katholieke Universiteit Leuven, Belgium), SIAM UQ '14 (Savannah, USA)
- 2013 MAFELAP '13 (Brunel University, UK)
- 2012 Winter Simulation Conference '12 (Berlin, Germany), MCQMC'12 (University of New South Wales, Australia)

WORKSHOP ORGANISATION

- Workshop on *Approximating high-dimensional functions*, Alan Turing Institute (UK), 18-19 December 2017. (Funded by the Alan Turing Institute, award value £5000)
- Summer school on *Mathematical Aspects of Inverse Problems*, Alan Turing Institute (UK), 29 August - 1 September 2017. (Funded by the Alan Turing Institute, award value £9200)

RESEARCH VISITS

- Funded participation in the Newton Institute programme *Uncertainty quantification for complex systems: theory and methodologies*, 9 weeks in 2018
- Funded participation in the British Council Researcher Links workshop on *Uncertainty Quantification in Inverse Modelling* in Novosibirsk (Russia), April 2016
- Funded research visit to Professor Clayton Webster at the Oak Ridge National Laboratory (USA), 1 week in October 2013

- Funded research visits to Professor Panayot Vassilevski at the Lawrence Livermore National Laboratory (USA), 2 weeks in September 2011 and 4 weeks in July 2012
- Funded participation in the *RICAM Special Semester on Multiscale Simulation & Analysis in Energy and the Environment* at the RICAM in Linz (Austria), October 3-December 16, 2011

PROFESSIONAL ACTIVITIES

- **Reviewer** for international peer-reviewed journals, including BIT Numerical Mathematics, Foundations of Computational Mathematics, Numerical Linear Algebra with Applications, SIAM/ASA Journal on Uncertainty Quantification, SIAM Journal on Numerical Analysis, SIAM Journal on Scientific Computing and Stochastic Partial Differential Equations: Analysis and Applications
- **Member** of the Events Steering Group at the Alan Turing Institute (UK), 2017-present

PROGRAMMING SKILLS

- Programming in MATLAB (advanced), Fortran90/95, C/C++, R (basic)
- Experience with MPI, OpenMP, CUDA C

REFERENCES

Professor Max Gunzburger
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Professor Robert Scheichl
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Professor Andrew Stuart
Computing and Mathematical Sciences
California Institute of Technology
Pasadena, CA91125, USA.
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