Felix Lucka

Personal Information

Born in Hannover, Germany on May 23, 1985, nationality: German

email *felix.lucka@uni-muenster.de*

homepage *felixlucka.github.io*

Research Interests

Theoretical	inverse problems, Bayesian inference, variational regularization, compressed sensing, mathematical modeling
Methodical	MCMC, convex optimization, multimodal integration, finite element methods
Applications	biomedical imaging and computing, brain research

PhD Thesis

Title	*Bayesian Inversion in Biomedical Imaging*
Supervisors	Prof. Dr. Martin Burger and PD Dr. Carsten H. Wolters
Reviewers	Prof. Dr. Martin Burger, Prof. Dr. Samuli Siltanen and PD Dr. Carsten H. Wolters
Sub./Defense	Dec. 2014 / 23.01.2015
Degree	*summa cum laude*
Permalink	http://nbn-resolving.de/urn:nbn:de:hbz:6-80359613770

Work Groups

since 2014 **Member of "The Center for Medical Image Computing"**, *Department of Computer Science, University College London*, Advisor: Prof. Dr. Simon Arridge.

2013 **Research Visit to UCLA**, *Department of Mathematics*, invited by Prof. Dr. Andrea Bertozzi and Prof. Dr. Stanley Osher.

2010-2014 **Member of "Workgroup Imaging"**, *Institute of Computational and Applied Mathematics, University of Münster*, headed by Prof. Dr. Martin Burger.

2008-2014 **Member of "Methods in bioelectromagnetism"**, *Institute for Biomagnetism and Biosignalanalysis, University of Münster*, headed by PD Dr. Carsten H. Wolters.

Scientific Activities

Symposia "Imaging in the fast lane: in pursuit of dynamical information" SIAM conference on Imaging Science, Albuquerque, May 23-26, 2016.

"Bayesian Computation", Applied Inverse Problems conference, Helsinki, May 25-29, 2015.

The electronic version of this document contains hyperlinks explaining the terms and details of the German academic system. In addition, hyperlinks to the institutions and persons are provided.

Reviewer Biomedical Physics & Engineering Express (1), Computer Methods and Programs in Biomedicine (1), IEEE Transactions on Image Processing (1), Inverse Problems (4), Inverse Problems and Imaging (1), Inverse Problems in Science and Engineering (2), Mathematical Problems in Engineering (1), Neurological Research (1)

Referee German National Academic Foundation (Studienstiftung des deutschen Volkes) (1), University of Innsbruck, Austria (1)

Awards and Scholarships

Apr. 2014 **Poster price**, *Workshop "Innovative Verarbeitung bioelektrischer und biomagnetischer Signale" - bbs2014, Berlin*.

Okt. 2012 **Poster price**, *NeuroVisionen 8, Aachen*.

Apr. 2012 **Best talk in "Biomagnetism and online signal processing"**, *Workshop "Innovative Verarbeitung bioelektrischer und biomagnetischer Signale" - bbs2012, Berlin*.

Sep. 2011 **Research visit funding**, *Funding for a two week research visit at the RTWH Aachen by the annual meeting of the DMV (German mathematical society)*.

since Jul. 2011 **PhD-Scholarship**, *German National Academic Foundation (Studienstiftung des deutschen Volkes)*.

2005-2011 **Scholarship**, *German National Academic Foundation (Studienstiftung des deutschen Volkes)*.

Articles in Preparation

[1] S. Wagner, F.L., J. Vorwerk, C.S. Herrmann, G. Nolte, M. Burger. Using reciprocity for relating the simulation of transcranial current stimulation to the EEG forward problem. *In revision for NeuroImage.*

[2] S. Arridge, M. Betcke, B. Cox, F.L., B. Treeby. On the Adjoint Operator in Photoacoustic Tomography. *In revision for Inverse Problems, preprint on arXiv:1602.02027.*

[3] S. Arridge, P. Beard, M. Betcke, B. Cox Nam Huynh, F.L. and E Zhang. Accelerated High-Resolution Photoacoustic Tomography via Compressed Sensing. *In preparation for Physics in Medicine & Biology.*

[4] F.L. Fast Gibbs sampling for high-dimensional Bayesian inversion. *In preparation for Inverse Problems.*

[5] N. Bissantz, C. Brune, M. Burger, H. Dette, F.L., K. Proksch and F. Wübbeling. Properties and Limitations of Risk Estimators for Choosing Regularization Parameters in Ill-Posed Problems. *In preparation.*

[6] F.L., S. Tellen, C.H. Wolters, M. Burger. Sparse Recovery Conditions and Realistic Forward Modeling in EEG/MEG Source Reconstruction. *In preparation.*

[7] F.L., Ümit Aydin, J. Vorwerk, M. Burger, C.H. Wolters. Hierarchical Bayesian Inference for Combined EEG/MEG Source Analysis. *In preparation for NeuroImage.*

Publications

[1] L.D.J. Fiederer, J. Vorwerk, F. Lucka, M. Dannhauer, S. Yang, M. Dümpelmann, A. Schulze-Bonhage, A. Aertsen, O. Speck, C.H. Wolters, and T. Ball. The role of blood vessels in high-resolution volume conductor head modeling of EEG. *NeuroImage*, 128:193 – 208, 2016.

[2] F.L. *Bayesian Inversion in Biomedical Imaging*. PhD thesis, University of Muenster, 2014.

[3] M. Burger and F.L. Maximum a posteriori estimates in linear inverse problems with log-concave priors are proper Bayes estimators. *Inverse Problems*, 30(11):114004, 2014.

[4] S.M. Rampersad, A.M. Janssen, F.L., U. Aydin, B. Lanfer, S. Lew, C.H. Wolters, D.F. Stegeman, and T.F. Oostendorp. Simulating Transcranial Direct Current Stimulation With a Detailed Anisotropic Human Head Model. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 22(3):441–452, 2014.

[5] A.M. Janssen, S.M. Rampersad, F.L., B. Lanfer, S. Lew, Ü. Aydin, C.H. Wolters, D.F. Stegeman, and T.F. Oostendorp. The influence of sulcus width on simulated electric fields induced by transcranial magnetic stimulation. *Physics in Medicine and Biology*, 58(14):4881, 2013.

[6] F.L. Fast Markov chain Monte Carlo sampling for sparse Bayesian inference in high-dimensional inverse problems using L1-type priors. *Inverse Problems*, 28(12):125012, 2012.

[7] F.L., S. Pursiainen, M. Burger, and C.H. Wolters. Hierarchical Bayesian inference for the EEG inverse problem using realistic FE head models: Depth localization and source separation for focal primary currents. *NeuroImage*, 61(4):1364–1382, 2012.

[8] S. Wagner, F.L., M. Burger, L. Grasedyck, J. Haueisen, and C.H. Wolters. Comparison of direct and reciprocal forward modeling approaches in EEG source analysis. *Biomedical Engineering-Biomedizinische Technik*, 57(Suppl. 1):310, 2012.

[9] S. Pursiainen, F.L., and C.H. Wolters. Complete electrode model in EEG: relationship and differences to the point electrode model. *Physics in Medicine & Biology*, 57(4):999–1017, 2012.

[10] F.L., S. Pursiainen, M. Burger, and C.H. Wolters. Hierarchical Bayesian Models for EEG Inversion: Depth Localization and Source Separation for Focal Sources in Realistic FE Head Models. In *Biomedical Engineering*, volume 56. De Gruyter, 2011.

[11] F.L. Hierarchical Bayesian Approaches to the Inverse Problem of EEG/MEG Current Density Reconstruction. Diploma thesis, University of Münster, March 2011.

Talks on Conferences

Nov. 12, 2015 "Compressive Sensing and Sparsity: Theory and Applications in Tomography" Workshop, Manchester: *Variational Image Reconstruction in 4D Photoacoustic Tomography*

Sep. 28, 2015 "Variational Methods for Dynamic Inverse Problems and Imaging" Conference, Münster: *Variational Methods for Dynamic High-Resolution Photoacoustic Tomography*

Sep. 2, 2015 BaCI, Utrecht: *Hierarchical Bayesian Inference for Combined EEG/MEG Source Analysis*

Aug. 14, 2015 ICIAM, Beijing: *Towards Dynamic High Resolution Photoacoustic Tomography*

Aug. 11, 2015 ICIAM, Beijing: *Sample-based Sparse Bayesian Inversion in Biomedical Imaging*

Jun. 9, 2015 Challenges in Dynamic Imaging Data, Cambridge: *Challenges of 4D Photoacoustic Tomography*

May 25, 2015 Applied Inverse Problems, Helsinki: *Recent Advances in Bayesian Inference for Inverse Problems*

Dec. 8, 2014 20-th "Inverse Days" Conference, Tampere: *Sample-based Bayesian Inversion*

Sep. 28, 2013 International Workshop on Inverse Problems and Regularization Theory, Fudan University, Shanghai: *Computational and Theoretical Aspects of L1-type Priors in Bayesian Inverse Problems*

Sep. 21, 2013 Shanghai International Workshop on Recent Advances in Inverse Problems and Imaging Science, Shanghai Jiao Tong University: *Recent Results on L1-type Priors in Bayesian Inverse Problems*

Jul. 5, 2013 Applied Inverse Problems Conference, Daejeon: *Computational and Theoretical Aspects of Sparsity-Constraints in Bayesian Inversion*

Jul. 2, 2013 Applied Inverse Problems Conference, Daejeon: *Hierarchical Bayesian Modeling for EEG/MEG: From Simulated to Experimental Data*

Dec. 19, 2012 18-th "Inverse Days" Conference, Jyväskylä: *Sparsity Constraints in Bayesian Inversion*

Apr. 19, 2012 Workshop "Innovative Verarbeitung bioelektrischer und biomagnetischer Signale" - bbs2012, Berlin: *Hierarchical Bayesian Models for Focal EEG/MEG Inversion*

Sep. 28, 2011 Annual meeting of the DGBMT, Freiburg: *Hierarchical Bayesian Models for EEG Inversion: Depth Localization and Source Separation for Focal Sources in Realistic FE Head Models*

Sep. 20, 2011 Annual meeting of the DMV, Köln.: *Hierarchical Bayesian Approaches to the Inverse Problem of EEG/MEG Current Density Reconstruction*

Invited Talks

Feb. 13, 2015 Applied Maths Seminar, Warwick: *Sample-based Bayesian Inference in Inverse Problems*

Feb. 2, 2015 Applied Math Colloquium, WWU: *Challenges of Dynamic High Resolution Photoacoustic Tomography*

May 29, 2013 Applied Math Colloquium, UCLA: *Hierarchical Bayesian Modeling and Another Type of Sparsity*

Apr. 30, 2013
May 7, 2013 Two introductory talks given at Stanley Osher's level set collective seminar, UCLA: *The Bayesian Approach to Inverse Problems and Imaging*

Nov. 13-15, 2012 Three introductory talks given at the DAMTP, Centre for Mathematical Sciences, University of Cambridge: *The Bayesian Approach to Inverse Problems*

Own Posters

Feb. 13-18, 2016 F.L., M. Betcke, N. Huynh, E. Zhang, P. Beard, B. Cox, and S. Arridge: *Variational Image Reconstruction for Dynamic High Resolution Photoacoustic Tomography*. SPIE Photonics West, San Francisco.

Jul. 6-9, 2015 F.L., M. Betcke, S. Arridge, B. Cox, N. Huynh, E. Zhang, and P. Beard: *Towards 4D Photoacoustic Tomography*. SPARS, Cambridge.

Sep. 4-5, 2014 Lucka, F., Tellen, S., Wolters C.H. and Burger, M.: *Sparse Recovery Conditions and Realistic Forward Modeling in EEG/MEG Source Reconstruction*. UCL-Duke Workshop on Sensing and Analysis of High-Dimensional Data (SAHD 2014), London.

Aug. 26-28, 2014 Lucka, F., Tellen, S., Wolters C.H. and Burger, M.: *Sparse Recovery Conditions and Realistic Forward Modeling in EEG/MEG Source Reconstruction*. "Inverse Problems - from Theory to Applications" (IPTA 2014) conference, Bristol.

Apr. 10-11, 2014 Lucka, F., Tellen, S., Wolters C.H. and Burger, M.: *Sparse Recovery Conditions and Realistic Forward Modeling in EEG/MEG Source Reconstruction*. Workshop "Innovative Verarbeitung bioelektrischer und biomagnetischer Signale" - bbs2014, Berlin.

Dez. 9-13, 2013 Lucka, F., Tellen, S., Wolters C.H. and Burger, M.: *Sparse Recovery Conditions and Realistic Forward Modeling in EEG/MEG Source Reconstruction*. Matheon Workshop on Compressed Sensing and its Applications 2013, Berlin.

Nov. 29, 2013 Lucka, F., Aydin, Ü., Vorwerk, J., Burger, M. and Wolters C.H.:*Hierarchical Fully-Bayesian Inference for Combined EEG/MEG Source Analysis of Evoked Responses: From Simulations to Real Data*. Neurovisionen 9, Cologne.

Sep. 5-8, 2013	Lucka, F., Aydin, Ü., Vorwerk, J., Burger, M. and Wolters C.H.: *Hierarchical Fully-Bayesian Inference for Combined EEG/MEG Source Analysis of Evoked Responses: From Simulations to Real Data*. International Conference on Basic and Clinical Multimodal Imaging (BaCI), Geneva.
Okt. 26, 2012	Lucka, F., Pursiainen, S., Burger, M. and Wolters C.H.: *Hierarchical Fully-Bayesian Inference for EEG/MEG combination: Examination of Depth Localization and Source Separation using Realistic FE Head Models*. NeuroVisionen 8, Aachen
Aug. 26-30, 2012	Lucka, F., Pursiainen, S., Burger, M. and Wolters C.H.: *Hierarchical Fully-Bayesian Inference for EEG/MEG combination: Examination of Depth Localization and Source Separation using Realistic FE Head Models*. 18-th International Conference on Biomagnetism (Biomag 2012), Paris
Oct. 5-6, 2011	Lucka, F., Pursiainen, S., Burger, M. and Wolters C.H.: *Hierarchical Bayesian Estimation for the EEG Inverse Problem using Realistic FE Head Models: Depth Localization and Source Separation for Focal Primary Currents*. Autumn School "The Multimodal Brain", Tübingen

Diploma Thesis

Title	*Hierarchical Bayesian Approaches to the Inverse Problem of EEG/MEG Current Density Reconstruction*
Supervisors	Prof. Dr. Martin Burger and PD Dr. Carsten H. Wolters
Submission	Mar. 2011

Teaching

2015-2016	Assistance to Simon Arridge for the course "Inverse Problems in Imaging"
2013	Introductory course to Matlab
since 2012	Supervision of Bachelor and Masters theses.
2009–2010	Student tutor for an exercise for the course *Stochastics*
2007–2008	Student mentor for the courses *Theoretical Physics III and IV*

Summer Schools

Jun. 11-15, 2012	Summer school on *Computational Methods for Inverse Problems in Imaging*, Kuopio
Oct. 5-6, 2011	Autumn school *The Multimodal Brain*, Tübingen
Jul. 25-29, 2011	*Introductory Workshop on Inverse Problems*, Cambridge

Education

2005-2011	**Studies in Mathematics with minor in Physics**, *University of Münster*, grade of diploma: 0.85 (with greatest distinction).
2006-2011	**Studies in Physics with minor in Computer Science**, *University of Münster*, grade of intermediate diploma: 1.0.
Aug. 2007	**Summer Academy**, *Collective behavior in physical, biological and other many particle systems*. by Prof. Dr. Erich Runge, Prof. Dr. Philipp Maass and PD Dr. Michael Bachmann

Aug. 2006 **Summer Academy**, *Pattern Formation: Phenomena and Modeling*.
by Prof. Dr. Andreas Mielke and Prof. Dr. Stefan Kehrein

1995–2004 **Secondary education (Abitur)**, *Gymnasium Mellendorf*, final grade: 1.0.

1991–1995 **Primary education**, *Grundschule Bissendorf*.

Experience

since 2014 **Research associate**, *Department of Computer Science, University College London*.

2012-2014 **Research assistant**, *Institute of Computational and Applied Mathematics, University of Münster*.

2009–2010 **Student assistant**, *Institute of Mathematical Statistics*.

2008–2009 **Student research assistant**, *Institute for Biomagnetism and Biosignalanalysis*.

March 2008 **Internship**, *Max-Planck-Institute for Dynamics and Self-Organization*, Göttingen.
Laboratory for Fluid Dynamics, Pattern Formation and Nanobiocomplexity

2007–2008 **Student assistant**, *Institute for Theoretical Physics*.

2004–2005 **Alternative civilian service (Zivildienst)**, *gemeinnützige Gesellschaft für integrative Sozialdienste mbH (GIS), school escort for a disabled child*.

Engagement

University Students' union (Fachschaft), faculty council (Fachbereichsrat), miscellaneous faculty committees, faculty task force *Public Relations*, faculty task force *Networking*, organizer of the *Lange Nacht der Mathematik* (*Long Night of the Sciences* for mathematics), co-organizer of the awarded project *Studies an die Schulen*

Gymnasium Student council (Schülervertretung), school president (Schülersprecher)

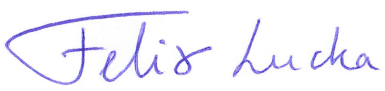
Miscellaneous Local youth council (Jugendparament der Gemeinde), miscellaneous political activities

References

Prof. Dr. Martin Burger: martin.burger@uni-muenster.de

PD Dr. Carsten Hermann Wolters: carsten.wolters@uni-muenster.de

Prof. Dr. Simon Arridge: s.arridge@cs.ucl.ac.uk



Signature; last updated: February 16, 2016

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