

ANNA LISCHKE

Division of Applied Mathematics, Brown University

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EDUCATION

Brown University

Ph.D., Applied Mathematics, Advisor: Johnny Guzmán, Ph.D.

Master of Science, Applied Mathematics

Providence, RI

Expected Dec 2019

2018

Iowa State University

Master of Science, Applied Mathematics, Advisor: James Rossmanith, Ph.D.

Ames, IA

2015

Washburn University

Bachelor of Science, Mathematics

Summa Cum Laude, Mathematics & Statistics Department Honors

Topeka, KS

2012

RESEARCH EXPERIENCE

Brown University

Ph.D. Thesis

Providence, RI

2015 - Present

Finite Element Exterior Calculus

- Formulating C^1 and Stokes finite elements using the calculus of differential forms and constructing global de Rham complexes in arbitrary dimensions.

Numerical Methods for Fractional Differential Equations

- Developed spectral methods of quasi-optimal complexity and exponential convergence for nonlocal fractional differential equations [Lischke, Zayernouri, & Karniadakis, 2017].
- Constructed and analyzed finite difference methods with physically consistent reflecting boundary conditions for nonlocal diffusion problems [Lischke, Kelly, & Meerschaert, submitted 2018].
- Investigated and reviewed numerical methods, stochastic interpretations, and regularity properties for different fractional Laplacian definitions [Lischke, Pang, Gulian, et al., under review].

Iowa State University

Masters Thesis

Ames, IA

2013 - 2014

Asymptotic preserving space-time discontinuous Galerkin methods for a class of relaxation systems

- Designed a discontinuous Galerkin method for singularly perturbed hyperbolic conservation laws.

Washburn University

Undergraduate Research, Advised by Brian Thomas, Ph.D.

Topeka, KS

2010 - 2011

Modeling the Distribution of Phytoplankton in Water

- Implemented a model of phytoplankton concentration in water as part of a broader effort to analyze gamma ray burst effects on ecological systems.

SKILLS

Programming Experience

MATLAB, C++, Python, R, SAS, SPSS

Selected Coursework

Parallel Computing on Heterogeneous Systems, Scientific Programming in C++, Finite Element Methods, Spectral Methods, Partial Differential Equations, Probability Theory

PUBLICATIONS

J. Guzmán, **A. Lischke**, and M. Neilan, "Exact sequences on Powell-Sabin splits." (2019). *Submitted*.

A. Lischke, M. Zayernouri, Z. Zhang, "Spectral and Spectral Element Methods". Chapter 2.2 in *Handbook of Fractional Calculus with Applications. Volume 3: Numerical Methods*, DeGruyter, 2019.

A. Lischke, J. F. Kelly, M. M. Meerschaert. "Reflecting boundary conditions for tempered fractional diffusion." (2018). *Submitted*.

A. Lischke, G. Pang, M. Gulian, F. Song, C. Glusa, X. Zheng, Z. Mao, W. Cai, M. M. Meerschaert, M. Ainsworth, G. E. Karniadakis. "What Is the Fractional Laplacian?" (2018). *Under review*.

A. Lischke, M. Zayernouri, and G. E. Karniadakis, "A Petrov-Galerkin spectral method of linear complexity for fractional multiterm ODEs on the half line." *SIAM J. on Sci. Comput.*, 39(3), 2017.

LEADERSHIP & COMMUNITY ENGAGEMENT ACTIVITIES

Fractional PDE research seminar at Brown University

Aug 2015 - Aug 2018

Chairperson

- Coordinated and presented research talks during a two-hour weekly seminar about recent advances in fractional PDEs.
- Managed a research project leading to a paper co-authored by eleven of the group members.

Association for Women in Mathematics Student Chapter

Aug 2017 - Aug 2018

Chapter President

Organized professional development and social events, a weekly reading group, educational talks, a regional conference, and informal mentoring events promoting underrepresented perspectives in mathematics and providing mentoring and learning experiences for students in STEM fields.

WINRS mathematics conference at Brown University

March 2017

Conference Organizer

- Planned an NSF-funded mathematics conference at Brown for New England-area universities.
- This conference won the national Association for Women in Mathematics award for Scientific Excellence.

Brown University SIAM Student Chapter

2016 - 2018

Executive Committee Member

Organized professional development and social events for students in STEM departments as a member of the student chapter executive committee.

HONORS & AWARDS

- Association for Women in Mathematics Award for Scientific Excellence 2017
- Diane Brandt Women in STEM Scholarship, Iowa State University 2012
- Summa Cum Laude, Washburn University 2012
- Mathematics & Statistics Department Honors, Washburn University 2012
- Laura Greene Scholarship for exceptional students in Mathematics, Washburn University 2010-2012
- Presidential Scholarship, Washburn University 2007-2012
- Phi Kappa Phi Honors Society 2011
- Young Artist Award, Washburn University Orchestra 2010
- American Pen Women Association Music Scholarship Recipient, Topeka, KS Chapter 2010
- Kappa Mu Epsilon Honors Society 2009
- Garvey Scholarship Exam, Top five score, Washburn University 2007

PRESENTATIONS

Invited Talks

- SIAM Conference on Computational Science and Engineering** Feb 2019
Boundary Conditions for Tempered Fractional Diffusion, in Theoretical and Computational Aspects in Nonlocal and Material Science Modeling, Spokane, WA
- International Conference on Spectral and High Order Methods** July 2018
What is the fractional Laplacian? in MS41 Fractional Partial Differential Equations: Theory, Numerics, and Applications, London, UK
- SIAM Annual Meeting** July 2017
Generalized Petrov-Galerkin schemes of linear complexity for distributed order initial value problems, in MS34 Fractional Partial Differential Equations: Modeling, Simulation, Application, and Analysis, Pittsburgh, PA
- American Institute of Mathematical Sciences** July 2016
Efficient and tunably accurate spectral methods for fractional differential equations on the half line, in SS105 Recent Advances in Computational PDEs and their Applications, Orlando, FL
- International Conference on Spectral and High Order Methods** June 2016
Efficient and tunably accurate Laguerre Petrov-Galerkin spectral methods for fractional differential equations on the half line, Rio de Janeiro, Brazil

Contributed Talks

- SIAM Conference on Computational Science and Engineering** March 2015
Asymptotic-preserving space-time discontinuous Galerkin methods for a class of relaxation systems, Salt Lake City, UT
- SIAM Annual Meeting** July 2014
Asymptotic-preserving space-time discontinuous Galerkin methods for a class of relaxation systems, Chicago, IL
- Iowa State University** April 2014
Asymptotic-preserving semi-Lagrangian discontinuous Galerkin methods for a class of relaxation systems, Graduate Student Research Conference, Ames, IA

Poster Presentations

- Institute for Computational and Experimental Research in Mathematics** June 2018
What is the fractional Laplacian? Workshop on "Fractional PDEs: Theory, Algorithms and Applications", Providence, RI
- MANNA: Modeling, Analysis and Numerics for Nonlocal Applications** Dec 2017
What is the fractional Laplacian? Santa Fe, NM
- Michigan State University** Oct 2016
A tunably-accurate spectral method with linear complexity for multi-term fractional differential equations on the half line, "A Workshop on Future Directions in Fractional Calculus Research and Applications", East Lansing, MI

MEETINGS ORGANIZED

- Co-organizer of "Fractional PDEs: Theory, Algorithms, and Applications", ICERM, Providence, RI June 2018
- Co-organizer of "MANNA: Modeling, Analysis and Numerics for Nonlocal Applications", Santa Fe, NM Dec 2017
- Co-organizer of "Women's Intellectual Network Research Symposium: Pan-New England Conference", Brown University, Providence, RI March 2017

WORKSHOPS & SUMMER SCHOOLS ATTENDED

- Workshop on Fractional PDEs: Theory, Algorithms and Applications ICERM, Providence, RI June 2018
- Workshop on Future Directions in Fractional Calculus Research and Applications Michigan State University, East Lansing, MI Oct 2016
- Brown-ICERM-Kobe Summer Simulation School Brown University, Providence, RI and Kobe University, Kobe, Japan. Aug 2016

STATISTICS & FINANCE EXPERIENCE

Valuation Actuarial Intern Dec 2011 - Aug 2012
Security Benefit Life Insurance Topeka, KS
Modeled annuity products for reserve calculations and compiled a presentation for state regulators.

Joint Program in Survey Methodology Junior Fellow May 2011 - Aug 2011
National Center for Health Statistics Hyattsville, MD
· Debugged SAS-based software used for federal public-facing vital statistics data sets.
· Validated statistical and interpretive content of federal infant mortality reports.

TEACHING

Experience

- Introduction to Real Analysis, Teaching Assistant, Iowa State University Summer 2014
- Introduction to Real Analysis, Teaching Assistant, Iowa State University Summer 2013
- Calculus II, Teaching Assistant, Iowa State University Spring 2013
- Calculus I, Teaching Assistant, Iowa State University Fall 2012

Pedagogical Training

- Sheridan Center Certificate I: Reflective Teaching, Brown University Fall 2017
Introductory seminar which highlighted inclusive teaching practices, student engagement, and principles of learning design.

PROFESSIONAL ORGANIZATIONS

- American Mathematical Society 2016 - Present
- Association for Women in Mathematics 2015 - Present
- Society for Industrial and Applied Mathematics 2013 - Present