

# ANNA LISCHKE

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## EDUCATION

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### Brown University

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

*Master of Science, Applied Mathematics*

Providence, RI

Expected 2020

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

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### 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

### Washburn University

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

Topeka, KS

2010 - 2011

Modeling the Distribution of Phytoplankton in Water

## SOFTWARE DEVELOPMENT EXPERIENCE

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### Languages and Developer Tools

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

Jira, Confluence, Perforce, Git

### MathWorks

*Software Development Intern, Core Math Team*

Natick, MA

Summer 2019

Developed randomized algorithms for use in statistics and machine learning applications.

## PUBLICATIONS

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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

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**Fractional PDE research seminar at Brown University**  
*Chairperson*

Aug 2015 - Aug 2018

- 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**  
*Chapter President*

Aug 2017 - Aug 2018

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**  
*Conference Organizer*

March 2017

- 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**  
*Executive Committee Member*

2016 - 2018

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

## HONORS & AWARDS

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- 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

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### 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

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- 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

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- 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

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**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

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### 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

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