Dr. Manuel Baumann

Curriculum Vitæ

About myself

Date of birth	04-10-1986
Birth place	Berlin
Nationality	German
Education	PhD in Applied Mathematics

Experience

2018–Present **Postdoctoral Research Scientist**, *Max Planck Institute for Dynamics of Complex Technical Systems*, Magdeburg.

Development of mathematical models and efficient algorithms for the numerical simulation of power grid networks with respect to renewable energy sources, flexible consumers and new storage devices.

- Project: Consistent Optimization and Stabilization of Electric Power Grids
- Research focus: Mathematical modelling and software development in Python.
  - Power grid stabilization via optimal control of storage elements.
  - Complexity reduction of dynamic power flow simulations using network clustering.
  - Algorithmic development in Python for scientific computing (`NumPy` and `SciPy`), data analysis (`Pandas`) and network problems (`NetworkX` and `scikit-learn`).
  - Mathematical expertise: numerical optimization · network simulation · complexity reduction for large-scale network computations · mathematical modelling.
- Industrial partners TenneT TSO · ENSO NETZ · Venios GmbH · Energy Saxony e.V.

2013–2018 **PhD Researcher**, *Delft University of Technology*, Delft.

PhD in Applied Mathematics (Numerical Analysis)

- PhD thesis: *Fast Iterative Solution of the Time-Harmonic Elastic Wave Equation*
- Research focus: Theory and implementation of preconditioners designed for the efficient computer simulation of seismic waves.
  - Development of fast and memory-efficient iterative solvers for large-scale linear systems in a coupled Python/Fortran 90 environment.
  - Imaging techniques (inverse problems) for seismic applications.
  - Mathematical expertise: matrix computations · Finite Element method · partial differential equations.
- Industrial partner: Shell Global Solutions International B.V.

2009 **Internship**, *German Aerospace Center (DLR)*, Braunschweig.

Coupled flow-structure simulations on parallel hardware using C++ and MPI.

Education

2012–2013 **Master of Science**, *Delft University of Technology*, Delft.
Applied Mathematics · Topic of the Master thesis: Computational complexity reduction

2011–2012 **Master of Science**, *KTH Royal Institute of Technology*, Stockholm.
Computational Science & Engineering · Major: Numerical analysis and simulations

2008–2011 **Bachelor of Science**, *Technical University of Berlin*, Berlin.
Mathematics · Topic of the Bachelor thesis: Simulation of mixtures in a stirrer

2007–2011 **Bachelor of Science**, *Technical University of Berlin*, Berlin.
Engineering Sciences · Topic of the Bachelor thesis: Computational fluid dynamics with Cuda

Publications in international journals

2018 *Space-Time Galerkin POD with Application in Optimal Control of Semilinear Partial Differential Equations.* In: SIAM J. Sci. Comp., with J. Heiland and P. Benner

2018 *An efficient two-level preconditioner for multi-frequency wave propagation problems.* In: Appl. Numer. Math., with M.B. van Gijzen

2018 *Convergence and complexity study of GMRES variants for solving multi-frequency elastic wave propagation problems.* In: J. Comp. Sci., with M.B. van Gijzen

2017 *An MSSS-preconditioned matrix equation approach for the time-harmonic elastic wave equation at multiple frequencies.* In: Comput. Geosci., with R. Astudillo, Y. Qiu, E.Y.M. Ang, M.B. van Gijzen and R.-É. Plessix

2015 *Nested Krylov methods for shifted linear systems.* In: SIAM J. Sci Comp., with M.B. van Gijzen

Talks at international conferences

2019 SIAM Conference on Computational Science and Engineering, Spokane (planned)

2019 Future Electric Power Systems and the Energy Transition, Champéry (planned)

2017 International Conference on Preconditioning Techniques, Vancouver

2017 International Conference on Computational Science, Zurich

2016 SIAM Annual Meeting, Boston

2016 EAGE Conference & Exhibition, Vienna

2015 SIAM Conference on Applied Linear Algebra, Atlanta

2015 International Conference on Preconditioning Techniques, Eindhoven

2014 Conference on Numerical Linear Algebra and Optimisation, Birmingham

Awards and Scholarships

2017 SIAM Certificate of Recognition

2014 Poster award at the Woudschoten Conference on Scientific Computing (2^{nd} place)

2011–2013 Erasmus Mundus scholarship

2011 Best Bachelor thesis in Mathematics at TU Berlin (1^{st} place)

2007–2011 Scholarship of the Friedrich Ebert Foundation

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Programming skills

Expert	MATLAB · Python · scientific software development
Advanced	Continuous integration · Fortran 90 · parallel programming with MPI and Cuda
Intermediate	COMSOL Multiphysics · FEniCS · PETSc · C++

Communication skills

2018–Present	Supervision of Master thesis at Otto von Guericke University Magdeburg: F. Weiss, *Simulation, Analysis and Model-Order Reduction for Dynamic Power Flow Models.*
2015–2017	Assistance in several courses on numerical analysis at different levels at TU Delft.
2013–2018	Successful collaboration with international scientists.
2014–2017	Organization of bi-monthly seminars *Numerical Mathematics in Practice* for PhD students at TU Delft.
2014–2017	Inaugural president of the SIAM Student Chapter at TU Delft.
2008–2009	Speaker of student group *development politics* of the Friedrich Ebert Foundation.

Languages

German	**Mother tongue**	
English	**Business fluent**	*Years of experience in an English-speaking work environment.*
French · Dutch	**Intermediate**	*I lived and studied abroad.*

Interests

race cycling · outdoor activities · skiing instructor · traveling

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