

Curriculum Vitæ

Daniel Peterseim

born May 22, 1980 – Mühlhausen/Thüringen, Germany
nationality German
family status married, two children
affiliation Chair of Computational Mathematics
Institute of Mathematics
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University of Augsburg
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www <http://scicomp.math.uni-augsburg.de>
area of research Numerical Analysis, Scientific Computing,
Computational Mechanics, Computational Physics
main interests Computational multiscale methods, Numerical homogenization

Positions

since 2017 Chair of *Computational Mathematics* (W3, professor ordinarius)
Universität Augsburg, Germany
2013-2017 Professor for *Numerical Simulation* (W3)
Universität Bonn, Germany
2009-2013 Head of MATHEON Junior Research Group *Numerical Analysis*
DFG Research Center MATHEON *Mathematics for key technologies*
Humboldt-Universität zu Berlin, Germany
2009 (Postdoctoral) Research assistant
Humboldt-Universität zu Berlin, Germany
2004-2008 (PhD and Postdoctoral) Research assistant
Universität Zürich, Switzerland

Education

2016 Habilitation in Mathematics at Humboldt-Universität zu Berlin, Germany
2007 Dr. sc. nat. in Mathematics at Universität Zürich, Switzerland
2004 Diploma in Mathematics at Technische Universität Ilmenau, Germany

Awards, Grants & Offers

2022 Offer: W3-professorship at Freie Universität Berlin
2019 European Research Council (ERC) Consolidator Grant
2017 Teaching award of Faculty of Mathematics and Natural Sciences, Universität Bonn
2015/16 Offers: W3-professorships at Technische Universität Dortmund, Leibniz Universität Hannover, Otto-von-Guericke-Universität Magdeburg and Universität Augsburg

- 2013 Offers: W3-professorship (5y) at Universität Bonn, W2-professorship at Technische Universität Dresden
- 2012 MATHEON young investigator award

Organization of Scientific Events

- 2023 Workshop on nonlinear Schrödinger equations, Universität Augsburg
- 2023 Jena-Augsburg-Meeting (JAM) on Numerical Analysis, Universität Augsburg
with D. Gallistl, R. Maier
- 2022 Summer School *Adaptivity, Uncertainty, Learning*, Universität Augsburg
with R. Maier, P. Freese
- 2022 Winter School *Multiple Scales in Mathematics and Engineering*, Universität Augsburg
with M. Peter and B. Schmidt
- 2021 Workshop *Scattering in random heterogeneous media*, Universität Augsburg
with F. Bonizzoni
- since 2020 *One World Numerical Analysis Series*, International Center for Mathematical Sciences (online)
with L. Banjai, E. Georgoulis, C. Makridakis
- 2020 French-German Workshop on *Multiscale Problems*, Universität Augsburg (online)
with R. Altmann
- 2019 Workshop *Computational Multiscale Methods*, Mathematisches Forschungsinstitut Oberwolfach
with B. Engquist
- 2019 Seminar *Beyond Numerical Homogenization*, Mathematisches Forschungsinstitut Oberwolfach
with H. Owhadi
- 2018 GAMM Workshop on *Numerical Analysis*, Universität Augsburg
with L. Grasedyck
- 2018 *3rd German–Russian–American Workshop on Numerical Methods and Mathematical Modelling in Geophysical and Biomedical Sciences*, Herrsching am Ammersee
with L. Beck, M. Peter, T. Stykel
- 2018 Section *Computational Differential Equations*, GAMM Annual Meeting Munich
with L. Grasedyck
- 2017 GAMM Workshop on *Numerical Analysis*, RWTH Aachen
with L. Grasedyck
- 2017 Trimester program *Multiscale Problems: Algorithms, Numerical Analysis and Computation*, Hausdorff Research Institute for Mathematics Bonn
 - Winter School *Numerical Analysis of Multiscale Problems*
 - Workshop *Numerical Inverse and Stochastic Homogenization*
 - Workshop *Non-local Material Models and Concurrent Multiscale Methods*
 with S. C. Brenner, B. Engquist, M. Gunzburger, M.A. Schweitzer
- 2017 Workshop on *Isogeometric Finite Element Data Structures based on Bézier Extraction*, TU Munich
with E. Rank, S. Kollmannsberger, A. Düster, A. Schröder, M. Kästner

- 2016 Conference *14th European Finite Element Fair*, Bonn
with D. Gallistl, M. Schedensack
- 2014 Workshop *Computational Multiscale Methods*, Mathematisches Forschungsinstitut Oberwolfach
with B. Engquist and C. Carstensen
- 2012 MATHEON *Multiscale Workshop* Berlin
with K. Schmidt

Research Funding (as Principal Investigator)

- 2023-2026 *Novel Approaches for the Multidimensional Convexification of Inelastic Variational Models for Fracture*
within Priority program 2256 of the German Research Foundation DFG (with Prof. D. Balzani, Chair of Continuum Mechanics, U Bochum, Prof. M. A. Peter, Modelling and Applied Analysis, U Augsburg)
<https://gepris.dfg.de/gepris/projekt/441154176>
- 2022-2025 *Autonomous research for exploring structure-property linkages and optimizing microstructures*
German Research Foundation DFG (with Prof. M. Kästner, Chair of Computational and Experimental Mechanics, TU Dresden)
<https://gepris.dfg.de/gepris/projekt/496984632>
- 2021-2024 *Computational Multiscale Methods for Inverse Estimation of Effective Properties of Poroelastic Tissues*
German Research Foundation DFG (with Dr. A. Caiazzo, WIAS Berlin)
<https://gepris.dfg.de/gepris/projekt/455719484>
- 2020-2023 *Convexified variational formulations at finite strains based on homogenized damaged microstructures*
within Priority program 2256 of the German Research Foundation DFG (with Prof. D. Balzani, Chair of Continuum Mechanics, U Bochum, Prof. M. A. Peter, Modelling and Applied Analysis, U Augsburg)
<https://gepris.dfg.de/gepris/projekt/441154176>
- 2020-2025 *Computational Random Multiscale Problems*
Consolidator Grant 2019 of the European Research Council ERC
<https://cordis.europa.eu/project/rcn/226853>
- 2017-2020 *Adaptive isogeometric modelling of discontinuities in complex shaped solids*
within Priority program 1748 of the German Research Foundation DFG (with Prof. M. Kästner, Chair of Computational and Experimental Mechanics, TU Dresden)
<http://gepris.dfg.de/gepris/projekt/255853920>
- 2017-2018 *Space-time multiscale methods for the wave equation in heterogeneous media*
German Academic Exchange Service (DAAD) (with Prof. E. T. Chung, Chinese University of Honkong)
- 2014-2017 *Adaptive isogeometric modelling of propagating strong discontinuities in heterogeneous materials*
within Priority program 1748 of the German Research Foundation DFG (with Prof. M. Kästner, Chair of Computational and Experimental Mechanics, TU Dresden)
<http://gepris.dfg.de/gepris/projekt/255853920>

2010-2014 *Modeling and Simulation of Composite Materials*

within DFG Research Center MATHEON

<http://www2.mathematik.hu-berlin.de/~numa/C33/>

Further Scientific Activities and Service

editorial work SIAM Journal on Numerical Analysis, associate editor, 2022–2024

Mathematics of Computation, associate editor, 2022–2026

SIAM Multiscale Modeling & Simulation, associate editor, 2022–2024

Advances in Discrete and Continuous Models, associate editor, 2021–2023

IMA Journal of Numerical Analysis, associate editor, since 2020

organizing committees European Finite Element Fair, since 2022

administration Founding Director of Centre for Advanced Analytics and Predictive Sciences, Universität Augsburg, since 2021

Deputy head of Institute of Mathematics, Universität Augsburg, 2021 – 2023

Board of Faculty of Mathematics, Natural Sciences, and Materials Engineering, Universität Augsburg, 2021 – 2023

Head of Institute of Mathematics, Universität Augsburg, 2019 – 2021

member Academia Cearense de Matemática (ACM)

– Corresponding Academician Founder (since 2017)

International Association of Applied Mathematics and Mechanics (GAMM)

– Head of Activity Group *Numerical Analysis* (since 2017)

– Activity Group *Multiscale Material Modeling* (2013–2016)

Swiss Mathematical Society (SMG)

Society for Industrial and Applied Mathematics (SIAM)

Augsburg Centre for Innovative Technologies (ACIT)

panels Computational Mathematics, Data Science, and Statistics 2022 at the Swedish Research Council

reviewing FWF Austrian Science Fund, German Research Foundation DFG, Chilean National Science & Technol. Commission, Vienna Science and Technology Fund, The Research Council of Norway

Supervision

mentoring F. Bonizzoni (2020-2022, U Augsburg, now Assoc. Prof. at Politecnico di Milano)

post-docs C. Zimmer (since 2023, U Augsburg)

J. Garay (since 2023, U Augsburg)

Y. Liang (since 2022, U Augsburg, Humboldt Research Fellowship)

J.-P. Freese (since 2021-2023, U Augsburg, now at TU Hamburg)

B. Verfürth (2018-2020, U Augsburg, now Associate Prof. at U Bonn)

R. Altmann (2017-2023, U Augsburg, Habilitation 2020, now Associate Prof. at U Magdeburg)

M. Schedensack (2015-2017, U Bonn/Augsburg, now Assistant Prof. at U Leipzig)

- D. Gallistl (2014-2016, U Bonn, now Full Prof. at U Jena)
 D. L. Brown (2014-2015, U Bonn, then Assistant Prof. at U Nottingham)
 M. Eigel (2010-2013, HU Berlin, now WIAS Berlin)
- phd students M. Hermann (since 2023, U Augsburg)
 M. Deiml (since 2023, U Augsburg)
 P. Reck (since 2022, U Augsburg)
 H. Mohr (since 2022, U Augsburg)
 C. Belponer (since 2021, joint with A. Caiazzo, U Augsburg/WIAS Berlin)
 T. Neumeier (since 2020, joint with M. A. Peter, U Augsburg)
 M. Hauck (2020-2023, U Augsburg)
 F. Kröpfl (since 2019, U Augsburg)
 R. Maier (2017-2020, U Augsburg, GAMM Junior 2020–22, Kulturpreis Bayern 2020, GAMM Dr.-Klaus-Körper-Prize 2021, now Assistant Professor (tt) at Karlsruhe IT)
 P. Morgenstern (2013-2017, U Bonn, GAMM Junior 2017–19, now at Leibniz U Hannover)

List of Publications

Monograph

- [b01] *Numerical homogenization by Localized Orthogonal Decomposition*
 SIAM Spotlights 5, ISBN: 978-1-611976-44-1, 2020
 (with A. Målqvist)

Preprints

- [s05] *A reduced basis super-localized orthogonal decomposition for reaction-convection-diffusion problems*
 (with F. Bonizzoni and M. Hauck)
- [s04] *A super-localized generalized finite element method*
 (with P. Freese, M. Hauck and T. Keil)
- [s03] *Neural network approximation of correctors in numerical homogenization*
 (with F. Kröpfl and R. Maier)
- [s02] *Super-localized orthogonal decomposition for convection-dominated diffusion problems*
 (with F. Bonizzoni and J.P. Freese)
- [s01] *Super-localized orthogonal decomposition of high-frequency Helmholtz problems*
 (with J.P. Freese and M. Hauck)

Refereed Publications

- [p62] *Computational Multiscale Methods for Non-divergence Form Elliptic Partial Differential Equations*
 accepted for publication in *CMAM*, 2023
 (with P. Freese, D. Gallistl and T. Sprekeler)

- [p61] *Rank-one convexification of incremental damage models for stress and strain softening at finite strains*
accepted for publication in *Computational Mechanics*, 2023
(with D. Balzani, M. Köhler, T. Neumeier and M. Peter)
- [p60] *Super-localization of elliptic multiscale problems*
Mathematics of Computation, 92:981-1003, 2023
(with M. Hauck)
- [p59] *Adaptive convexification of microsphere-based incremental damage for stress and strain softening at finite strains*
Acta Mechanica, 233:4347-4364, 2022
(with D. Balzani, M. Köhler, J. Melchior, T. Neumeier and M. Peter)
- [p58] *Energy-adaptive Riemannian Optimization on the Stiefel Manifold*
ESAIM: Mathematical Modelling and Numerical Analysis, 56:1629–1653, 2022
(with R. Altmann and T. Stykel)
- [p57] *Operator compression with deep neural networks*
Advances in Continuous and Discrete Models, 2022:29, 2022
(with F. Kröpfl and R. Maier)
- [p56] *Multi-resolution Localized Orthogonal Decomposition for Helmholtz problems*
Multiscale Modeling & Simulation, 20(2):657–684, 2022
(with M. Hauck)
- [p55] *Localization and delocalization of ground states of Bose-Einstein condensates under disorder*
SIAM Journal of Applied Mathematics, 82(1):330–358, 2022
(with R. Altmann and P. Henning)
- [p54] *Adaptive Isogeometric Phase-Field Modeling of Weak and Strong Discontinuities*
Lecture Notes in Applied and Computational Mechanics, 98:243–282, 2022
(with P. Hennig, M. Kästner, R. Maier, P. Morgenstern)
- [r53] *Numerical Homogenisation beyond Scale Separation*
Acta Numerica, 30:1–86, 2021
(with R. Altmann and P. Henning)
- [r52] *The J-method for the Gross-Pitaevskii Eigenvalue Problem*
Numerische Mathematik, 148:575–610, 2021
(with R. Altmann and P. Henning)
- [r51] *A priori error analysis of a numerical stochastic homogenization method*
SIAM Journal of Numerical Analysis, 59(2):660–674, 2021
(with J. Fischer and D. Gallistl)
- [r50] *Reconstruction of quasi-local numerical effective models from low-resolution measurements*
Journal of Scientific Computing 85, Article number: 10, 2020
(with A. Caiazzo and R. Maier)
- [r49] *Sparse compression of expected solution operators*
SIAM Journal on Numerical Analysis, 58(6): 3144–3164, 2020
(with M. Feischl)
- [r48] *Sobolev gradient flow for the Gross-Pitaevskii eigenvalue problem: global convergence and computational efficiency*

- SIAM Journal on Numerical Analysis*, 58(3):1744–1772, 2020
(with P. Henning)
- [r47] *Quantitative Anderson localization of Schrödinger eigenstates under disorder potentials*
Mathematical Models and Methods in the Applied Sciences, 30(5):917–955, 2020
(with R. Altmann and P. Henning)
- [r46] *Computational high frequency scattering from high contrast heterogeneous media*
Mathematics of Computation, 89:2649–2674, 2020
(with B. Verfürth)
- [r45] *Computational multiscale methods for linear heterogeneous poroelasticity*
Journal on Computational Mathematics, 38:41–57, 2020
(with R. Altmann, E. T. Chung, S. Pun, and R. Maier)
- [r44] *A diffuse modeling approach for embedded interfaces in linear elasticity*
GAMM Mitteilungen, 43(1):e202000001, 2020
(with P. Hennig, M. Kästner, R. Maier, D. Schillinger, and B. Verfürth)
- [r43] *From Domain Decomposition to Homogenization Theory*
In *Proceedings of Domain Decomposition Methods XXV, Lecture Notes in Computational Science and Engineering*, 138:29–40, Springer, 2020
(with D. Varga and B. Verfürth)
- [r42] *Localized computation of eigenstates of random Schrödinger operators*
SIAM Journal on Scientific Computing, 41(6):B1211–B1227.4, 2019
(with R. Altmann)
- [r41] *Efficient implementation of the Localized Orthogonal Decomposition method*
Computer Methods in Applied Mechanics and Engineering, 350:123–153, 2019
(with C. Engwer, P. Henning and A. Målqvist)
- [r40] *Computational Multiscale Methods for Linear Poroelasticity with High Contrast*
Journal of Computational Physics, 395:286–297, 2019
(with R. Altmann, E. T. Chung, S. Fu, S. Pun, and R. Maier)
- [r39] *Explicit computational wave propagation in micro-heterogeneous media*
BIT Numerical Mathematics, 59(2):443–462, 2019
(with R. Maier)
- [r38] *Numerical stochastic homogenization by quasilocal effective diffusion tensors*
Communications in Mathematical Sciences, 17(3):637–651, 2019
(with D. Gallistl)
- [r37] *An analysis of a class of variational multiscale methods based on subspace decomposition*
Mathematics of Computation, 87:2765–2774, 2018
(with R. Kornhuber and H. Yserentant)
- [r36] *Error analysis of a variational multiscale stabilization for convection dominated diffusion equations in 2d*
IMA Journal on Numerical Analysis, 38(3):1229–1253, 2018
(with G. Li and M. Schedensack)
- [r35] *Numerical homogenization of heterogeneous fractional Laplacians*
Multiscale Modeling & Simulation, 16(3):1305–1332, 2018
(with D. L. Brown and J. Gedicke)

- [r34] *Thermo-optical interactions in a dye-microcavity photon Bose-Einstein condensate*
New Journal of Physics, 10(11):115009, 2017
(with H. Alaeian, M. Schedensack, C. Bartels and M. Weitz)
- [r33] *Crank-Nicolson Galerkin approximations to nonlinear Schrödinger equations with disorder potentials*
Mathematical Models and Methods in Applied Sciences, 27(11):2147–2184, 2017
(with P. Henning)
- [r32] *Computation of quasilocal effective diffusion tensors and connections to the mathematical theory of homogenization*
Multiscale Modeling & Simulation, 15(4):1530–1552, 2017
(with D. Gallistl)
- [r31] *Relaxing the CFL condition for the wave equation on adaptive meshes*
Journal of Scientific Computing, 72(3):1196–1213, 2017
(with M. Schedensack)
- [r30] *On the stability of the Rayleigh-Ritz method for eigenvalues*
Numerische Mathematik, 137(2):339–351, 2017
(with D. Gallistl and P. Huber)
- [r29] *Adaptive mesh refinement strategies in Isogeometric Analysis – a computational comparison*
Computer Methods in Applied Mechanics and Engineering, 316:424–448, 2017
(with P. Hennig, M. Kästner and P. Morgenstern)
- [r28] *Multiscale Petrov-Galerkin method for high-frequency heterogeneous Helmholtz equations*
In *Meshfree Methods for Partial Differential Equations VIII, Lecture Notes in Computational Science and Engineering*, 115:85–115, Springer, 2017
(with D. L. Brown and D. Gallistl)
- [r27] *Eliminating the pollution effect in Helmholtz problems by local subscale correction*
Mathematics of Computation, 86:1005–1036, 2017
- [r26] *Generalized finite element methods for quadratic eigenvalue problems*
ESAIM: Mathematical Modelling and Numerical Analysis, 51(1):147–163, 2017
(with A. Målqvist)
- [r25] *Complexity of hierarchical refinement for a class of admissible mesh configurations*
Computer Aided Geometric Design, 47:83–92, 2016
(with A. Buffa, C. Giannelli and P. Morgenstern)
- [r24] *Robust numerical upscaling of elliptic multiscale problems at high contrast*
Computational Methods in Applied Mathematics, 16(4):579-603, 2016
(with R. Scheichl)
- [r23] *A multiscale method for porous microstructures*
Multiscale Modeling & Simulation, 14:1123-1152, 2016
(with D. L. Brown)
- [r22] *Variational multiscale stabilization and the exponential decay of finescale correctors*
In *Building Bridges: Connections and Challenges in Modern Approaches to Numerical Partial Differential Equations, Lecture Notes in Computational Science and Engineering*, 114:343–369, Springer, 2016

- [r21] *The norm of a discretized gradient in $H(\operatorname{div})^*$ for a posteriori finite element error analysis*
Numerische Mathematik 132(3):519–539, 2016
 (with C. Carstensen and A. Schröder)
- [r20] *Stable multiscale Petrov-Galerkin finite element method for high frequency acoustic scattering*
Computer Methods in Applied Mechanics and Engineering 295:1–17, 2015
 (with D. Gallistl)
- [r19] *Adaptive analysis-suitable T -mesh refinement with linear complexity*
Computer Aided Geometric Design 34:50–66, 2015
 (with P. Morgenstern)
- [r18] *Computation of eigenvalues by numerical upscaling*
Numerische Mathematik 130(2):337–361, 2015
 (with A. Målqvist)
- [r17] *Simulation of composite materials by a network FEM with error control*
Computational Methods in Applied Mathematics, 15(1): 21–37, 2015
 (with M. Eigel)
- [r16] *Comparison results for the Stokes equations*
Applied Numerical Mathematics 95:118–129, 2015
 (with C. Carstensen, K. Köhler and M. Schedensack)
- [r15] *Multiscale partition of unity*
 In *Meshfree Methods for Partial Differential Equations VII, Lecture Notes in Computational Science and Engineering*, 100:185–204, Springer, 2014
 (with P. Henning and P. Morgenstern)
- [r14] *Composite finite elements for elliptic interface problems*
Mathematics of Computation 83:2657–2674, 2014
- [r13] *Localization of elliptic multiscale problems*
Mathematics of Computation 83:2583–2603, 2014
 (with A. Målqvist)
- [r12] *Two-level discretization techniques for ground state computations of Bose-Einstein condensates*
SIAM Journal on Numerical Analysis 52(4):1525–1550, 2014
 (with P. Henning and A. Målqvist)
- [r11] *A localized orthogonal decomposition method for semi-linear elliptic problems*
ESAIM: Mathematical Modelling and Numerical Analysis 48(5):1331–1349, 2014
 (with P. Henning and A. Målqvist)
- [r10] *Convergence of a discontinuous Galerkin multiscale method*
SIAM Journal on Numerical Analysis 51(6):3351–3372, 2013
 (with D. Elfverson, E. H. Georgoulis and A. Målqvist)
- [r09] *Oversampling for the multiscale finite element method*
SIAM Multiscale Modeling & Simulation 11(4), 1149–1175, 2013
 (with P. Henning)
- [r08] *Finite element network approximation of conductivity in particle composites*
Numerische Mathematik, 124(1):73–97, 2013
 (with C. Carstensen)

- [r07] *Optimal adaptive nonconforming FEM for the Stokes problem*
Numerische Mathematik, 123(2):291–308, 2013
(with C. Carstensen and H. Rabus)
- [r06] *Comparison results of first-order finite element methods for the Poisson model problem*
SIAM Journal on Numerical Analysis 50(6):2803–2823, 2012
(with C. Carstensen and M. Schedensack)
- [r05] *Finite Elements for Elliptic Problems with Highly Varying, Non-Periodic Diffusion Matrix*
SIAM Multiscale Modeling & Simulation 10(3):665–695, 2012
(with S. A. Sauter)
- [r04] *Robustness of finite element simulations in densely packed random particle composites*
Networks and Heterogeneous Media 7(1):113–126, 2012
- [r03] *Finite element methods for the Stokes problem on complicated domains*
Computer Methods in Applied Mechanics and Engineering 200:2611–2623, 2011
(with S. A. Sauter)
- [r02] *Parallel multistep methods for linear evolution problems*
IMA Journal on Numerical Analysis 32(3):1217–1240, 2011
(with L. Banjai)
- [r01] *The composite mini element – coarse mesh computation of Stokes flows on complicated domains*
SIAM Journal on Numerical Analysis 46(6):3181–3206, 2008
(with S. A. Sauter)

Edited Proceedings

- [e02] *Computational Multiscale Methods*
Oberwolfach Reports, 16(3):2099–2181, 2020
(with B. Engquist)
- [e01] *Computational Multiscale Methods*
Oberwolfach Reports, 11(2):1625–1681, 2015
(with B. Engquist and C. Carstensen)

Contributions to Conference Proceedings

- [p24] *Relaxed Incremental Formulations for Damage at Finite Strains Including Strain Softening*
In *Proceedings in Applied Mathematics and Mechanics*, doi:10.1002/pamm.202200297, 2021
(with D. Balzani, M. Köhler, M. Peter and T. Neumeier)
- [p23] *An enhanced algorithmic scheme for relaxed incremental variational damage formulations at finite strains*
In *Proceedings in Applied Mathematics and Mechanics*, doi:10.1002/pamm.202100135, 2021
(with D. Balzani, M. Köhler, M. Peter and T. Neumeier)

- [p22] *Multiscale Methods for Heterogeneous Fractional Laplacians*
 In *Computational Engineering, Oberwolfach Reports*, doi:10.4171/OWR/2018/48,
 pp. 7–9, 2018
 (with D.L. Brown and J. Gedicke)
- [p21] *Sparse Compression of Expected Solution Operators*
 In *Computational Engineering, Oberwolfach Reports*, doi:10.4171/OWR/2018/48,
 pp. 11–13, 2018
 (with M. Feischl)
- [p20] *Fast time-explicit micro-heterogeneous wave propagation*
 In *Proceedings in Applied Mathematics and Mechanics*, doi:10.1002/pamm.201800294,
 2018
 (with R. Maier)
- [p19] *Localization studies for ground states of the Gross-Pitaevskii equation*
 In *Proceedings in Applied Mathematics and Mechanics*, doi:10.1002/pamm.201800343,
 2018
 (with R. Altmann and D. Varga)
- [p18] *Numerical = periodic homogenization*
 In *Proceedings in Applied Mathematics and Mechanics*, doi:10.1002/pamm.201800384,
 2018
 (with D. Varga)
- [p17] *An immersed boundary method for detail-preserving soft tissue simulation from
 medical images*
 In *Computational Biomechanics for Medicine*, 2017
 (with S. Cotin, R. Maier, and C. Paulus)
- [p16] *Towards adaptive discontinuous Petrov-Galerkin methods*
 In *Proceedings in Applied Mathematics and Mechanics*, 16(1):741-742, 2016
 (with P. Bringmann, C. Carstensen, D. Gallistl, F. Hellwig, S. Puttkammer, H. Rabus,
 and J. Storn)
- [p15] *Multiscale Petrov-Galerkin FEM for acoustic scattering*
 In *Proceedings in Applied Mathematics and Mechanics*, 16(1):745-746, 2016
 (with C. Carstensen and D. Gallistl)
- [p14] *Relaxing the CFL condition for the wave equation on adaptive meshes*
 In *Proceedings in Applied Mathematics and Mechanics*, 16(1):765-766, 2016
 (with M. Schedensack)
- [p13] *Multiscale Petrov-Galerkin finite element method for high frequency acoustic scat-
 tering*
 In *Computational Engineering, Oberwolfach Reports*, 12(3):2580–2581, 2016
 (with D. Gallistl)
- [p12] *Two-level discretization for the Gross-Pitaevskii eigenvalue problem with a rough
 potential*
 In *Computational Multiscale Methods, Oberwolfach Reports*, 11(2):1653–1656, 2014
 (with P. Henning and A. Målqvist)
- [p11] *Multiscale techniques for solving quadratic eigenvalue problems*
 In *Computational Multiscale Methods, Oberwolfach Reports*, 11(2):1661–1664, 2014
 (with A. Målqvist)

- [p10] *Spectrum-preserving two-scale decompositions with applications to numerical homogenization and eigensolvers*
In *Interplay of Theory and Numerics for Deterministic and Stochastic Homogenization*, *Oberwolfach Reports* 10(1):850-853, 2013
(with A. Målqvist)
- [p09] *Numerical Upscaling of Eigenvalue Problems*
In *Numerical Upscaling for Media with Deterministic and Stochastic Heterogeneity*, *Oberwolfach Reports* 10(1):402-405, 2013
(with A. Målqvist)
- [p08] *Comparison of finite element methods for the Poisson model problem*
In *Theory and Applications of discontinuous Galerkin Methods*, *Oberwolfach Reports* 9(1):584–587, 2012
(with C. Carstensen and M. Schedensack)
- [p07] *Finite element discretization of multiscale elliptic problems*
In *Advanced Computational Engineering*, *Oberwolfach Reports* 9(1):516–518, 2012
(with A. Målqvist)
- [p06] *Comparison results for first-order FEMs*
In *Advanced Computational Engineering*, *Oberwolfach Reports* 9(1):495–497, 2012
(with C. Carstensen and M. Schedensack)
- [p05] *Composite finite elements for elliptic interface problems*
Proceedings in Applied Mathematics and Mechanics 10(1):661–664, 2010
- [p04] *Triangulating a system of disks*
Proceedings of the 26th European Workshop on Computational Geometry (EWCG)
pages 241–244, 2010
- [p03] *Finite element analysis of particle-reinforced composites*
In *Computational Multiscale Methods*, *Oberwolfach Reports* 6(2):1597–1665, 2009
- [p02] *Recent advances in composite finite elements*
In *Schnelle Löser für Partielle Differentialgleichungen*, *Oberwolfach Reports* 5(2):1233–1293, 2008
(with S. A. Sauter)
- [p01] *The composite mini element: a new mixed FEM for the Stokes equations on complicated domains*
Proceedings in Applied Mathematics and Mechanics 7(1):2020101–2020102, 2007
(with S. A. Sauter)

Theses

- [t03] *Computational Multiscale Methods for Partial Differential Equations*
Habilitation thesis, Humboldt-Universität zu Berlin, 2017
- [t02] *The Composite Mini Element: A mixed FEM for the Stokes equations on complicated domains*
PhD thesis, Universität Zürich, 2007
- [t01] *Numerische Analyse parameterabhängiger periodischer Orbits nichtlinearer dynamischer Systeme mittels Mehrzielmethode und effizienter Fortsetzungstechniken*
Diploma thesis, TU Ilmenau, 2004

Further Publications

- [f01] *Anderson-Lokalisierung ungeordneter Quantensysteme*
GAMM Rundbrief, pp. 18–23, February 2019
 (with P. Henning)
- [f01] *Stable simulation of multiscale processes in the under-resolved regime*
ECCOMAS Newsletter, pp. 18–23, June 2016
 (with P. Henning)

Research Presentations

Plenary/Semi-Plenary/Invited Adresses

- 2023 *The 29th Biennial Numerical Analysis Conference*, Glasgow, Scotland
- 07/2022 *Equadiff 15*, Brno, Czech Republic
- 06/2022 *8th European Congress on Computational Methods in Applied Sciences and Engineering – ECCOMAS 2022*, Oslo, Norway
- 06/2020 *7th European Seminar on Computing (ESCO) 2020*, Pilsen, Czech Republic (online)
- 06/2020 *LMS Scottish Numerical Methods Network workshop*, Glasgow, Scotland (online)
- 07/2019 *Workshop on Wave Phenomena*, Karlsruhe, Germany
- 07/2018 *25th International Conference on Domain Decomposition Methods*, St. John's, Newfoundland, Canada
- 10/2017 *Homogenization Theory and Applications*, Weierstraß Institute Berlin, Germany
- 10/2017 *6th Chinese-German Workshop on Computational Mathematics*, Shanghai, China
- 08/2017 *Multiscale Methods and Large-scale Scientific Computing*, Hunan University, Changsha, China
- 06/2016 *4th CAM-ICCM Workshop: Multiscale and Large-scale Scientific Computing*, Chinese University of Hong Kong
- 09/2015 *28th FEM-Symposium*, Chemnitz, Germany
- 09/2015 *5th Chinese-German Workshop on Computational Mathematics*, Augsburg, Germany
- 07/2014 *EPSRC Durham Symposium of the London Mathematical Society*, Durham, UK
- 01/2013 *Workshop Dissipative Spectral Theory: Operator Theory, PDEs and Numerics*, Cardiff School of Mathematics, UK

Short Courses

- 02/2021 *Workshop Multi-scale Analysis: Thematic Lectures and Conference (MATLC-2021)* (online)
- 02/2020 *Workshop Finite Element Methods for Nonlinear and Multiscale Problems*, IISc Bangalore, India
- 07/2019 *Australian Mathematical Sciences Institute (AMSI) Winter School Computational Modelling of Heterogenous Media*, Queensland University of Technology, Brisbane, Australia

- 06/2019 Oberwolfach Seminar *Beyond Numerical Homogenization*, Mathematisches Forschungsinstitut Oberwolfach, Germany
- 07/2018 Summer School *MATH@NTUA*, National Technical University of Athens, Greece
- 01/2017 Hausdorff School on *Numerical Analysis of Multiscale Problems*, Hausdorff Research Institute for Mathematics Bonn, Germany
- 02/2011 Winter School on Adaptive Computational PDEs, BITS-Pilani Goa Campus, India

Invited Conference Talks

- 04/2022 Workshop *Adaptivity, High Dimensionality and Randomness*, Erwin Schrödinger International Institute for Mathematics and Physics (ESI), Vienna, Austria
- 03/2022 Workshop *Finite Element Methods and Adaptivity*, Technical University of Vienna, Austria
- 01/2022 *21st GAMM Seminar on Microstructures*, Wien, Austria
- 09/2021 *BI.DISCRETE21 Numerical Analysis*, Bielefeld, Germany
- 09/2021 Workshop *Numerical Analysis*, Hannover, Germany
- 09/2021 French-German Workshop on *Multiscale Problems*, Besancon, France
- 09/2021 Workshop *Numerical Methods for Evolution Equations*, Heraklion, Crete
- 07/2021 Workshop *New trends in computational multiscale methods and beyond*, Institut Mittag-Leffler, Stockholm, Sweden (online)
- 09/2020 *CECAM workshop on Multiscale simulations of soft matter: New method developments and mathematical foundations*, Mainz, Germany (online)
- 09/2019 Session *Numerical Methods at Dynamics, Equations and Applications*, AGH University of Science and Technology, Kraków, Poland
- 08/2019 *7th Sino-German Symposium on Computational and Applied Mathematics*, U Kiel, Germany
- 04/2019 Workshop *Eigenvalue day*, HU Berlin, Germany
- 10/2018 Workshop *Computational Engineering*, Mathematisches Forschungsinstitut Oberwolfach, Germany
- 09/2018 Workshop *Numerical Methods for Evolution Equations*, Heraklion, Crete
- 06/2018 Workshop *Interplay of multiscale data assimilation and data science with advanced PDE discretizations*, Erwin Schrödinger International Institute for Mathematics and Physics (ESI), Vienna, Austria
- 05/2018 Program *Analysis, Modeling, and Computation for Nanoscale Systems*, The Fields Institute for Research in Mathematical Sciences, Toronto, Canada
- 07/2017 Workshop *Mechanical and Mathematical Analysis of Nonstandard Discretization Methods*, RWTH Aachen, Germany
- 07/2017 Workshop *Multiresolution and Adaptivity in Numerical PDEs* at FoCM, Barcelona, Spain
- 06/2017 German-Russian-US American Workshop *Numerical Methods and Mathematical Modelling in Geophysical and Biomedical Sciences*, Russian Academy of Sciences, Moscow, Russia
- 03/2013 Workshop *Interplay of Theory and Numerics for Deterministic and Stochastic Homogenization*, Mathematisches Forschungsinstitut Oberwolfach, Germany

- 02/2013 Symposium *Higher-Order and DG Methods for Flow and Transport*, Computational Mechanics (ACM 2013), San Diego, California, USA
- 02/2012 Workshop *Theory and Applications of Discontinuous Galerkin Methods*, Mathematisches Forschungsinstitut Oberwolfach, Germany
- 02/2012 Workshop *Advanced Computational Engineering*, Mathematisches Forschungsinstitut Oberwolfach, Germany
- 11/2010 Berlin-Seoul Workshop, Yonsei University Seoul, Korea
- 06/2010 5th Scientific Computing Seminar, CAU Kiel, Germany
- 06/2009 Workshop *Computational Multiscale Methods*, Mathematisches Forschungsinstitut Oberwolfach, Germany
- 05/2008 Workshop *Schnelle Löser für partielle Differentialgleichungen*, Mathematisches Forschungsinstitut Oberwolfach, Germany

Colloquia and Invited Seminar Talks

- 12/2022 INRIA Paris, France
- 12/2022 Institut für Mathematik, Universität Hamburg, Germany
- 01/2022 Institut für Mathematik, Humboldt-Universität zu Berlin, Germany
- 11/2021 Kolloquium Wilhelm Killing, Universität Münster
- 11/2021 Department of Mathematical Sciences, Chalmers University of Technology, Gothenburg, Sweden
- 12/2020 Faculty of Mathematics, RWTH Aachen
- 06/2020 Faculty of Mathematics, FAU Erlangen, Germany (online)
- 12/2019 Department of Mathematics, TU Darmstadt, Germany
- 11/2019 Max-Planck-Institute for Mathematics in the Sciences, Leipzig, Germany
- 11/2019 Department of Mathematics, U Duisburg-Essen, Essen, Germany
- 05/2019 Seminaire du Laboratoire Jacques-Louis Lions, Paris, France
- 11/2018 Department of Mathematics, U Cologne, Germany
- 11/2018 Department of Mathematics, Chinese University of Hong Kong
- 06/2018 Faculty of Mathematics, FAU Erlangen, Germany
- 04/2018 Institut für Mathematik, Humboldt-Universität zu Berlin, Germany
- 04/2017 Department of Mathematical Sciences, Chalmers University of Technology, Gothenburg, Sweden
- 01/2018 Faculty of Mathematics, TU München, Germany
- 12/2017 Departement of Mathematics, Universität Freiburg, Germany
- 12/2016 Departement of Mathematics, Universität Basel, Switzerland
- 11/2016 Departement of Mathematics, KTH Royal Institute of Technology, Stockholm, Sweden
- 10/2016 Center for Computational Engineering Science, RWTH Aachen, Germany
- 12/2015 Institut für Mathematik, Humboldt-Universität zu Berlin, Germany
- 11/2015 Institute of Natural Sciences, Shanghai Jiao Tong University, China
- 11/2015 Department of Mathematics, Shanghai Jiao Tong University, China

- 10/2015 Colloquium of SFB 1114, FU Berlin, Germany
- 04/2015 MATHICSE Seminar, EPF Lausanne, Switzerland
- 12/2014 Department of Mathematics, Technical University of Athens, Greece
- 11/2014 Computational and Applied Mathematics Seminar, Chalmers University of Technology, Göteborg, Schweden
- 11/2012 Department of Mathematics, Strathclyde University, Glasgow, Scotland
- 10/2012 Institut für Mathematik, Universität Zürich, Switzerland
- 06/2012 Colloquium of AG Modellierung, Numerik, Differentialgleichungen, Technische Universität Berlin, Germany
- 11/2011 Department of Mathematics, University of Leicester, UK
- 06/2011 Maths and Applications Sussex Seminar, University of Sussex, Brighton, UK
- 12/2009 Institut für Mathematik, Universität Zürich, Schweiz
- 11/2008 Institut für Mathematik, Humboldt-Universität zu Berlin
- 06/2008 Fraunhofer ITWM Kaiserslautern

Contributed talks

- 12/2020 DD XXIV, Hong Kong (online)
- 11/2019 GAMM CSE Workshop, Ulm/Reisensburg, Germany
- 07/2019 MFET, Physikzentrum Bad Honnef, Germany
- 05/2019 EFEF, Nicosia, Cyprus
- 02/2019 GAMM Annual Meeting, Vienna, Austria
- 03/2018 VMS 2018, Berlin, Germany
- 03/2018 GAMM Annual Meeting, München, Germany
- 03/2018 DMV Annual Meeting, Paderborn, Germany
- 03/2017 GAMM Annual Meeting, Weimar, Germany
- 06/2016 MAFELAP, London, UK
- 01/2016 WONAPDE, Universidad de Concepción, Chile
- 08/2015 ICIAM, Beijing, China
- 07/2015 USNCCM, San Diego, California, USA
- 06/2015 CEDYA, Cadiz, Spain
- 07/2014 WCCM, Barcelona, Spain
- 05/2014 EFEF, Vienna, Austria
- 07/2013 USNCCM, Raleigh, North Carolina, USA
- 06/2013 7th GAMM-Seminar on Multiscale Material Modeling, TU Dresden, Germany
- 01/2013 WONAPDE 2013, Universidad de Concepción, Chile
- 11/2012 Multiscale-Seminar, TU Berlin, Germany
- 08/2012 PUM-Workshop, Humboldt-Universität zu Berlin, Germany
- 08/2012 CMAM, Humboldt-Universität zu Berlin, Germany
- 07/2012 WCCM, Sao Paulo, Brasil
- 04/2012 MATHEON Multiscale Workshop, TU Berlin, Germany

- 07/2011 ICIAM, Vancouver, Canada
- 07/2011 RMMM, EPF Lausanne, Switzerland
- 06/2011 EFEF, Paris, France
- 06/2010 SIMAI 2010, Università di Cagliari, Italy
- 03/2010 GAMM 2010, Karlsruhe, Germany
- 03/2010 EuroCG, Dortmund, Germany
- 07/2009 ENUMATH, Uppsala, Sweden
- 06/2009 EFEF, Helsinki, Finland
- 01/2009 GAMM-Seminar, Leipzig, Germany
- 09/2008 DMV Annual Meeting, Erlangen, Germany
- 08/2008 12th Serbian mathematics congress, Novi Sad, Serbia
- 05/2008 EFEF, Göteborg, Sweden
- 09/2007 ENUMATH, Graz, Austria
- 07/2007 ICIAM, Zürich, Switzerland
- 06/2007 3rd Scientific Computing Seminar, CAU Kiel, Germany
- 05/2007 EFEF, Luminy, France
- 04/2007 Colloque Numérique Suisse, Genève, Switzerland

Other Conferences and Workshops Attended

- 07/2018 Workshop *Geometric processing and finite elements*, Erwin Schrödinger International Institute for Mathematics and Physics (ESI), Vienna, Austria
- 09/2016 Workshop *Adaptive Algorithms*, Mathematisches Forschungsinstitut Oberwolfach, Germany
- 08/2010 Workshop *Wavelet and Multiscale Methods*, Mathematisches Forschungsinstitut Oberwolfach, Germany
- 11/2009 Seminar *Computational Fluid Dynamics*, Mathematisches Forschungsinstitut Oberwolfach, Germany