

# ANNA LISCHKE

Ph.D. Candidate  
Division of Applied Mathematics  
Brown University



## CONTACT INFORMATION

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## RESEARCH INTERESTS

Development of numerical methods for solving fractional differential equations with applications to complex multi-scale problems arising from physical and biological phenomena, spectral methods for anomalous transport, determining order of fractional models based on available data and parameter sensitivity analysis.

## EDUCATION

### **Brown University** **2015 - Present**

*Degree* Doctor of Philosophy, Applied Mathematics Expected 2019  
*GPA* 3.88  
*Advisor* George Em Karniadakis, [george\\_karniadakis@brown.edu](mailto:george_karniadakis@brown.edu)  
*Thesis Topic* Spectral methods for fractional differential equations  
*Research Group* Chair/organizer of the fractional PDE seminar at Brown University

### **Iowa State University** **2012 - 2014**

*Degree* Master of Science, Applied Mathematics  
*GPA* 3.87  
*Thesis* Asymptotic-preserving semi-Lagrangian discontinuous Galerkin methods for a class of relaxation systems  
*Advisor* James A. Rossmanith, [rossmani@iastate.edu](mailto:rossmani@iastate.edu)  
*Award* Diane Brandt Women in STEM Scholarship

### **Washburn University** **2007 - 2012**

*Degree* Bachelor of Science, Mathematics  
Concentration in Physics and Computer Science  
*GPA* 3.92  
*Honors* Summa Cum Laude  
Mathematics and Statistics Department Honors

## PUBLICATIONS

<i>Title</i>	<b>“Spectral &amp; Spectral Element Methods”</b> , Chapter 2.2 in <i>Handbook of Fractional Calculus with Applications. Volume 3: Numerical Methods</i>
<i>Authors</i>	Anna Lischke, Mohsen Zayernouri, & Zhongqiang Zhang
<i>Publisher</i>	DeGruyter
<i>Title</i>	<b>What is the fractional Laplacian?</b>
<i>Authors</i>	Anna Lischke, Guofei Pang, Mamikon Gulian, Fangying Song, Christian Glusa, Xiaoning Zheng, Zhiping Mao, Wei Cai, Mark M. Meerschaert, Mark Ainsworth, George Em Karniadakis, <i>submitted to J. Comput. Phys.</i>
<i>Journal</i>	<i>arXiv:1801.09767</i>
<i>Title</i>	<b>A Petrov-Galerkin spectral method of linear complexity for fractional multiterm ODEs on the half line</b>
<i>Authors</i>	Anna Lischke, Mohsen Zayernouri, George Em Karniadakis
<i>Journal</i>	<i>SIAM J. Sci. Comput.</i> , Vol. 39, No. 3, pp. A922-A946, 2017
<i>Title</i>	<b>Asymptotic preserving space-time discontinuous Galerkin methods for a class of relaxation systems</b> , <i>Masters Thesis, Iowa State Univ.</i>
<i>Author</i>	Anna Lischke, <i>prepared under the direction of James Rossmanith, PhD</i>
<i>Publisher</i>	ProQuest Dissertations & Theses Global

## GRADUATE COURSEWORK

**Brown University**

<i>Spring 2017</i>	Dynamics and Stochastics
<i>Fall 2016</i>	Scientific Programming in C++ Topics in Markov Processes and Stochastic Analysis
<i>Spring 2016</i>	Partial Differential Equations 2 Introduction to Probability Theory 2 Numerical PDE 2: Spectral Methods
<i>Fall 2015</i>	Partial Differential Equations 1 Introduction to Probability Theory 1 Lévy Processes Fluid Dynamics
<i>Spring 2015</i>	Domain Decomposition and Multigrid Methods Computational Fluid Dynamics

**Iowa State University**

<i>Fall 2014</i>	Finite Element Methods Partial Differential Equations I
<i>Spring 2014</i>	Numerical Analysis II Finite Difference Methods
<i>Fall 2013</i>	Numerical Analysis I Ordinary Differential Equations and Dynamical Systems
<i>Spring 2013</i>	Applied Mathematics II Real Analysis II

Fall 2012      Applied Mathematics I  
Real Analysis I

#### QUALIFYING EXAMS PASSED

##### Brown University

Spring 2016      Theory of Partial Differential Equations, *Major Exam*  
Numerical Solution of Partial Differential Equations, *Major Exam*  
Theory of Probability, *Minor Exam*  
Fluid Mechanics, *Minor Exam*

##### Iowa State University

Spring 2014      Applied Mathematics (*Topics Include: Sobolev Spaces, Functional Analysis, Calculus of Variations, Distribution Theory, Fourier Analysis, Spectral Theory*)

#### REFEREED FOR JOURNALS

18 reviews      Journal of Computational Physics, *Elsevier*

2 reviews      SeMA Journal (Boletín de la Sociedad Española de Matemática Aplicada),  
*Springer Milan*

2 reviews      Advances in Difference Equations, *Springer International Publishing*

1 review      Calcolo, *Springer Milan*

#### TALKS

##### Graduate

Dec 2017      "What Is the Fractional Laplacian?"  
*Invited Poster Presentation, MANNA: Modeling, Analysis and Numerics for Nonlocal Applications, Santa Fe, NM*

July 2017      "Generalized Petrov-Galerkin Schemes of Linear Complexity for Distributed Order Initial Value Problems"  
*Invited Presentation, SIAM Annual Meeting, Pittsburgh, PA*

Feb 2017      "A Tunably-Accurate Spectral Method with Linear Complexity for Multi-Term Fractional Differential Equations on the Half Line"  
*Contributed Poster Presentation, SIAM CSE, Atlanta, GA*

Oct 2016      "A Tunably-Accurate Spectral Method with Linear Complexity for Multi-Term Fractional Differential Equations on the Half Line"  
*Invited Poster Presentation, A Workshop on Future Directions in Fractional Calculus Research and Applications, MSU*

July 2016      "Spectral methods for fractional differential equations on the half line with tunable accuracy"  
*The 2016 SIAM Annual Meeting, Boston, MA*

July 2016      "Efficient and tunably accurate spectral methods for fractional differential equations on the half line"  
*Invited talk, Minisymposium on "Recent Advances in Computational PDEs and their Applications"*  
AIMS 2016, Orlando, FL

<i>June 2016</i>	<p>“Efficient and tunably accurate Laguerre Petrov-Galerkin spectral methods for fractional differential equations on the half line”</p> <p><i>Invited talk, Minisymposium on “New Trends in Computational Methods for Fractional PDEs: Theory, Numerics, and Applications”</i></p> <p>ICOSAHOM 2016, Rio de Janeiro, Brazil</p>
<i>March 2015</i>	<p>‘Asymptotic-preserving space-time discontinuous Galerkin methods for a class of relaxation systems”</p> <p>SIAM Conference on Computational Science and Engineering</p>
<i>July 2014</i>	<p>“Asymptotic-preserving semi-Lagrangian discontinuous Galerkin methods for a class of relaxation systems”</p> <p>The 2014 SIAM Annual Meeting, Chicago, IL</p>
<i>April 2014</i>	<p>“Asymptotic-preserving semi-Lagrangian discontinuous Galerkin methods for a class of relaxation systems”</p> <p>Iowa State University Graduate Student Research Conference</p>

#### MEETINGS AND WORKSHOPS ATTENDED

<i>Dec 2017</i>	MANNA: Modeling, Analysis and Numerics for Nonlocal Applications Santa Fe, NM
<i>July 2017</i>	Society for Industrial and Applied Mathematics Annual Meeting
<i>March 2017</i>	WINRS New England: A Meeting of Mathematical Minds
<i>Feb 2017</i>	Society for Industrial and Applied Mathematics Conference on Computational Science and Engineering
<i>Oct 2016</i>	A Workshop on Future Directions in Fractional Calculus Research and Applications <i>Michigan State University</i>
<i>July 2016</i>	The 2016 SIAM Annual Meeting, Boston, MA
<i>July 2016</i>	The 11th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Orlando, FL
<i>June 2016</i>	ICOSAHOM 2016, Rio de Janeiro, Brazil
<i>March 2015</i>	SIAM Conference on Scientific Computing and Engineering Session Chair, “Numerical Methods for PDE I”
<i>July 2014</i>	The 2014 SIAM Annual Meeting, Chicago, IL Session Chair, “Numerical Methods for PDE IV”
<i>April 2014</i>	ISU Graduate and Professional Student Research Conference
<i>April 2013</i>	2013 AMS Spring Central Section Meeting
<i>March 2013</i>	Career Options for Women in Mathematical Sciences Workshop Institute for Mathematics and its Applications
<i>May 2012</i>	2012 Program for Women and Mathematics Institute for Advanced Study, Princeton, NJ

#### PROFESSIONAL SOCIETIES

<i>2015 - present</i>	Rose Whelan Society, Brown University
<i>2013 - present</i>	Society for Industrial and Applied Mathematics (SIAM)

2012 - present Association for Women in Mathematics (AWM)

2012 - present American Mathematical Society (AMS)

#### TEACHING EXPERIENCE

Summer 2014 Introduction to Real Analysis - Grader with teaching responsibilities

Spring 2014 & Fall 2013 Mathematics Computer Lab Coordinator - Administrative position

Summer 2013 Introduction to Real Analysis - Grader

Spring 2013 Calculus II

Fall 2012 Calculus I

#### SERVICE EXPERIENCE

Fall 2017-  
Spring 2018 President, Brown University AWM Student Chapter

Fall 2016 Treasurer, AWM Student Chapter  
Technology Officer, SIAM Student Chapter

Fall 2015 Technology and Social Media Outreach Officer, AWM Student Chapter

Fall 2014 Communications Officer, SIAM Student Chapter

#### CONFERENCES ORGANIZED

June 2018 Local Co-organizer of Fractional PDEs: Theory, Algorithms, and Applications, ICERM, Providence, RI

Fall 2017 Local Co-organizer of MANNA: Modeling, Analysis and Numerics for Nonlocal Applications, Santa Fe, NM

Spring 2017 Co-organizer of Women's Intellectual Network Research Symposium  
Pan-New England Conference, Brown University, Providence, RI  
*This conference won the AWM Student Chapter award for Scientific Excellence*

#### INTERNSHIPS

Dec 2011 - Valuation Actuarial Intern

August 2012 Security Benefit Life Insurance, Topeka, KS

May 2011 - Joint Program in Survey Methodology Junior Fellow

August 2011 National Center for Health Statistics & UMD, College Park

#### CREATIVE ACTIVITIES AND AWARDS

Fall 2013 &  
Fall 2014 Iowa State University Orchestra member, Principal Horn

Fall 2008 - Washburn University Orchestra member, Principal Horn  
Spring 2011 2010 Young Artist Award recipient

Fall 2007 - Washburn University Wind Ensemble member, Principal Horn  
Spring 2011 Kennedy Center Performing Artist, Washington, D.C.

Spring 2010 National Intercollegiate Band, First Horn

## Collegiate Band Directors National Association, Seattle, WA

<i>Spring 2010</i>	American Pen Women Association Music Scholarship Recipient
<i>Spring 2009</i>	KANSAS Band <i>Know Place Like Home</i> DVD performance and recording artist
<i>Spring 2009 &amp; Spring 08</i>	Kansas Intercollegiate Band, First Horn Kansas Music Educators Association Convention