

Dr. Philipp Christian Petersen

Curriculum Vitae

Technische Universität Berlin
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Education

- 06/2016 **Ph.D.**, *Technische Universität Berlin.*
- 03/2013 **Master of Science in Mathematik**, *Technische Universität Berlin.*
- 03/2011 **Bachelor of Science in Mathematik**, *Technische Universität Berlin.*
- 06/2006 **Abitur**, *Humboldt Gymnasium Tegel, Berlin.*

Employment History

- 07/2018 - 06/2019 **Researcher**, *University of Oxford, Mathematical Institute.*
- 04/2013–06/2018 **Researcher**, *Technische Universität Berlin, SFB/TRR 109 "Discretization in Geometry and Dynamics".*
- 06/2012–04/2013 **Student assistant**, *Technische Universität Berlin, Applied Functional Analysis Group.*
- 06/2011–06/2012 **Student assistant**, *Landesbank Berlin - LBB, Pricing and Modeling.*

Teaching

- WS16/17 **Functional analysis 2**, *Lecturer.*
- WS16/17 **Seminar Applied Functional Analysis**, *Instructor.*
- SS14 **Funktional analysis 3**, *Assistant.*

Awards

- 2017 BiMoS PhD Award
- 2017 Dr. Klaus Körper Preis of the GAMM
- 2014 GAMM Junior 2014.

Publications

Articles

- [1] **C. Lessig, P. Petersen, and M. Schäfer**, *Bendlets: A Second-Order Shearlet Transform with Bent Elements*, *Appl. Comput. Harmon. Anal.*, in Press.
- [2] **G. Kutyniok, V. Mehrmann, and P. Petersen**, *Regularization and Numerical Solution of the Inverse Scattering Problem using Shearlet Frames*, *J. Inverse Ill-Posed Probl.*, 25(3), 287–309, 2017. .

- [3] **G. Kutyniok and P. Petersen**, *Classification of edges using compactly supported shearlets*, Appl. Comput. Harmon. Anal., 42(2), 245–293, 2017.
- [4] **P. Petersen**, *Shearlet approximation of functions with discontinuous derivatives*, J. Approx. Theory, 207, 127–138, 2016.
- [5] **J. Ma and P. Petersen**, *Linear independence of compactly supported separable shearlet systems*, J. Math. Anal. Appl., 428 (1), 238–257, 2015.

Conference Proceedings

- [1] **H. Bölcskei, P. Grohs, G. Kutyniok, and P. Petersen**, *Memory-optimal neural network approximation*, Proc. of SPIE (Wavelets and Sparsity XVII), San Diego, USA, 2017, to appear.

Preprints

- [1] **P. Grohs, G. Kutyniok, J. Ma, and P. Petersen**, *Anisotropic multiscale systems on bounded domains*, arXiv:1510.04538v1, 2015.
- [2] **P. Grohs, G. Kutyniok, and P. Petersen**, *Optimally Sparse Approximation with Deep Neural Networks*, arXiv:1705.01714, 2017.
- [3] **P. Petersen, F. Voigtlaender**, *Optimal approximation of piecewise smooth functions using deep ReLU neural networks*, arXiv:1709.05289, 2017.
- [4] **P. Petersen, M. Raslan,** *Approximation properties of shearlet frames for Sobolev Spaces*, arXiv:1712.01047, 2017.

Monographs

- [1] **P. Petersen**, *Shearlets on Bounded Domains and Analysis of Singularities Using Compactly Supported Shearlets*, Dissertation, Technische Universität Berlin, 2016.
- [2] **P. Petersen**, *Applications of Shearlet Frames for a Sparsity Promoting Regularization of the Inverse Scattering Problem*, Masterarbeit, Technische Universität Berlin, 2013.
- [3] **P. Petersen**, *Nonnegative Completions of Block Operators*, Bachelorarbeit, Technische Universität Berlin, 2011.

Invited Talks

- 2018 **Interplay of tensor structured formats with advanced PDE discretizations**, WS Vienna, 11.-15.08.2018
- 2017 **Workshop on Mathematics of Deep Learning 2017**, Weierstrass Institute for Applied Analysis and Stochastics, 13–15.09.2017
- Reliable Methods of Mathematical Modeling**, HU Berlin, 31.07–04.08.2017
- International Workshop on Computational Harmonic Analysis**, Nankai University, Tianjin, China, 15–18.06.2017.
- RTG π^3 Seminar**, Universität Bremen, 29.03.2017
- 2016 **NuHAG seminar**, Universität Wien, Austria, 16.11.2016

Analysis Seminar, Harbin Institute of Technology, Harbin, China, 05.08.2016.

Minisymposium, "Geometry and Non-Linear Approximation", Tønsberg, Norway, 27.06.2016.

Oberseminar zur Numerik, Philipps-Universität Marburg, 15.06.2016.

2015 **DMV15-Minisymposium**, "Applied and Computational Harmonic Analysis", Universität Hamburg, 23.09.2015.

Oberwolfach-Workshop "Applied Harmonic Analysis and Sparse Approximation", Mathematisches Forschungsinstitut Oberwolfach, 21.08.2015.

1. BIMoS Day "Compressed Sensing", TU Berlin, 04.05.2015.

Oberwolfach-Workshop "New Discretization Methods for the Numerical Approximation of PDEs", Mathematisches Forschungsinstitut Oberwolfach, 11.01.2015.

2014 **Zurich Colloquium in Applied and Computational Mathematics**, ETH Zürich, Zürich, Schweiz, 12.11.2014.

Analysis Seminar, Brandenburgische Technische Hochschule Cottbus, 06.10.2014.

Research Visits

11/2016 **Universität Wien**, with Prof. Dr. Philipp Grohs, (1 week).

08/2016 **Harbin Institute of Technology**, with Prof. Dr. Jianwei Ma, (1 month).

11/2014 **ETH Zürich**, with Prof. Dr. Philipp Grohs, (1 week).

10/2014 **Technische Universität München**, with Prof. Dr. Massimo Fornasier, (2 months).

Membership in Professional Societies

American Mathematical Society (AMS)

Gesellschaft für Angewandte Mathematik und Mechanik (GAMM)

GAMM Activity Group on Mathematical Signal- and Image Processing

Berlin Mathematical School (BMS)

Berlin International Graduate School in Model and Simulation Based Research (BIMoS)

Administrative Work

12/2017 Organizer of the MATHEON Conference "Compressed Sensing and its Applications" at TU Berlin

05/2017 Organizer of the MATHEON Conference "Wavelet and Tensor Methods for Partial Differential Equations" at TU Berlin

since 01/2016 Coordination of the Colloquium of the Modelling, Numerics, and Differential Equations Group

since 06/2013 Coordination of the Seminar "Applied functional analysis" at TU Berlin

- 12/2015 Local coordinator of the 2. MATHEON Conference "Compressed Sensing and its Applications" at TU Berlin.
- 04/2014 Local coordinator of the joint GAMM ANLA-MSIP Workshops 2014 on "Matrix Computations for Sparse Recovery" at TU Berlin
- 12/2013 Local coordinator of the MATHEON Conference "Compressed Sensing and its Applications" at TU Berlin
- since 06/2013 Administration of the webpage of the GAMM Mathematical Signal and Image Processing Activity Group

Grants

- 2018 Research scholarship of the DFG: "Shearlet-based energy functionals for anisotropic phase-field models"
- 2017 3. International MATHEON Conference on Compressed Sensing and its Applications
- 2017 MATHEON Conference on Wavelet and Tensor Methods for Partial Differential Equations

Refereeing and Reviewing Work

Referee for the following journals:

Advances in Computational Mathematics, Elsevier

Applied and Numerical Harmonic Analysis, Birkhäuser

Communications in Nonlinear Science and Numerical Simulation, Elsevier

IEEE Access, IEEE

Journal of Approximation Theory, Elsevier

Journal of Fourier Analysis and Applications, Springer

Journal of Geometric Analysis, Springer

Signal, Image and Video Processing, Springer

Journal of Mathematical Imaging and Vision, Springer

Transactions on Medical Imaging, IEEE

International Journal of Wavelets, Multiresolution and Information Processing,
World Scientific