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Postdoctoral Researcher
Center for Computational Engineering Science
Department of Mathematics
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Professional Experience

March 2013 to Present: Postdoctoral researcher in the Department of Mathematics at RWTH Aachen University. Advisor: Martin Frank.

October 2015 to February 2016: Interim professor (Vertretungsprofessor) in the Department of Mathematics at RWTH Aachen University.

Education

University of Maryland, College Park

Ph.D: December 2012. Electrical and Computer Engineering.

Thesis: “Optimization Techniques for Entropy-Based Moment Models of Linear Transport.”

Advisors: André Tits and Cory Hauck.

Case Western Reserve University, Cleveland, Ohio

BSE: May 2007, Systems and Control Engineering. GPA 3.8, Magna cum Laude

MS: August 2007, Systems and Control Engineering. GPA 3.8.

Thesis: “PID and Model Predictive Control in a Networked Environment.”

Advisor: Michael S. Branicky.

Journal Publications

- T. Kyriou, G.W. Alldredge, *Robust inversion methods for aerosol spectroscopy*. To appear in Inverse Problems in Science and Engineering.
- T. Pichard, G.W. Alldredge, S. Brull, B. Dubroca, M. Frank, *An approximation of the M_2 closure: application to radiotherapy dose simulation*. To appear in the Journal of Scientific Computing.
- G.W. Alldredge, R. Li, W. Li, *Approximating the M_2 method by the extended quadrature method of moments for radiative transfer in slab geometry*. Kinetic and Related Models, Volume 9–2 June 2016, pp. 237–249.
- F. Schneider, G.W. Alldredge, J. Kall, *A realizability-preserving high-order kinetic scheme using WENO reconstruction for entropy-based moment closures of linear kinetic equations in slab geometry*. Kinetic and Related Models, Volume 9–1 March 2016, pp. 193–215.
- G.W. Alldredge, F. Schneider, *A realizability-preserving discontinuous Galerkin scheme for entropy-based moment closures for linear kinetic equations in one space dimension*. Journal of Computational Physics, Volume 295 August 2015, pp. 665–684.
- F. Schneider, G.W. Alldredge, M. Frank, A. Klar, *Higher-order mixed-moment approximations for the Fokker-Planck equation in one space dimension*. SIAM Journal on Applied Mathematics Volume 74–4 (2014), pp. 1087–1114.

G.W. Alldredge, D.P. O’Leary, C.D. Hauck, and A.L. Tits, *Adaptive change of basis in entropy-based moment closures for linear kinetic equations*. Journal of Computational Physics, Volume 258 February 2014, pp. 489–508.

G.W. Alldredge, C.D. Hauck, and A.L. Tits, *High-order entropy-based closures for linear transport in slab geometry II: A computational study of the optimization problem*, SIAM Journal on Scientific Computing Volume 34–4 (2012), pp. B361–B391.

In Conference Proceedings

T. Pichard, G.W. Alldredge, S. Brull, B. Dubroca and M. Frank, ‘The M_2 model for dose simulation in radiationtherapy.’ To appear in Proc. 24th Int. Conf. on Transport Theory.

G. W. Alldredge, M. S. Branicky, and V. Liberatore, “Play-back buffers in networked control systems: Evaluation and design,” Proc. American Control Conf., 2008, pp. 3106–3113.

Presentations

High-order numerical methods for entropy-based moment closures for linear transport Tikhonov regularization for non-realizable flux evaluations. European Congress on Computational Methods in Applied Sciences and Engineering. 7 June 2016. Hersonissos, Greece.

Realizability limiting for entropy-based moment closures. ECCOMAS Young Investigators Conference. 23 July 2015. Aachen, Germany.

High-order numerical methods for entropy-based moment closures for linear transport: An optimization-based realizability limiter. SIAM Conference on Computational Science and Engineering. 16 March 2015. Salt Lake City, Utah.

High-order numerical methods for entropy-based moment closures for linear transport: An optimization-based realizability limiter. California State University, Northridge. 11 March 2015. Northridge, California.

High-order numerical methods for entropy-based moment closures for linear transport: An optimization-based realizability limiter. Institute for Pure and Applied Mathematics, University of California, Los Angeles. 10 March 2015. Los Angeles, California.

High-order numerical methods for entropy-based moment closures for linear transport: An optimization-based realizability limiter. Lawrence Livermore National Lab. 5 March 2015. Livermore, California.

A discontinuous-Galerkin implementation of the entropy-based moment closure for linear kinetic equations. Young Researchers Workshop: Multiscale phenomena: modeling, analysis and computation. 28 October 2014. Center for Scientific Computation And Mathematical Modeling, College Park, MD.

A discontinuous-Galerkin implementation of the entropy-based moment closure for linear kinetic equations. 22 October 2014. North Carolina State University, Raleigh, NC.

A discontinuous-Galerkin implementation of the entropy-based moment closure for linear kinetic equations. 20 October 2014. Michigan State University, East Lansing, MI.

Advanced optimization techniques for entropy-based closures: Experiments with linear transport in slab geometry. Young Researchers Workshop: Kinetic Descriptions of Multiscale Phenomena. 11 October 2012. Madison, WI.

High-order entropy-based closures for linear transport in slab geometry: a computational study of the optimization problem. International Congress on Industrial and Applied Mathematics. 21 July 2011. Vancouver, BC.

Robust optimization for entropy-based closures. National Control Engineering Students Workshop. 6 April 2011. College Park, MD.

Posters

Optimization-based realizability limiting in high-order methods for entropy-based moment closures of linear kinetic equations. Numerical Approximations of hyperbolic systems with source terms and applications. 16 June 2015. Cortona, Italy.

A high-order kinetic scheme using WENO reconstruction for entropy-based moment closures of linear kinetic equations. SIAM Conference on Computational Science and Engineering. 15 March 2015. Salt Lake City, Utah.

High-order mixed-moment closures for the Fokker-Planck equation Numerical Approximations of Hyperbolic Systems with Source Terms and Applications. 25 September 2013. Aachen, Germany.

Advanced optimization techniques for entropy-based closures in slab geometry. SIAM Annual Meeting. 10 July 2012. Minneapolis, MN.

Advanced optimization techniques for entropy-based moment closures. Department of Energy Applied Mathematics Program Meeting. 18 October 2011. Reston, VA.

Robust optimization for entropy-based closures. University of Maryland Graduate Research Interaction Day. 30 April 2011. College Park, MD

Student Projects Advised

At RWTH-Aachen:

Integrable partial-moment minimum-entropy models for linear transport. Gregor Corbin of RWTH Aachen University. Master's Thesis, Winter Semester 2015-16.

Monte Carlo integration methods for nonnegative Bayesian inversion methods in Mie theory. Juan Diego Cárdenas Cartagena of Escuela de Ingeniería de Antioquia. Internship, Spring 2015.

Optimization techniques for the moment-constrained entropy minimization problem on the sphere. Aleksii Porokka of Aalto University. Bachelor's Thesis, Spring 2014.

Linear methods for Mie inversion theory. Anuj Tyagi of IIT Madras. Master's Thesis, Winter Term 2013.

Simplifying kinetic simulations by optimization methods. Clément Alou of ENSEIRB-MATMECA, Bordeaux Institute of Technology. Internship, Summer 2013.

Teaching Experience

RWTH Winter 2015-16 Instructor for Mathematische Grundlagen I and III (first- and third-semester fundamental math courses for students in the Computational Engineering Science B.Sc. program). Summer 2014, 2015, 2016 Instructor for Introduction to Transport Theory. Summer 2013 Teaching Assistant for Introduction to Transport Theory.

UMCP Spring 2010 Co-Instructor for Engineering Probability and Graduate Teaching Fellow for Optimal Control. Fall 2007 through Spring 2009 Teaching Assistant for Signal and System Theory, Basic Circuit Theory, and Engineering Probability.

CWRU Fall 2004, Fall 2005 Introductory Circuits Lab Teaching Assistant.

Professional Service

Co-organized (with Stephan Martin) the minisymposium entitled “Computational Methods for Kinetic Equations and Related Models” at the Third ECCOMAS Young Investigators Conference at RWTH Aachen University, 23–24 July, 2015.

Served as a reviewer for the *Journal of Computational Physics, Kinetic and Related Models, Journal of Physics A: Mathematical and Theoretical, and Optimization and Engineering.*

Awards Received

2010 - UMCP ECE Teaching Assistant Training and Development Fellow

2009 - UMCP Clark School of Engineering Future Faculty Fellowship

2008 - Distinguished Teaching Assistant at UMCP

2007 - UMCP Clark School of Engineering Graduate Fellowship

2006 - NiuNui Ji Fellowship for BS/MS students in Systems Engineering at CWRU

2004 - Alden Scholarship for Systems Engineering students at CWRU

Professional Internships

Intelligent Automation Rockville, Maryland Summer 2008

Development and implementation of a decentralized path-planning algorithm for multiple robot navigation.

ABB Cleveland, Ohio Spring/Summer 2005

Software analysis tools evaluation for dynamic analysis, static analysis.

Bendix Commercial Vehicle Systems Cleveland, Ohio Summer 2004

Anti-lock braking system testing and hardware-in-the-loop simulation.

Language Skills

English (native speaker), German (excellent command, spoken and written (Common European Framework C1))