

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.

Dr. Manuel Baumann | Fake Street 123 | 12345 Magdeburg

☎ (0171) 12 34 567 | ✉ manuelmbaumann@gmail.com | 🌐 www.manuelbaumann.de

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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
- 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 (2nd place)
- 2011–2013 Erasmus Mundus scholarship
- 2011 Best Bachelor thesis in Mathematics at TU Berlin (1st place)
- 2007–2011 Study scholarship of the Friedrich Ebert Foundation

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



Magdeburg, February 8, 2019