

# curriculum vitae

# matthias chung

(as of December 16, 2019)

Department of Mathematics &  
Computational Modeling and Data Analytics Division  
Academy of Integrated Science  
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## Research interests

numerical analysis & scientific computing, inverse problems, computational biology, applied linear algebra, machine learning, parameter estimation, dynamical systems, optimization

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## Education

- 2002 – 2006 Dr. rer. nat. in Mathematics (Ph.D. equivalent) at the University of Lübeck, Germany  
*Summa Cum Laude*
- 1995 – 2001 Studies of Mathematics with a minor in Computer Science at the University of Hamburg, Germany with a Diploma (Dipl. math.) (German equivalent of M. Sc. degree)
- 1999 – 2000 Exchange-student (Erasmus program) at the School of Mathematics and Computer Science, University of Leicester (UK)

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## Employment

- since 2018 Associate Professor, Department of Mathematics, Virginia Tech
- 2012 – 2018 Assistant Professor, Department of Mathematics, Virginia Tech
- 2010 – 2012 Assistant Professor, Department of Mathematics, Texas State University – San Marcos
- 2008 – 2010 Post Doctoral Research Fellow, Computational and Life Sciences Strategic Initiative and Department of Mathematics and Computer Science, Emory University
- 2002 – 2008 Research assistant, third-party funds project, Institute of Mathematics, University of Lübeck, Germany
- 2001 – 2002 Research assistant, third-party funds project, Department of Computer Science, University of Hamburg, Germany

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## Funded research projects

- Externally funded research projects

- [G6] Project Title: *Phase I I/UCRC Virginia Tech: Center for Advanced Subsurface Earth Resource Models (CASERM)*  
Source of Support: *NSF IIP 1822108*  
Award Amount: *\$ 750,000 at Virginia Tech, \$ 1,500,000 total plus approx. \$ 300,000 annual membership fees from companies and agencies*  
List of PIs: *Matthias Chung (Site Director), John Chermak, John Hole, Erik Westman*  
Support Period: *09/01/2018–08/31/2023*

- [G5] Project Title: *Stochastic Approximations for the Solution and Uncertainty Analysis of Data-Intensive Inverse Problems*  
Source of Support: NSF DMS 1723005 (Collaborative Research: CDS&E-MSS)  
Award Amount: \$210,000 at Virginia Tech, \$400,000 total  
List of PIs: Matthias Chung, Julianne Chung (VT); Youssef Marzouk (MIT); Luis Tenorio (Mines)  
Support Period: 09/01/2017–08/31/2020
- [G4] Project Title: *Quantifying Nitrogen Transformations and Losses Associated with Manure Storage to Improve Accuracy of Whole Farm Process Based Nitrogen Accounting Models*  
Source of Support: USDA NIFA: 2016-08687  
Award Amount: \$475,000  
List of PIs: Jactone Ogejo, Matthias Chung, Biswarup Mukhopadhyay (VT)  
Support Period: 01/01/2017–12/31/2019
- [G3] Project Title: *Virginia Tech Planning Grant: I/UCRC for Advanced Subsurface Earth Resource Models*  
Source of Support: NSF I/UCRC 1650463  
Award Amount: \$15,000  
List of PIs: Matthias Chung, John Hole, Erik Westman (VT)  
Support Period: 02/01/2017–01/31/2018  
Note: *This is a seed grant for establishing an industry sponsored center on subsurface modeling and targeted towards the mining industry. I am the lead PI at VT.*
- [G2] Project Title: *Identifying the dynamics of small and large microbial communities*  
Source of Support: NIH R21 GM107683-01  
Award Amount: \$313,067  
List of PIs: Matthias Chung (VT); Mihai Pop (UMD)  
Support Period: 09/15/2013–08/31/2016
- [G1] Project Title: *Energy Metabolism: Physiology and Model, Graduate School for Computing in Medicine and Life Sciences*  
Source of Support: German Research Association (DFG)  
Award Amount: €45,000 (approx. \$63,000)  
List of PIs: Matthias Chung (Emory); Kerstin Oltmanns (U Lübeck)  
Support Period: 09/01/2007–01/01/2012
- Internally funded research projects
- [H3] Project Title: *Gaussian Process in Reduced Order Models*  
Source of Support: Hamlett Undergraduate Research, Virginia Tech Foundation  
Award Amount: \$2,000  
List of PIs: Matthias Chung  
Support Period: 06/01/2018–12/31/2018
- [H2] Project Title: *HPC Methods for Randomized Least-Squares Problems*  
Source of Support: Hamlett Undergraduate Research, Virginia Tech Foundation  
Award Amount: \$3,000  
List of PIs: Matthias Chung  
Support Period: 01/01/2018–05/31/2018

- [H1] Project Title: *Optimal Experimental Design with Model Constraints*  
Source of Support: *Internal Texas State University Research Enhancement Grant*  
Award Amount: \$8,000  
List of PIs: *Matthias Chung (TxState)*  
Support Period: *09/01/2011–08/31/2012*

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## Awards & recognitions

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- 2019 Alexander von Humboldt Fellowship for Experience Researchers.  
2011/2012 Research Excellence Award from the Department of Mathematics at Texas State University, 2011. Nominee for the Presidential Award of Excellence in Research, 2011/2012.

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## Publications

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### Journal papers (submitted & in revision)

- [J26] S. Karunaratne, *M. Chung*, and J. A. Ogejo. Process-based models for estimating emissions of ammonia and greenhouse gases from stored liquid dairy manure: A critical review. In revision at *Biosystems Engineering*, 2019.

### Journal papers

- [J25] J. T. Slagel, J. Chung, *M. Chung*, D. Kozak, and L. Tenorio. Sampled Tikhonov Regularization for Large Linear Inverse Problems. *Inverse Problems*, <https://doi.org/10.1088/1361-6420/ab2787>, 2019.
- [J24] *M. Chung*, M. Binois, R.B. Gramacy, J. Bardsley, D.J. Moquin, A.P. Smith, and A.M. Smith. Parameter and Uncertainty Estimation for Dynamical Systems Using Surrogate Stochastic Processes. *SIAM Journal on Scientific Computing*, <https://arxiv.org/abs/1802.00852>, arXiv preprint arXiv:1802.00852, 2019.
- [J23] L. Ruthotto, J. Chung, *M. Chung*. Optimal Experimental Design for Constrained Inverse Problems. *SIAM Journal on Scientific Computing*, 40(4): B1080–B1100, 2018.
- [J22] Q. Mu, V. Tavella, J. Kirby, T. Cecere, *M. Chung*, J. Lee, S. Li, S. Ahmed, C. Reilly, and X. Luo. Antibiotics ameliorate Lupus-like symptoms in mice. *Scientific Reports*, 7(1):13675, 2017.
- [J21] *M. Chung*, J. Krueger, and M. Pop. Robust parameter estimation for biological systems: A study on the dynamics of microbial communities. *Mathematical Bioscience*, 294:71–84, 2017.
- [J20] A.C. Rodriguez, *M. Chung*, and S.M. Ciupe. Understanding the complex patterns observed during hepatitis B Virus therapy. *Viruses*, 9(117):1–15, 2017.
- [J19] J. Chung and *M. Chung*. Optimal regularized inverse matrices for inverse problems. *SIAM Journal on Matrix Analysis and Applications*, 38(2):458–477, 2017.
- [J18] Y. Zhao, *M. Chung*, B.A. Johnson, C.S. Moreno, and Q. Long. Hierarchical feature selection incorporating known and novel biological information: Identifying genomic features related to prostate cancer recurrence. *Journal of the American Statistical Association*, 111(516):1427–1439, 2016.
- [J17] J. Chung, *M. Chung*, and D.P. O’Leary. Optimal regularized low rank inverse approximation. *Linear Algebra and its Applications*, 468:260–269, 2015.

- [J16] J. Chung and M. Chung. An efficient approach for computing optimal low-rank regularized inverse matrices. *Inverse Problems*, 30(11): 1–19, 2014.
- [J15] B. Göbel, K.M. Oltmanns, and M. Chung. Linking neuronal activity to the glucose metabolism. *Theoretical Biology and Medical Modelling*, 10(50), 1–19, 2013.
- [J14] M. Chung, B.A. Johnson and Q. Long. A tutorial on rank-based coefficient estimation for censored data in small- and large-scale problems. *Statistics and Computing*, 1–14, 2013.
- [J13] E. Haber, M. Chung, and F. Hermann. An effective method for parameter estimation with PDE constraints with multiple right hand sides. *SIAM Journal on Optimization*, 22(3), 739–757, 2012.
- [J12] J. Chung, M. Chung, and D.P. O’Leary. Optimal error filters for image deconvolution with data acquisition errors. *Journal of Mathematical Imaging and Vision*, 44(3), 336–374, 2012.
- [J11] M. Chung and E. Haber. Experimental design for biological systems. *SIAM Journal on Control and Optimization*, 50(1):471–489, 2012.
- [J10] B. Göbel, M. Chung, K.M. Oltmanns, A. Peters, and D. Langemann. Robust modeling of appetite regulation. *Journal of Theoretical Biology*, 291:65–75, 2011.
- [J9] J. Chung and M. Chung and D. P. O’Leary. Designing optimal spectral filters for inverse problems. *SIAM Journal on Scientific Computing*, 33(6):3132–3152, 2011.
- [J8] M. Chung, B. Göbel, A. Peters, K. M. Oltmanns, and A. Moser. Mathematical model of the biphasic dopaminergic response to glucose. *Journal of Biomedical Science and Engineering*, 4:136–145, 2011.
- [J7] Q. Long, M. Chung, C. S. Moreno, and B.A. Johnson. Risk prediction for prostate cancer recurrence through regularized estimation with simultaneous adjustment for nonlinear clinical effects. *Annals of Applied Statistics*, 5(3):2003–2023, 2011.
- [J6] B.A. Johnson, Q. Long, and M. Chung. On path restoration for censored outcomes. *Biometrics*, 67, 2011.
- [J5] B. Göbel, D. Langemann, K. M. Oltmanns, and M. Chung. Compact energy metabolism model: Brain controlled energy supply. *Journal of Theoretical Biology*, 264(4):1214–24, 2010.
- [J4] M. Conrad, C. Hubold, B. Fischer, and A. Peters. Modeling the hypothalamus-pituitary-adrenal system: Homeostasis by interacting positive and negative feedback. *Journal of Biological Physics*, 35:149–162, 2009.
- [J3] L. Ramrath, J. Levering, M. Conrad, A. Thuemen, H. Fuellgraf, and A. Moser. Mathematical identification of a neuronal network consisting of GABA and dopamine in striatal slices of the rat brain. *Computational and Mathematical Methods in Medicine*, 10(4):273–285, 2009.
- [J2] A. Peters, M. Conrad, C. Hubold, U. Schweiger, B. Fischer, and H. L. Fehm. The principle of homeostasis in the hypothalamus-pituitary-adrenal system: new insight from positive feedback. *American Journal of Physiology – Regulatory, Integrative and Comparative Physiology*, 293(1):R83–R98, 2007.
- [J1] A. Peters, U. Schweiger, L. Pellerin, C. Hubold, K. M. Oltmanns, M. Conrad, B. Schultes, J. Born, and H. L. Fehm. The selfish brain: Competition for energy resources. *Neuroscience & Biobehavioral Reviews*, 28(2):143–180, 2004.

- **Book chapters**

- [B2] M. Chung and B. Göbel. *Advances in Systems Biology*, chapter Mathematical modeling of the energy metabolism based on the Selfish Brain Theory, pages 425–440, Springer, New York, 2012.
- [B1] M. Conrad and J. Prestin. *Tutorials on Multiresolution in Geometric Modelling*, chapter Multiresolution on the sphere, pages 165–202. Springer, New York, 2002.

- **Proceeding papers**

- [P6] J. Chung, M. Chung, and J. T. Slagel. Iterative Sampled Methods for Massive and Separable Nonlinear Inverse Problems. *Proceedings of Seventh International Conference on Scale Space and Variational Methods in Computer Vision*, 119–130, Springer, 2019.
- [P5] S. Karunaratne, M. Chung, and J. A. Ogejo. Compartmental process-based model for estimating ammonia emission from liquid dairy manure storage tank. *Proceedings of the 2017 ASABE Annual International Meeting*, 2017.
- [P4] B. Y. Lee, A. Moustakas, A. Zeigler, M. Prague, R. Santos, M. Chung, R. Gras, V. Forbes, S. Borg, et al.. Population modelling by examples II. Society for Computer Simulation International, *Proceedings of the Summer Computer Simulation Conference*, 2016.
- [P3] J. Chung and M. Chung. Computing optimal low-rank matrix approximations for image processing. *IEEE Proceedings of the Asilomar Conference on Signals, Systems, and Computers*. November 3-6, 2013, Pacific Grove, CA, USA, 2013.
- [P2] S. McClellan, M. Casey, and M. Chung. Coherent pre-distortion of low-frequency PLC carriers. *Conference Proceedings CTRQ 2013, The Sixth International Conference on Communication Theory, Reliability, and Quality of Service*, 2013.
- [P1] J. Olesch, N. Papenberg, T. Lange, M. Conrad, and B. Fischer. Matching CT and ultrasound data of the liver by landmark constrained image registration. *Proceedings of SPIE (7261) 1*: 72610G, 2009.

- **Advised research (submitted)**

- [O12] A. Krinos and A Maurais (Sponsor: M. Chung). Parameter and Uncertainty Estimation for a Model of Atmospheric CO<sub>2</sub> Observations. *SIAM Undergraduate Research Online*, 12, DOI 10.1137/18S017533, 2019.

- **Technical reports**

- [O11] J. Chung, M. Chung, J. T. Slagel, and L. Tenorio. Stochastic Newton and Quasi-Newton methods for large linear least-squares problems, arXiv preprint <http://arxiv.org/abs/1702.07367>, 2017.
- [O10] E. Haber and M. Chung. Simultaneous source for non-uniform data variance and missing data. arXiv preprint <http://arxiv.org/abs/1404.5254>, 2014.
- [O9] M. Conrad and B.A. Johnson. A quasi-Newton algorithm for efficient computation of Gehan estimates. *Technical Report, Emory University, Department of Biostatistics and Bioinformatics*, TR-2010-02, 2010.
- [O8] M. Conrad and N. Papenberg. Iterative adaptive Simpson and Lobatto quadrature in Matlab. *Technical Report, Emory University, Department of Mathematics and Computer Science* TR-2008-012, 2008.

- **Abstracts**

- [O7] Y. Tian, Y. Zhou, J. Chung and M. Chung. A Bayesian approach to linear inverse problems in seismic tomography. *Proceedings of the AGU Fall Meeting* (abstract), 2014.
- [O6] M. Chung and S. Ciupe. Parameter identifiability in virus infection models: an application to hepatitis B (extended abstract). *Proceedings of International Symposium of Bioinformatics Research and Applications*, Charlotte, USA, 2013.
- [O5] M. Conrad, C. Hubold, B. Fischer, U. Schweiger, H. L. Fehm, and A. Peters. The “principle of balance”: How do biological systems become homeostatic? (abstract). *Experimental and Clinical Endocrinology & Diabetes*, 114:469, 2006.
- [O4] M. Conrad. Multiresolution on the sphere (abstract). In Konstantinos Daniilidis, Reinhard Klette, and Ales Leonardis, editors, *Imaging Beyond the Pin-hole Camera. 12th Seminar on Theoretical Foundations of Computer Vision*, number 04251 in *Dagstuhl Seminar Proceedings*. Internationales Begegnungs- und Forschungszentrum (IBFI), Schloss Dagstuhl, Germany, 2005.
- [O3] M. Conrad, C. Hubold, B. Fischer, U. Schweiger, H. L. Fehm, and A. Peters. The principle of regulation (abstract). *Experimental and Clinical Endocrinology & Diabetes*, 113:490, 2005.
- [O2] H. Krüger, C. Hubold, M. Conrad, A. Peters, and H. L. Fehm. Responses of the LHPA-system to CRH stimulation in subjects with type 1 diabetes mellitus and obesity (abstract). *Experimental and Clinical Endocrinology & Diabetes*, 113:495–496, 2005.
- [O1] M. Conrad, C. Hubold, B. Fischer, and A. Peters. The selfish brain: A new model of the LHPA-system (abstract). *Experimental and Clinical Endocrinology & Diabetes*, 112:481–482, 2004.
- **Master (Dipl. Math.) & Ph.D. thesis (Dr. rer. nat.)**
- [T2] M. Conrad. *Modellierung und Parameterschätzung endokriner Systeme. English: Modeling and parameter estimation of endocrine systems*. PhD thesis, Institute of Mathematics, University of Lübeck, 2006.  
Committee: B. Fischer (advisor), University of Lübeck; A. Peters, University of Lübeck; K. Voigt, Philipps-University Marburg
- [T1] M. Conrad. *Approximation und Multiskalenzerlegung auf der Sphäre. English: Approximation and multiresolution analysis on the sphere*. Master thesis, Institute of Mathematics, University of Hamburg, 2001.  
Committee: C. Geiger (advisor), University of Hamburg; G. Opfer, University of Hamburg

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## Presentations, invited talks & lectures

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- **Invited colloquia and seminar talks**
- March 2019 *Computational Challenges in Inverse Problems, Seminar, Auburn University, Auburn, USA*
- May 2018 *Computational Challenges in Inverse Problems, Mathematisches Colloquium, Bergische Universität Wuppertal, Wuppertal, Germany*
- March 2018 *Computational Challenges in Inverse Problems, Mathematics seminar, University of Montana, Missoula, USA*
- February 2018 *Computational Challenges in Inverse Problems, ICES seminar, University of Texas, Austin, USA*

- April 2015 *Designing Optimal Spectral Filters and Low-Rank Matrices for Inverse Problems, AEROASTRO seminar, MIT, Boston, USA*
- October 2014 *Designing Optimal Spectral Filters and Low-Rank Matrices for Inverse Problems, Applied Mathematics and Statistics Colloquium, Colorado School of Mines, Golden, USA*
- March 2014 *Designing Optimal Regularized Inverse Matrices for Inverse Problems, Biostatistics & Bioinformatics Seminar, Emory University, Atlanta, USA*
- February 2014 *Lecture on Mathematical Modeling, Texas State University, San Marcos, USA*
- January 2014 *Designing Optimal Spectral Filters and Low-Rank Matrices for Inverse Problems, Special Linear Algebra and Optimization Seminar, Stanford, USA*
- March 2012 *Designing Optimal Experiments for Biological Systems, Colloquium of the Department of Mathematics, University of Texas at Arlington, USA*
- February 2012 *Optimal Experimental Design in Biology and Medicine, Mathematical Sciences Colloquium, Michigan Tech, USA*
- January 2012 *Optimal Experimental Design in Biology and Medicine, Mathematics Seminar, University of California, Merced, USA*
- December 2011 *Experimental Design in Biology, Mathematics Seminar, North Dakota State University, USA*
- October 2011 *Optimal Experimental Design in Biology, Applied Mathematics Seminar, University of Texas at Arlington, USA*
- May 2011 *Optimal experimental design in biology and medicine, Graduate School for Computing in Medicine and Life Science, Colloquium, University of Lübeck, Germany*
- March 2011 *Optimal experimental design for biological systems, Center for Bioinformatics and Computational Biology, University of Maryland, College Park, USA*
- March 2011 *Optimal experimental design in biology and medicine, Department of Mathematics, Colloquium, Georgia State University, Atlanta, USA*
- November 2010 *Optimal experimental design and its applications, ICES Seminar, UT Austin, USA*
- May 2010 *Experimental design for biological systems, Department of Mathematics, University of Maryland, College Park, USA*
- March 2010 *Experimental design for biological systems, Department of Mathematics, Texas State University, San Marcos, USA*
- November 2009 *Optimal experimental design and parameter estimation for the energy metabolism, UBC Mathematical Biology Seminar, Vancouver, Canada*
- September 2008 *Parameter estimation in ordinary differential equations, Laboratory for Biological System Analysis, Georgia Tech, Atlanta, USA*
- December 2007 *The selfish brain: modeling and parameter estimation, Institute of Scientific Computing (IWR), Heidelberg, Germany*
- December 2006 *Modeling the stress system, Institut für Physiologie und Pathophysiologie, Neurodynamik, Marburg, Germany*
- **Invited lectures, conference, workshops, and minisymposia talks**
- February 2019 *Optimal Experimental Design: Sampling Methods for Massive Linear Inverse Problems, SIAM CSE, Spokane, USA*

- November 2018 *From Parameter Estimation to Optimal Experimental Design: Challenges in Biological Dynamical Systems Inference, Workshop, Banff, Canada*
- June 2018 *Randomized Newton methods for large least-squares problems, SIAM Imaging Science, Bologna, Italy*
- May 2018 *Optimal Experimental Design for Constrained Inverse Problems, 9th International Conference on Inverse Problems: Modeling and Simulation, Malta*
- April 2018 *Randomized Newton methods for large least-squares problems, SIAM Uncertainty Quantification, Garden Grove, USA*
- June 2017 *Optimal Regularized Inverse Matrices for Inverse Problems, Householder Symposium XX, Blacksburg, USA*
- March 2017 *Optimal Regularized Inverse Matrices for Inverse Problems, SIAM CSE, Atlanta, USA*
- January 2017 *Stochastic Newton and Quasi-Newton Methods, SAMSI Workshop on Statistical Inverse Problems, Research Triangle Park, USA*
- June 2016 *Optimal Regularized Inverse Matrices for Inverse Problems, Inverse Problem Symposium, Lexington, VA, USA*
- April 2016 *Optimal Regularized Inverse Matrices for Inverse Problems, SIAM Uncertainty Quantification, Lausanne, CHE*
- October 2015 *Optimal Low-Rank Inverse Preconditioner, SIAM Applied Linear Algebra, Atlanta, USA*
- June 2015 *Lecture: Optimal Experimental Design for Differential Equations, IMA Uncertainty Quantification Workshop, Minneapolis, USA*
- May 2015 *Optimal Inversion Matrices for Inverse Problems, Applied Inverse Problems Conference, Helsinki, Finland*
- March 2015 *Optimal Inversion Matrices for Inverse Problems, AMS Sectional Meeting, Georgetown, USA*
- August 2014 *Inverse Problems in Biological Systems, SIAM Life Science, Charlotte, USA*
- May 2014 *Designing Optimal Regularized Inverse Matrices for Inverse Problems, SIAM Optimization, San Diego, USA*
- May 2014 *Designing Optimal Regularized Inverse Matrices for Inverse Problems, SIAM Imaging Science, Hong Kong, China*
- March 2014 *Designing Experiments for Optimal Parameter Recovery in Biological Systems, SIAM Uncertainty Quantification, Savannah, USA*
- September 2013 *Designing Optimal Regularized Inverse Matrices for Inverse Problems, IFIP TC 7 2013, Klagenfurt, Austria*
- May 2012 *Designing Optimal Spectral Filters for Inverse Problems, SIAM Imaging Science Conference, Philadelphia, USA*
- September 2011 *Designing Optimal Spectral Filters for Inverse Problems, Workshop on Mathematical Methods for Medical Imaging, Vancouver, Canada*
- June 2011 *Experimental Design in Biological Applications, ICIAM 2011, Vancouver, Canada*
- June 2011 *Designing Optimal Spectral Filters for Inverse Problems, Workshop on Optimization and Machine Learning, University of Texas, Austin, USA*
- July 2010 *Control mechanisms and modeling of the energy metabolism, SIAM Life Science 2010, Pittsburgh, USA*



- August 2009 *Optimal experimental design for the surveillance of the glucose metabolism, ISMP, Chicago, USA*
- July 2009 *Homeostasis by interacting positive and negative feedback, SMB Annual Meeting, Vancouver, Canada*
- July 2009 *Optimal control in glucose regulation, SIAM Conference on Control and its Applications, Denver, USA*
- September 2008 *Workshop on mathematical modeling of human metabolism and body weight regulation, Bethesda, Maryland, USA*
- September 2007 *The selfish brain: homeostasis in physiological modeling, PhysCon, Potsdam, Germany*
- June 2007 *Modeling the Hypothalamus-Pituitary-Adrenal system: homeostasis by interacting positive and negative feedback, Workshop From Complex Systems Theory to Clinical Neurology, Dresden, Germany*
- October 2006 *Brain-enforced glucose homeostasis, 10th Annual Meeting of the Neuroendocrinology Section of the German Society of Endocrinology, Tübingen, Germany*
- August 2006 *The "principle of balance" – How do biological systems become homeostatic?, Hormones & Brain, from cloning to clinic. 37th ISPNE Annual Meeting, Leiden, Netherlands*
- February 2006 *Modeling the HPA system, The Selfish Brain Conference, Lübeck, Germany*
- January 2006 *Modellierungsmethoden in der Selfish Brain Theorie, English: Methods for modeling elements of the Selfish Brain theory, Mathematical Modeling and Data Analysis in Biological Systems, Workshop, Lübeck, Germany*
- August 2005 *Mathematik und Medizin: von Parabiose über Synergie zur Symbiose?, English: Mathematics and medicine: from parabiosis via synergy to symbiosis, Summer school of the German National Merit Foundation, Salem, Germany*
- July 2005 *The Selfish Brain: A new model of the LHPA system, XXV. Dynamics Days Europe, Berlin, Germany*
- July 2005 *The Selfish Brain: A new model of the stress system, Conference ECMTB05, Dresden, Germany*
- June 2004 *Multiresolution on the sphere, Workshop on Imaging Beyond the Pinhole Camera, Dagstuhl, Germany*

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## Professional service

- **Memberships**

SIAM Society for Industrial and Applied Mathematics

- **Organized conferences, workshops, & summer schools**

- November 2018 *I/UCRC CASERM meeting, Golden, USA*  
*Industry Advisory Board meeting of Center*
- June 2017 *Householder Symposium XX, Blacksburg, USA*  
*Local organizing committee*
- January 2006 *Mathematical Modeling and Data Analysis in Biological Systems, Workshop, Lübeck, Germany*
- August 2005 *The Selfish-Brain: Competition for Energy Resources, Summer school of the German National Academic Foundation, Salem, Germany*

- **Organized minisymposia**

- June 2018 Computational Methods for Large-Scale Machine Learning in Imaging, 2 sessions, 8 speaker, SIAM Imaging Science, Bologna, Italy
- March 2017 *Inverse problems meet big data*, 3 session, 12 speaker, SIAM CSE, Atlanta, USA
- April 2016 *Inverse problems meet big data*, 1 session, 4 speaker, SIAM Uncertainty Quantification, Lausanne, CHE
- August 2015 *Computational learning and model optimization*, 1 session, 4 speaker, ICIAM 2015, Beijing, China
- August 2014 *Parameter Estimation for Biological Systems*, 1 session, 4 speaker, SIAM Life Science, Charlotte, USA
- August 2014 *Applications of Dynamical Systems to Biology and Medicine*, 1 session, 4 speaker, SIAM Life Science, Charlotte, USA
- May 2012 *Inverse Problems and Statistical Learning in Imaging Applications*, 1 session, 4 speaker, SIAM Imaging Science, Philadelphia, USA
- July 2011 *Experimental Design and its Applications*, 1 session, 4 speaker, ICIAM, Vancouver, Canada
- July 2010 *Control mechanism of the energy metabolism*, 2 session, 8 speaker, SIAM Life Science, Minisymposium, Pittsburgh, USA
- July 2010 *Optimal Experimental Design and its Applications*, 1 session, 4 speaker, SIAM Annual, Minisymposium, Pittsburgh, USA
- July 2009 *Control and Inverse Problems in Medicine*, 1 session, 4 speaker, SIAM Conference on Control and its Applications, Minisymposium, Denver, USA

- **Program committees**

- 2016 Biocomputation 2016, June 26-30, Lisbon, Portugal, 2016.
- 2015 Biocomputation 2015, May 24-29, Rome, Italy, 2015.
- 2013 3rd IEEE International Conference on Computational Advances in Bio and Medical Sciences (ICCABS) 2013, New Orleans, Louisiana, USA.
- 2012 2nd IEEE International Conference on Computational Advances in Bio and Medical Sciences (ICCABS) 2012, Las Vegas, Nevada, USA

- **Referee for journals and proceedings**

- Chronobiology International
- Computational and Mathematical Methods in Medicine
- Computational Statistics & Data Analysis
- IEEE ICCABS 2012 and 2013 Proceedings
- IET Systems Biology
- Journal of Computational and Applied Mathematics
- Journal of Mathematical Biosciences
- Journal of Mathematical Imaging and Vision
- Journal of Theoretical Biology
- Mathematical Bioscience
- Optimization and Engineering Journal

SIAM Journal of Scientific Computing  
SIAM Journal of Matrix Analysis and Applications  
SIAM Journal on Uncertainty Quantification  
IEEE Decision and Control  
BIT Numerical Mathematics  
Numerische Mathematik

● Referee for presentations

- 2016,2017 Poster and presentation judge at Virginia Tech's Graduate Research Symposium  
2011 Poster judge at Louis Stokes Alliance for Minority Participation (LSAMP) Summer Research Academy (SRA) conference at University of Texas at Arlington

● University service

- 2018–present Senior Fellow of the Honor Residential College at Virginia Tech  
November 2018 Presentation on *From Democracy to Dictatorship: German's path in the early 1930s*  
2012–present Graduate Certificate in International Research Committee (OIREC)

● College service

- 2012–present Development of the Computational Modeling and Data Analytics (CMDA) major, established in 2016. I am a member of the early group designing this new successful degree program, with about 500 majors.

● Departmental service

- November 2018 Presentation on *Ethical Considerations in Mathematical Modeling and Data Analytics*  
2018–present Instructor personal committee  
2018–present Graduate program committee  
2015–present Mathematical Biology Prelim committee  
2015–present Departmental teaching evaluation  
2013–present ACM Undergraduate advising  
2014–2018 Colloquium committee (chair)  
2014–2015 Matrix computation seminar (chair)  
2012–2013 Inverse problem seminar (chair)  
2012–2014 Colloquium committee

● Search committees

- 2018–2019 Search committee for tenure track faculty position in Computational Modeling and Data Analytics (CMDA) in the Department of Statistics  
2015 Search committee for tenure track faculty position in Mathematical Biology in the Department of Mathematics  
2015 Search committee for two tenure track faculty position in Computational Modeling and Data Analytics (CMDA) in the Department of Statistics  
2014 Search committee for an instructor position in Computational Modeling and Data Analytics (CMDA) in the Department of Statistics

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## Teaching

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- **At Virginia Tech**

Computational Modeling and Data Analytics (CMDA) is a new successful major developed in 2012 and established in 2016 at Virginia Tech in the intersection of Mathematics, Statistics, and Computer Science with an emphasis on real world applications. Currently the major has about 500 students. I am a founding member of this degree program. I am involved in designing the major and courses and recruiting students to this program. I developed new courses, especially CMDA 3605, a interdisciplinary mathematical modeling class and co-developed the introductory sequence CMDA 2005/2006.

Spring 2019 MATH 2406: *Mathematics in a Computational context*

Fall 2018 MATH 5465: *Numerical Analysis*

Spring 2018 MATH 2406: *Mathematics in a Computational context*

Fall 2017 CMDA 3605: *Mathematical Modeling*

Spring 2017 MATH 2406: *Mathematics in a Computational context*

Fall 2016 CMDA 3605: *Mathematical Modeling*

Spring 2016 MATH 2406: *Mathematics in a Computational context*

Fall 2015 CMDA 3605: *Mathematical Modeling*

Spring 2015 MATH 2984: *Mathematics in a Computational context*

Fall 2014 CMDA 3605: *Mathematical Modeling*

Fall 2013 MATH 5415: *Numerical Optimization*

Fall 2013 CMDA 3605: *Mathematical Modeling*

Spring 2013 MATH 5516: *Mathematical Biology*

Fall 2012 MATH 4445: *Numerical Analysis*

- **At Texas State University**

2012 MATH 3373: *Calculus III*

2012 MATH 3323: *Differential Equations*

2011 MATH 4336: *Numerical analysis*

2011 MATH 3323: *Differential Equations*

2011 MATH 4663: *Undergraduate Research in Optimization (seminar course)*

Spring 2011 MATH 5360 *Special Topics in Mathematical Modeling*

Fall 2010 MATH 3323: *Differential Equations (two sections)*

- **At the University of Lübeck**

Despite my pure research assignment, I volunteer to teach and mentor students at the University of Lübeck. My teaching spanned from holding seminars, teaching classes, and supervising term, bachelor, and master theses.

2006/2007 *Special Topics in Numerical Optimization, seminar*

2004 *Dynamics in Biology and Medicine, seminar*

2003/2004 *Numerical Analysis I, lecture, teaching assistant*

2003 *Numerical Analysis II, lecture, teaching assistant*

- 2002/2003 *Numerical Analysis I, lecture, teaching assistant*
- 2001 *Calculus II, lecture, teaching assistant*
- 2000/2001 *Linear Algebra I, lecture, teaching assistant*
- 1999 *Numerical Analysis, lecture, teaching assistant*

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## Supervised students

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- **Ph.D. students**

- current Slagel, J., *Big data inverse problems, PhD thesis, joint with J. Chung, expected graduation May 2019*
- July 2017 Krueger, J., *Identifying the dynamics of small and large microbial communities, PhD thesis*
- May 2011 Göbel, B., *Relationship between brain activity and peripheral glucose metabolism - combining experimentally acquired data with mathematical models, Ph.D. thesis, advising*

- **Master students**

- 2019-present Liu, H., *Massive inverse problems, master thesis, expected graduation May 2020*
- 2018-present Cooper, J., *Gaussian processes for model reduction, master thesis, expected graduation May 2020*
- 2018-present Macatula, R., *Gaussian processes for parameter estimation, master thesis, expected graduation May 2019*
- 2017-present Kaperick, B., *Diagonal estimation, master thesis, expected graduation May 2019*
- May 2017 Torrence, R., *Bayesian Parameter Estimation on Three Models of Influenza, master thesis*
- April 2015 Slagel, J., *The Sherman Morrison iteration, master thesis, joint with J. Chung*
- May 2012 Miller, G.F., *Theory and Application of Numerical Analysis to Select Problems in Physics, master thesis*
- April 2008 Olesch, J., *Parameterschätzverfahren: Ein- und Mehrzielansatz, English: Parameter estimation: initial and multi value approach, diploma thesis*

- **Undergraduate research students (last 4 years)**

- 2018-2019 Cooper, J., *Reduced order modeling using Gaussian processes, undergraduate research (CMDA)*
- 2018-2019 Maurais, A., *Atmospheric CO<sub>2</sub> modeling and uncertainty estimation, undergraduate research (CMDA)*  
*Winner of the Layman Prize for best undergraduate research for 2018*
- 2018-2019 Krinos, A., *Atmospheric CO<sub>2</sub> modeling and uncertainty estimation, undergraduate research (CMDA)*  
*Winner of the Layman Prize for best undergraduate research for 2018*
- 2018 Grady, T., *MCMC methods for Bayesian inversion, undergraduate research (CMDA)*
- 2018 Shaw, D., *MCMC methods for Bayesian inversion, undergraduate research*
- 2017 Wang, M., *Parameter estimation in thermal cooling, undergraduate research (CMDA)*
- 2015–2017 Kaperick, B., *Randomized SVD and diagonal estimation, undergraduate research*  
*Winner of the Layman Prize for best undergraduate research for 2017*
- 2016 Nguyen, K., *Least squares finite element methods, undergraduate research*

- 2015–2016 Macatula, R., *Experimental design and parameter estimation, undergraduate research (CMDA)*
- 2015 Winter, W., *Collocation methods, undergraduate research*