

# Debdeep Bhattacharya

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CONTACT INFORMATION	Department of Mathematics Louisiana State University 303 Lockett Hall Baton Rouge, LA 70803-4918	Email: <a href="mailto:debdeepbh@lsu.edu">debdeepbh@lsu.edu</a> Website: <a href="http://debdeepbh.github.io">http://debdeepbh.github.io</a>
RESEARCH INTERESTS	Analysis of partial differential equations, especially nonlocal and nonlinear dispersive equations; application to continuum mechanics, peridynamics and granular media using high-performance computing; signal processing	
EMPLOYMENT	<b>Louisiana State University</b> Postdoctoral Researcher, May 2020 - present <b>Host:</b> Prof. Robert Lipton	
EDUCATION	<b>The George Washington University</b> Ph.D. in Mathematics, May 2020 <b>Advisor:</b> Prof. Frank Baginski <b>Thesis title:</b> Harmonic Analysis Techniques in Nonlinear Dispersive Equations and Signal Processing  <b>Tata Institute of Fundamental Research Centre for Applicable Mathematics, Bengaluru, India</b> Master of Science (MSc) in Mathematics, May 2014  <b>Indian Statistical Institute, Bengaluru, India</b> Bachelor in Mathematics, May 2012	
SUMMER RESEARCH EXPERIENCE	<b>Oak Ridge National Laboratory</b> Mathematical Sciences Graduate Internship (MSGI), National Science Foundation (NSF), Summer 2019 <b>Supervisor:</b> Dr. Pablo Seleson  <b>University of Hawai'i at Manoa</b> Visiting Scholar, Summer 2018 <b>Supervisor:</b> Prof. Peter Gorham	
PUBLICATIONS	<ol style="list-style-type: none"><li><b>Mass concentration of <math>H^s</math> blowup solution to 2D modified Zakharov-Kuznetsov equation</b> Debdeep Bhattacharya. Partial Differential Equations and Applications doi:0.1007/s42985-021-00139-y arXiv: 2007.15773</li><li><b>Peridynamics-based discrete element method (PeriDEM) model of granular systems involving breakage of arbitrarily shaped particles.</b> Prashant K Jha, Prathamesh S Desai, Debdeep Bhattacharya, Robert P Lipton. Journal of the Mechanics and Physics of Solids, 2020. doi:10.1016/j.nonrwa.2021.103331 arXiv:2010.07218</li><li><b>Simulating grain shape effects and damage in granular media using PeriDEM.</b> Debdeep Bhattacharya, Robert P. Lipton. (Submitted) arXiv:2108.07212</li></ol>	

4. **Peridynamics for Quasistatic Fracture Modeling.** Debdeep Bhattacharya, Patrick Diehl, Robert P. Lipton. (Submitted) arXiv:2107.14665
5. **Unusual Near-Horizon Cosmic-Ray-like Events Observed by ANITA-IV.** P. W. Gorham et al. Physical Review Letters, 2021. doi:10.1103/PhysRevLett.126.071103 arXiv:2008.05690
6. **Global well-posedness of the mZK equation in 2 dimensions for low-regularity data.** Debdeep Bhattacharya, Luiz Gustavo Farah, and Svetlana Roudenko. Journal of Differential Equations, 2019. doi:10.1016/j.jde.2019.11.092 (arXiv: 1906.05822)
7. **Reduction of three-dimensional axisymmetric problems to two dimensions in Peridynamics** with Pablo Seleson and Jeremy Trageser (In preparation)
8. **Nonlocal fracture modeling with quasistatic loading** with Robert Lipton (In preparation)

#### OTHER WRITINGS

1. **Harmonic Analysis Techniques in Nonlinear Dispersive Equations and Signal Processing.** Ph.D Dissertation, May 2020. ProQuest: 27831360
2. **Deconvolution problem and application to ANITA signals,** Report, submitted to ANITA collaboration at University of Hawai'i at Manoa (link)
3. **Reduction of three-dimensional axisymmetric problems to two dimensions in Peridynamics,** submitted to the NSF as part of MSGI program (link)

#### HONORS AND ACHIEVEMENTS

- Dean's Graduate Conference Travel Grant, The George Washington University, 2017
- Columbian College of Arts of Sciences Fellowship, The George Washington University, 2015 – present
- Junior Research Fellowship from Tata Institute of Fundamental Research, India, 2012–2014
- INSPIRE Scholarship from Department of Science and Technology, Government of India, 2010–2012
- Student Fellowship from Indian Statistical Institute, 2009–2012
- Secured an all-India rank 31 in National Eligibility Test (NET) jointly conducted by Council of Scientific and Industrial Research and University Grant Commission, Government of India, 2013

#### INVITED TALKS

- International Mechanical Engineering Congress and Exposition (IMECE2021), November 3, 2021 (Virtual)
- Applied Math Seminar, George Washington University, October 1, 2021, Washington, D.C., USA
- 16th U.S. National Congress on Computational Mechanics (USCNCM16), July 25, 2021, Chicago, USA (Virtual)
- ALOP Workshop on Nonlocal Models, July 13, 2021, Universität Trier, Germany (Virtual)
- MURI seminar series, March 16, 2020 (Virtual)
- The 3rd Annual Meeting of the SIAM Texas-Louisiana Section, October 16–18, 2020, College Station, TX, USA (Virtual)
- MURI seminar, September 9, 2020 (Virtual)
- 13th AIMS Conference on Dynamical Systems, Differential Equations and Applications, June 5–9, 2020, Atlanta, USA
- Computational and Applied Math (CAM) seminar, Computer Science and Mathematics Division, Oak Ridge National Laboratory, August 8, 2019

	<ul style="list-style-type: none"> <li>• RIT in Applied Harmonic Analysis, Norbert Weiner Center, University of Maryland, May 13, 2019</li> <li>• Spring 2019 conference on Applied Mathematics, George Washington University, May 4, 2019</li> <li>• Antarctic Impulse Transient Anetann (ANITA) collaboration, December 10, 2018</li> <li>• University of Hawai'i at Manoa, June 28, 2018</li> <li>• Graduate Student Seminar, The George Washington University, October 27, 2017</li> </ul>
POSTER PRESENTATIONS	<ul style="list-style-type: none"> <li>• <i>Fracture modeling in axisymmetric problems using peridynamics</i>, Workshop on Experimental and Computational Fracture Mechanics: Validating peridynamics and phase field models for fracture prediction and experimental design, February 26-28, 2020</li> <li>• <i>Fracture modeling in axisymmetric problems using peridynamics</i>, Oak Ridge Postdoctoral Association (ORPA) Research Symposium, Oak Ridge National Laboratory, August 6, 2019</li> <li>• <i>Global Well-posedness of 2d Modified Zakharov-Kuznetsov Equation for Low-regularity Data</i>, 2019 Workshop on Nonlinear Dispersive Partial Differential Equations and Inverse Scattering, The Fields Institute, Toronto, Canada, May 21 - 24, 2019</li> <li>• <i>Global Well-posedness of 2d Modified Zakharov-Kuznetsov Equation for Low-regularity Data</i>, GW Research Days, George Washington University, April 9, 2019</li> </ul>
TEACHING EXPERIENCE	<p><b>Instructor</b></p> <ul style="list-style-type: none"> <li>• Summer 2017: Linear Algebra I</li> <li>• Summer 2016: Calculus with Pre-calculus I</li> </ul> <p><b>Teaching Assistant</b></p> <ul style="list-style-type: none"> <li>• 2015 - 2020: Calculus I, II, III, Calculus with Pre-calculus, Calculus for the Social and Management Sciences, Partial Differential Equations</li> </ul>
PROGRAMMING EXPERIENCE	<ul style="list-style-type: none"> <li>• <b>Python</b> (Proficient) Machine learning using <code>scikit-learn</code>, <code>TensorFlow 2.0</code>, <code>Keras</code>, <code>pandas</code> and <code>matplotlib</code>, automated theorem twitting twitter-bot</li> <li>• <b>C++/C</b> (Proficient) Parallelization using <code>openmp</code> and <code>mpi</code>. Signal processing library <code>libWTools</code> using wavelet-based tools</li> <li>• <b>MATLAB</b> (Proficient) Numerical simulations of crack branching using peridynamics, finite difference methods for solving partial differential equations, signal processing using Fourier and wavelet analysis</li> <li>• <b>R</b> (Fluent) Author of package <code>rexpense</code> to generate complex expense reports and statistics in a multi-user setup</li> </ul>
RESPONSIBILITIES	<ul style="list-style-type: none"> <li>• Co-organizer of GWU-SIAM conference on Applied Mathematics, April 29, 2017 with Eric Shehadi and Chong Wang</li> <li>• Vice president of the SIAM chapter at the George Washington University, January 2016 - 2018</li> </ul>
READING PROJECTS	<ul style="list-style-type: none"> <li>• <b>Spring 2015:</b> Algebraic Topology at Indian Statistical Institute, Kolkata, course taught by Prof. Goutam Mukherjee</li> <li>• <b>Summer 2011:</b> Differential Geometry at Indian Institute of Science Education and Research, Mohali, under the guidance of Prof. Kapil Hari Paranjape</li> <li>• <b>Winter 2010:</b> Measure Theory at Indian Statistical Institute, Bangalore with Prof. K. Ramamurthy</li> <li>• <b>Summer 2010:</b> Point Set Topology at Indian Statistical Institute, Kolkata with Prof. S. M. Srivastava</li> </ul>

CONFERENCES AND  
WORKSHOPS  
ATTENDED

- Workshop on *Experimental and Computational Fracture Mechanics: Validating peridynamics and phase field models for fracture prediction and experimental design*, February 26-28, 2020, Baton Rouge, Louisiana, USA
- 2019 Workshop on Nonlinear Dispersive Partial Differential Equations and Inverse Scattering, The Fields Institute, Toronto, Canada, May 21 - 24, 2019
- *February Fourier Talks*, February 21-22, 2019, University of Maryland, USA
- *IAS/PCMI 2018 Summer Graduate School on Harmonic Analysis*, July 1-21, 2018, Park City, Utah, USA
- *February Fourier Talks*, February 15-16, 2018, University of Maryland, USA
- Workshop on *Dispersive Equations, Solitons, and Blow-up*, September 4-8, 2017, Hausdorff Center of Mathematics, Bonn, Germany
- *French-American Conference on Nonlinear Dispersive PDEs*, June 12-16, 2017, Centre International de Rencontres Mathématiques (CIRM), Luminy, Marseille, France
- Research School on *Random Structures in Statistical Mechanics and Mathematical Physics*, March 6 -10, 2017, Centre International de Rencontres Mathématiques (CIRM), Luminy, Marseille, France
- PDE/Analysis Mini School on *Dynamics of the energy critical wave equations* by Thomas Duyckaerts, University of North Carolina, Chapel Hill, 13-15 February, 2017
- PDE/Analysis Mini School on *Random Schrödinger operators: Basic properties, localization, and spectral statistics* by Peter Hislop, University of North Carolina, Chapel Hill, 27-28 October 2016
- Workshop on *Getting Started with PDEs*, The Hebrew University, Jerusalem, Israel, September 11 - September 15, 2016
- *Third Chicago Summer School In Analysis*, University of Chicago, June 13 - June 24, 2016
- PIRE-CNA 2016 Summer School on *New Frontiers in Nonlinear Analysis for Materials*, Carnegie Mellon University, Pittsburgh, June 2-10, 2016
- Workshop on *Finite Element Method on Navier Stokes Equations*, Indian Institute of Science, September, 2014
- Compact Course on *Navier Stokes Equations*, Tata Institute of Fundamental Research Centre for Applicable Mathematics (TIFRCAM), Bangaluru, India, June, 2014
- Completed a semester-long course on *Mathematical Modelling* at TIFRCAM, Bangaluru, India, August – December, 2012
- *Advanced Instructional School on Analysis and Geometry*, July, 2013, TIFRCAM, India
- *ATM Workshop on Riemannian Geometry*, 16th-28th July, 2012, TIFRCAM, India.