Elisabeth Ullmann

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Personal Data

Citizenship: Germany

Education

2002–2008	Doctorate in Mathematics (Dr. rer. nat.) at TU Bergakademie Freiberg, Germany Dissertation: *Solution Strategies for Stochastic Finite Element Discretizations* Rating: summa cum laude, Supervisor: Oliver G. Ernst
1997–2002	Diploma in Applied Mathematics (Dipl.-Math.) at TU Bergakademie Freiberg Thesis: *Adaptive Finite Element Methods for Groundwater Flow Calculations* (in German), Supervisor: Oliver G. Ernst

Professional Experience

July 2014 – present	Research Associate at Universität Hamburg
July 2011 – June 2014	Research Associate at University of Bath
August 2008 – June 2011	Postdoctoral Research Associate in the German Research Foundation (DFG) Priority Program 1324 "Extraction of quantifiable information from complex systems" at TU Bergakademie Freiberg
April – September 2009	Visiting Research Associate at University of Maryland, College Park, USA
June 2002 – July 2008	Research Associate and Teaching Assistant at the Department of Mathematics and Computer Science, TU Bergakademie Freiberg

Memberships

SIAM	Society for Industrial and Applied Mathematics
GAMM	Activity Group on Uncertainty Quantification Activity Group Applied and Numerical Linear Algebra

Awards

2008	Michael-Jürgen-Leisler-Kiep Travel Fellowship, awarded annually by the TU Bergakademie Freiberg to young researchers for a study trip to a scientific institution prior in North America.

Research Experience

2011 – 2014	Postdoctoral Researcher in project "Multilevel Monte Carlo Methods for Elliptic Problems with Applications to Radioactive Waste Disposal" funded by the EPSRC. Principal Investigator: Prof. Scheichl (Bath)
2009 – 2011	Participated in joint project on "Probabilistic Uncertainty Quantification for Subsurface Flows applied to Radioactive Waste Disposal and C02 Sequestration" with Prof. Cliffe (University of Nottingham, UK) and Prof. Ernst and Prof. van den Boogaart (Freiberg) sponsored by the German Academic Exchange Service (DAAD).
2008 – 2011	Postdoctoral Researcher in project "Stochastic Galerkin Methods: Fundamentals and Algorithms" funded by the DFG Priority Program 1324. Principal Investigators: Prof. Ernst (Freiberg) and Prof. Starkloff (Zwickau). Topic: Efficient iterative solvers for stochastic Galerkin discretizations of PDEs with random data.

Research Interests

- Uncertainty quantification for PDE-based simulations in science and engineering
- Discretizations, solvers and estimators for partial differential equations with random data
  - Multilevel Monte Carlo estimators
  - Stochastic Galerkin methods
- Finite element methods, in particular mixed elements
- Numerical Linear Algebra: Iterative solvers, Krylov subspace methods, Preconditioning
- Estimation of rare events

Professional Activities

Referee for Journals

IMA Journal of Numerical Analysis
Journal of Computational Physics
Numerische Mathematik
SIAM Journal on Matrix Analysis and Applications
SIAM Journal on Scientific Computing
SIAM/ASA Journal on Uncertainty Quantification

Reviewer

AMS Mathematical Reviews (since 2012)

Organizer

April 2011	GAMM Annual Meeting, Graz, Austria. Co-organizer: Eveline Rosseel Minisymposium Title: *Numerical Methods for PDEs with Uncertainties* **Selected in annual GAMM Young Researcher's Minisymposium contest.**
Summer Term 2015	Co-organizer of public lecture series *Mathematics and Simulation of Uncertain Complex Systems* (in German), Universität Hamburg.

Publications

Submitted

Solving log-transformed random diffusion problems by stochastic Galerkin mixed finite element methods. (with C. E. Powell). MIMS Preprint 2014.76, University of Manchester, December 2014.

Multilevel estimation of rare events. (with I. Papaioannou). Hamburger Beiträge zur Angew. Mathematik 2014-24, October 2014.

Mixed finite element analysis of lognormal diffusion and multilevel Monte Carlo methods. (with R. Scheichl and I. G. Graham). Available from `arXiv.org:1312.6047`

Journals

Further analysis of multilevel Monte Carlo methods for elliptic PDEs with random coefficients. (with A. L. Teckentrup, R. Scheichl and M. B. Giles). Numerische Mathematik, 125 (2013), pp. 569–600.

Efficient iterative solvers for stochastic Galerkin discretizations of log-transformed random diffusion problems. (with H. C. Elman and O. G. Ernst). SIAM J. Sci. Comput., 34 (2012), pp. A659–A682.

On the convergence of generalized polynomial chaos expansions. (with O. G. Ernst, A. Mugler, and H.-J. Starkloff). ESAIM: Math. Model. Numer. Anal., 46 (2012), pp. 317–339.

Expansion of random field gradients using hierarchical matrices. (with I. Busch and O. G. Ernst). Proc. Appl. Math. Mech., 11 (2011), pp. 911–914.

A Kronecker product preconditioner for stochastic Galerkin finite element discretizations. SIAM J. Sci. Comput., 32 (2010), pp. 923–946.

Stochastic Galerkin matrices. (with O. G. Ernst). SIAM J. Matrix Anal. Appl., 31 (2010), pp. 1848–1872.

Preconditioning stochastic Galerkin saddle point systems. (with C. E. Powell). SIAM J. Matrix Anal. Appl., 31 (2010), pp. 2813–2840.

Efficient solvers for a linear stochastic Galerkin mixed formulation of diffusion problems with random data. (with O. G. Ernst, C. E. Powell, and D. J. Silvester). SIAM J. Sci. Comput., 31 (2009), pp. 1424–1447.

Computational aspects of the stochastic finite element method. (with M. Eiermann and O. G. Ernst). Comput. Visual. Sci., 10 (2007), pp. 3–15.

Theses

Solution Strategies for Stochastic Finite Element Discretizations. Dissertation, Fakultät für Mathematik und Informatik, TU Bergakademie Freiberg, June 2008.

Adaptive finite Element Methoden zur Approximation von Grundwasserströmungen. Diploma Thesis, Institut für Angewandte Mathematik II, TU Bergakademie Freiberg, May 2002.

Selected Conferences, Workshops, Seminars

Invited Talk

September 2014	Numer. Analysis and Scient. Computing Seminar, University of Manchester, UK
July 2014	11th World Congress on Computational Mechanics, Barcelona, Spain (MS)
April 2014	SIAM Conference on Uncertainty Quantification, Savannah, GA (MS)
March 2014	Mathematics and Statistics for Metrology (MATHMET 2014), Physikalisch-Technische Bundesanstalt, Institut Berlin, Germany **(Invited Plenary)**
September 2013	Symposium on Stochastic Parameterisation in Weather and Climate Models, Bonn, Germany
June 2013	25th Biennial Conference on Numerical Analysis, Glasgow, UK (MS)
June 2013	SIAM Conf. on Math. and Comput. Issues in the Geosciences, Padova, Italy (MS)
January 2013	Engineering Risk Analysis Group, TU München, Germany (Seminar)
October 2012	Numerical Analysis Group, Rutherford Appleton Laboratory, Didcot, UK (Seminar)
June 2012	Numerical Analysis of Stochastic PDEs (NASPDE) Workshop, Warwick, UK
February 2012	Tenth International Conference on Monte Carlo and Quasi-Monte Carlo Methods in Scientific Computing, Sydney, Australia (MS)
January 2012	University of Manchester, Workshop on Linear Algebra and PDEs with Random Data
June 2011	Householder Symposium XVIII, Tahoe City, CA **Received U.S. Dept of Energy travel funding.**
April 2011	82nd GAMM Annual Meeting, Graz, Austria **Received NAWI Graz travel funding.**
February 2011	20th Int. Conference on Domain Decomposition Methods, San Diego, CA (MS) **Received DAAD travel grant, declined conference travel funding.**
May 2010	ICMS Workshop on Uncertainty Quantification, Royal Society of Edinburgh, UK

Talk

May 2013	Workshop on Numerical Methods for Uncertainty Quantification, Hausdorff Center for Mathematics, Bonn, Germany
January 2013	29th GAMM Seminar on Numerical Methods for UQ, MPI Leipzig, Germany
March 2012	SIAM Conference on Uncertainty Quantification, Raleigh, NC

Programs

September 2011	Ideas Sandpit 2: Substainable Water, University of Bath In-house multidisciplinary workshop for academic staff at University of Bath. Topics: Water availability, use and challenges to recycling.
January 2011	Research Networks Training Workshop, Amsterdam Workshop for Early Career Researchers organized by the British Council. Topics: Management of an international research career with focus on creativity, innovation, collaboration, and impact. **Participation awarded by the British Council.**

Teaching and Supervision

2014 – present	PhD thesis of Ahmad Ali: *Optimal control of semilinear equations with state constraints* (jointly with Prof. Michael Hinze), Universität Hamburg
Summer Term 2015	Lecturer for the course *Numerical Methods for Stochastic Differential Equations* attended by Master's students in Mathematics at the Universität Hamburg
Winter Term 2014	Supervision of a Pro/Seminar *Least Squares Estimation and Kalman Filter* attended by Bachelor's and Master's students in Mathematics at the Universität Hamburg
	Teaching assistant for the course *Everything you always wanted to know about linear systems of equations* attended by Master's students in Education at the Universität Hamburg
2013	Lecturer for the Numerical Methods section of the course *Advanced Mathematical Modelling* attended by Year 3 Undergraduate Chemical Engineering students at the University of Bath
2011–12	Tutor for the following courses attended by Year 2 Undergraduate Mathematics students at the University of Bath: *Numerical Analysis* *Partial Differential Equations and Continuum Mechanics*
2002–2009	As a teaching assistant I developed or graded problem sets and exams, held review sessions and office hours and on occasion substituted for the instructor in the following courses given by the faculty of the Institut für Numerische Mathematik und Optimierung at TU Bergakademie Freiberg: *Numerical Analysis* *Numerical Solution of Ordinary Differential Equations* *Numerical Solution of Partial Differential Equations* *Finite Element Method* *Algorithms and Data Structures* *Advanced Mathematical Methods for Scientists* (Calculus, Linear Algebra, ODEs)

References

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April 11, 2015 (Elisabeth Ullmann)