

# Bharat B. Tripathi, Ph.D. \*

Lecturer (Above the Bar) in Applied Mathematics  
School of Mathematics, Statistics and Applied Mathematics  
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## Summary

Dr. Tripathi's main research interest is in the development of computational models for biomedical problems involving nonlinear-acoustic and nonlinear-shear waves in fluids and solids. He conducts research to bring together physics and scientific computing with statistics. The overarching theme of his research mission is in the amalgamation of these three fields to model the propagation of information and the motion of soft materials in the real world, especially for biomedical applications. He has a diverse academic experience from three world-class institutions in India, France and USA with outstanding achievements including university gold medal. Experienced in developing state-of-the-art approximation methods for solving physical problems spanning various disciplines. Expert in high performance computing across different languages and platforms.

## Work Experience

Year	Employment	Institution
09/2020 - Present	Lecturer (Above the Bar)	School of Mathematics, Statistics and Applied Mathematics, National University of Ireland Galway, Ireland
01/2018 - 08/2020	Research Assistant Professor	Joint Department of Biomedical Engineering, University of North Carolina at Chapel Hill, NC, USA
01/2016 - 12/2017	Postdoctoral Research Associate	Joint Department of Biomedical Engineering, University of North Carolina at Chapel Hill, NC, USA
05/2012 - 09/2012	Project Fellow	Department of Mathematics, Indian Institute of Technology Bombay, Mumbai, India

## Grants & Honors

Year	Award
04/2019 - 07/2022	Adaptive Information Refinement Modeling of Nonlinear Shear Wave Propagation in Biological Tissue NSF#: DMS-1903174 (PI: Mitran) Role: Co-Investigator
04/2018 - 03/2019	Acoustic Radiation Force Impulse (ARFI) Imaging of Cardiac Tissue NIH#: 5R37HL096023 (PI: Trahey) Role: UNC-PI
09/2012 - 08/2015	CEFIPRA-EGIDE (Indo-French) scholarship for a fully funded doctoral program
03/2011	University Gold Medal for securing First rank in B.Sc. (Hons.)
03/2011	Dr. Basudeo Sahani Gold Medal for academic excellence in B.Sc. (Hons.)
03/2011	Smt. Gargi Devi Deodhar Gold Medal for consistent academic performance in B.Sc. (Hons.)

## Education

Year	Degree	Institution
10/2012 - 09/2015	Ph.D. Mech. Engg.	Institute Jean Le Rond D'Alembert, Sorbonne Université (Paris-6), France
08/2010 - 05/2012	M.Sc. Statistics	Indian Institute of Technology Bombay, Mumbai, India
08/2007 - 05/2010	B.Sc. Statistics	Banaras Hindu University, Varanasi, India

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## Professional Activities

**Reviewer:** IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control, IEEE Access, New Journal of Physics, International Journal of Non-Linear Mechanics, Journal of Acoustical Society of America Express Letters, Frontiers in Physics, SIAM Journal of Applied Mathematics

## Refereed Publications

- [6] Sandhya Chandrasekaran, **Bharat B. Tripathi**, David Espíndola, and Gianmarco Pinton. Modeling ultrasound propagation in the moving brain: applications to shear shock waves and traumatic brain injury. *IEEE Trans. Ultras., Ferr. Freq. Cont.*, **68**(1), 201-212, 2021. [↗](#)
- [5] **Bharat B. Tripathi**, David Espindola, and Gianmarco F. Pinton. Modeling and Simulations of Two Dimensional Propagation of Shear Shock Waves in Relaxing Soft Solids, *J. Comput. Phys.*, **395**: 205-222, 2019. [↗](#)
- [4] **Bharat B. Tripathi**, David Espindola, and Gianmarco F. Pinton. Piecewise parabolic method for propagation of shear shock waves in relaxing soft solids: one dimensional case, *Int. J. Numer. Meth. Biomed. Engg.* **35**(5):e3187, 2019. [↗](#)
- [3] **Bharat B. Tripathi**, Sambandam Baskar, François Coulouvrat, and Régis Marchiano. “Numerical observation of secondary Mach stem in weak acoustic shock reflection”, *J. Acoust. Soc. Ameri.-Exp. Lett.*, **144**(2):EL125-EL130, 2018. [↗](#)
- [2] **Bharat B. Tripathi**, Adrian Luca, Sambandam Baskar, François Coulouvrat, and Régis Marchiano. “Element Centered Smooth Artificial Viscosity in Discontinuous Galerkin Method for Propagation of Acoustic Shock Waves on Unstructured Meshes”, *J. Comput. Phys.*, **366**: 298-319, 2018. [↗](#)
- [1] **B. B. Tripathi**, D. Espindola, and G. F. Pinton. Piecewise Parabolic Method for Simulating One-Dimensional Shear Shock Wave Propagation in Tissue-mimicking Phantoms, *Shock Waves*, **27**(6): 879–888, 2017. [↗](#)

## Preprints under review


- [2] Sandhya Chandrasekaran, Francisco Santibanez, **Bharat B. Tripathi**, Ryan DeRuiter, and Gianmarco F. Pinton. In situ ultrasound imaging of shear shock waves in the porcine brain. *arXiv preprint arXiv:2104.11911*, 2021. [↗](#)
- [1] **Bharat B. Tripathi**, Sandhya Chandrasekaran, and Gianmarco Pinton. Super-resolved shear shock focusing in the human head. *arXiv preprint arXiv:2010.03456*, 2020. [↗](#)

## Non-Refereed Publications

- [8] **Bharat Tripathi**, David Espindola, and Gianmarco Pinton. Estimation of viscoelastic properties of tissue with arbitrary power-law attenuation, *Proc. IEEE Int. Ultras. Symp.*, October, 2018. [↗](#)
- [7] **Bharat Tripathi**, Sandhya Chandrasekaran, David Espindola, and Gianmarco Pinton. Shear shock wave focusing in human skull phantom: observations with high-frame rate ultrasound imaging and matched simulations, *Proc. IEEE Int. Ultras. Symp.*, October, 2018. [↗](#)
- [6] Sandhya Chandrasekaran, **Bharat Tripathi**, David Espindola, and Gianmarco Pinton. Subresolution displacements and shear shock wave tracking in the human brain. *Proc. IEEE Int. Ultras. Symp.*, October, 2018. [↗](#)
- [5] **Bharat B. Tripathi** and Gianmarco F. Pinton. Simulation of Shear Shock Waves in the Human Head for Traumatic Brain Injury, *Proc. Mtgs. Acoust.* **34**, 032001, July 2018. [↗](#)
- [4] Bofeng Zhang, Gianmarco Pinton, Yufeng Deng, **Bharat Tripathi**, Kathryn Nightingale. Nonlinear Ultrasound Propagation in Homogeneous and Heterogeneous Media: Factors Affecting the *in situ* Mechanical Index(MI), *Proc. IEEE Int. Ultras. Symp.* September, 2017. [↗](#)
- [3] **Bharat B. Tripathi**, Sambandam Baskar, François Coulouvrat, and Régis Marchiano. Discontinuous Galerkin Method with Gaussian Artificial Viscosity on Graphical Processing Units for Nonlinear Acoustics, *AIP Conf. Proc.* **1685**(1):070015, July, 2015. [↗](#)

- [2] **Bharat B. Tripathi**, Sambandam Baskar, François Coulouvrat, and Régis Marchiano. Numerical Simulation for Propagation of Acoustical Shock Waves in Complex Geometry using Discontinuous Galerkin Method, *Proc. of CFA*, 2014.
- [1] **Bharat B. Tripathi**, Sambandam Baskar, François Coulouvrat, and Régis Marchiano. High Fidelity Solver for Non-linear Acoustics, *Proc. of Acoustics*, 2013.

## Other Publications

- [2] **Bharat B Tripathi**. *Discontinuous Galerkin Method for Propagation of Acoustical Shock Waves in Complex Geometry*, Ph.D. Thesis under the supervision of Dr. Régis Marchiano and Dr. François Coulouvrat from Université Pierre et Marie Curie (Paris VI), Paris, France, 2015. 
- [1] **Bharat B Tripathi**. *Cubic Spline Quasi-Interpolation with Applications*, M.Sc. Dissertation under the supervision of Dr. Sambandam Baskar IIT Bombay, Mumbai, India, 2012.

## Conference Presentations & Posters<sup>1</sup>

- [21] **Bharat B. Tripathi**, Sandhya Chandrasekaran, and Gianmarco F. Pinton. Formation of Shear Shock waves in Human Head Phantom for Traumatic Brain Injury. In *6th Oxford International Neuron and Brain Mechanics Workshop* (April 19-20, 2021), Oxford, UK (Oral).
- [20] **Bharat B. Tripathi**, Sandhya Chandrasekaran, and Gianmarco F. Pinton. Shear Shocks Are Focused in Human Head phantoms: Shear Wave Imaging and Simulations. In *2020 IEEE International Ultrasonics Symposium* (September 7-11, 2020), Las Vegas, USA (Oral).
- [19] Sandhya Chandrasekaran, Francisco Santibanez, **Bharat B. Tripathi**, and Gianmarco F. Pinton. Imaging Shear Shock Waves in the in Situ Porcine Brain. In *2020 IEEE International Ultrasonics Symposium* (September 7-11, 2020), Las Vegas, USA (Poster).
- [18] Sandhya Chandrasekaran, **Bharat Tripathi**, David Espindola, and Gianmarco Pinton. High frame rate ultrasound imaging of shear shock wave focusing in a human head phantom and the in situ porcine brain. In *2019 IEEE International Ultrasonics Symposium* (October 6-9, 2019), Glasgow, Scotland (Oral).
- [17] Sandhya Chandrasekaran, **Bharat Tripathi**, David Espindola, and Gianmarco Pinton. Shear shock wave generation and focusing in the human head. In *24th International Conference on Nonlinear Elasticity in Materials (ICNEM)* (June 24-28, 2019), Krakow, Poland (Oral).
- [16] **Bharat Tripathi**, David Espindola, and Gianmarco Pinton. Estimation of viscoelastic properties of tissue with arbitrary power-law attenuation. In *2018 IEEE International Ultrasonics Symposium* (October 22-25, 2018), Kobe, Japan (Oral).
- [15] **Bharat Tripathi**, Sandhya Chandrasekaran, David Espindola, and Gianmarco Pinton. Shear shock wave focusing in human skull phantom: observations with high-frame rate ultrasound imaging and matched simulations. In *2018 IEEE International Ultrasonics Symposium* (October 22-25, 2018), Kobe, Japan (Poster).
- [14] David Espindola, **Bharat Tripathi**, and Gianmarco Pinton. Measurement of the nonlinear elastic properties of ex vivo porcine brain: applications to traumatic brain injury. In *2018 IEEE International Ultrasonics Symposium* (October 22-25, 2018), Kobe, Japan (Poster).
- [13] Sandhya Chandrasekaran, **Bharat Tripathi**, David Espindola, and Gianmarco Pinton. Subresolution displacements and shear shock wave tracking in the human brain. In *2018 IEEE International Ultrasonics Symposium* (October 22-25, 2018), Kobe, Japan (Poster).
- [12] **Bharat B. Tripathi** and Gianmarco F. Pinton. Simulation of Shear Shock Waves in the Human Head for Traumatic Brain Injury. In *21<sup>st</sup> International Symposium on Nonlinear Acoustics* (July 8-13, 2018), Santa Fe NM, USA (Oral).
- [11] Sandhya Chandrasekaran, **Bharat B. Tripathi**, David Espindola, and Gianmarco F. Pinton. Subresolution displacement in tissue maps in ultrasound imaging simulation. In *43<sup>rd</sup> International Symposium on Ultrasound Imaging and Tissue Characterization* (May 30 – June 1, 2018), Washington DC, USA (Oral).

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<sup>1</sup>Presenting author is underlined

- [10] David Espindola, **Bharat B. Tripathi**, and Gianmarco F. Pinton. Characterization of nonlinear brain elasticity with shear shock waves. In *43<sup>rd</sup> International Symposium on Ultrasound Imaging and Tissue Characterization* (May 30 – June 1, 2018), Washington DC, USA (Oral).
- [9] **Bharat Tripathi**. Piecewise Parabolic Methods for Propagation of Shear Shock Waves in Relaxing soft solids. In *42<sup>nd</sup> SIAM South Eastern Atlantic Sectional Conference* (March 9-11, 2018) Chapel Hill NC, USA (Oral).
- [8] Bofeng Zhang, Gianmarco Pinton, Yufeng Deng, **Bharat Tripathi**, Kathryn Nightingale. Nonlinear Ultrasound Propagation in Homogeneous and Heterogeneous Media: Factors Affecting the *in situ* Mechanical Index(MI). In *2017 IEEE International Ultrasonics Symposium* (September 6-9, 2017), Washington DC, USA (Oral).
- [7] **Bharat B. Tripathi**, David Espindola, and Gianmarco F. Pinton. Piecewise Parabolic Methods for Propagation of Shear Shock Waves in soft solids. In *42<sup>nd</sup> International Symposium on Ultrasound Imaging and Tissue Characterization* (June 5 – 7, 2017), Washington DC, USA (Oral).
- [6] **Bharat B. Tripathi**, David Espindola, and Gianmarco F. Pinton. Piecewise Parabolic Methods for Propagation of Shear Shock Waves. In *Frontiers in Applied and Computational Mathematics* (January 4-6 2017), ICERM, Brown University, Providence, RI, USA (Poster).
- [5] K.R. Campbell, J.P. Mihalik, **B.B. Tripathi**, D. Espindola, and G.F. Pinton. Simulations of recently observed shear shock wave physics amplify local brain acceleration by a factor of 40 in head drop experiments – future implications for concussion. In *5th International Consensus Conference on Concussion in Sport* (October 27 – 28, 2016), Berlin, Germany (Poster).
- [4] R. Marchiano, **B. Tripathi**, F. Coulouvrat and S. Baskar. Simulation of the Propagation of Acoustical Shock Waves with A Discontinuous Galerkin Method. In *Western Pacific Commission for Acoustics* (October 2015), Singapore (Oral).
- [3] **Bharat B. Tripathi**, Sambandam Baskar, François Coulouvrat, and Régis Marchiano. Discontinuous Galerkin Method with Gaussian Artificial Viscosity on Graphical Processing Units for Nonlinear Acoustics. In *20th International Symposium on Nonlinear Acoustics* (29 June - 3 July 2015), Lyon, France (Oral).
- [2] **Bharat B. Tripathi**, Sambandam Baskar, François Coulouvrat, and Régis Marchiano. Numerical Simulation for Propagation of Acoustical Shock Waves in Complex Geometry using Discontinuous Galerkin Method. In *Congrès Français d'Acoustique 2014*, Poitiers, France (Oral).
- [1] **Bharat B. Tripathi**, Sambandam Baskar, François Coulouvrat, and Régis Marchiano. High Fidelity Solver for Non-linear Acoustics. In *Acoustics 2013*, New Delhi, India (Poster).