

## Aniruddha Bora

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| CONTACT<br>INFORMATION | 310D COMAL,<br>Texas State University<br>San Marcos, TX 78666 USA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <i>E-mail(O)</i> : aniruddha_bora@txstate.edu<br><i>E-mail(P)</i> : aniruddhabora@gmail.com<br><i>LinkedIn</i> : <a href="http://www.linkedin.com/in/aniruddha-bora-49b73a80/">www.linkedin.com/in/aniruddha-bora-49b73a80/</a> |
| RESEARCH<br>INTERESTS  | Scientific machine learning, data-driven scientific computing, physics-informed neural networks, numerical analysis, deep learning, mathematical modeling, nanoscale heat conduction, computational fluid dynamics.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                 |
| SKILLS                 | <b>Programming Languages:</b> Python, JAX, PyTorch, FORTRAN, FEniCS, MATLAB, Octave.<br><b>Statistical Packages:</b> R, SAS<br><b>HPC environment:</b> OSCAR (Brown); ALCF — Theta (KNL & GPU nodes), Polaris (HPE Cray EX; AMD EPYC + NVIDIA A100), Aurora (HPE Cray EX; Intel Sapphire Rapids + Intel Data Center GPU Max).<br><b>Scheduler:</b> Slurm, Cobalt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                 |
| WORK<br>EXPERIENCE     | <ul style="list-style-type: none"><li>• Assistant Professor, Department of Computer Science, Texas State University (2025 - currently ongoing)</li><li>• J. Tinsley Oden Faculty Fellow, Oden Institute for Computational Engineering and Sciences, The University of Texas at Austin, Summer 2026.</li><li>• Postdoctoral Research Associate, Department of Applied Mathematics, Brown University (2022-2025)</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                 |
| EDUCATION              | <b>Louisiana Tech University</b> , Louisiana USA      Nov, 2021<br>Ph.D. in Computational Analysis & Modelling<br><br><b>Dissertation Title:</b> <a href="#">Gradient Preserved Method and Neural Network Method for Solving Heat Conduction Equation with Variable Thermal Conductivity in Double Layered Structures.</a><br><b>Advisor:</b> Prof. Weizhong Dai <ul style="list-style-type: none"><li>• Developed artificial neural network method for solving the parabolic two temperature microscale heat conduction in double-layer thin films exposed to ultrashort-pulsed lasers.</li><li>• Developed numerical method for solving heat conduction with variable thermal conductivity in multi layer structure and application to parabolic two step heat equation to predict electron and lattice temperature when metal layers with interfaces are exposed to ultrashort-pulsed laser heating. The method has been proven to be unconditionally stable and applied to the Parabolic Two Temperature Model for gold coated mirrors.</li></ul><br><b>South Asian University</b> , New Delhi, INDIA<br>M.S., Applied Mathematics, May, 2015 <ul style="list-style-type: none"><li>• <i>Thesis:</i> Finite Difference Method of Order Two in Time and Four in Space for the Solution of Non-Linear Parabolic Equation. <b>Advisor:</b> Prof. Ranjan K. Mohanty</li><li>• <i>Project :</i> Computational fluid dynamics project for lid driven cavity using vorticity stream function formulation.</li></ul> |                                                                                                                                                                                                                                 |

TEACHING  
EXPERIENCE

**Cotton College**, Guwahati, Assam, INDIA

B.Sc., Mathematics, May, 2013

**Texas State University**, San Marcos, Texas, USA

*CS4379G: Data Analysis & Visualization*

*CS5325: Reinforcement Learning*

**Spring 2026**

**Fall 2025**

**Brown University**, Providence, Rhode Island, USA

*Teaching Assistant- Deep Learning for Scientists & Engineers*

**November 2021 - June 2025**

(Funded by NVIDIA, a unique course from basic deep learning techniques to recently published research papers)

Duties: Testing various optimization algorithms for benchmark in optimization, Analyzing mathematical formulations and proofs, and Preparing course contents from research papers and textbooks.

**The Sheridan Teaching Seminar**, Providence, Rhode Island, USA

*Reflective Teaching (Certificate I)*

**September 2022 - December 2022**

**Brown University**, Providence, Rhode Island, USA

*Internship mentor*

**June 2022 - July 2023**

Mentored Sotos Lois a student from Imperial College London. Guided him with training him in the mathematical basics required for scientific machine learning and guided him to work on mathematical finance using physics-informed neural networks and operator-based learning.

**Brown University**, Providence, Rhode Island, USA

*SPRINT UTRA scholarship application reviewer*

**October 2023**

**Brown University**, Providence, Rhode Island, USA

*Applied Mathematics - Directed Reading Program Mentor*

**Spring 2023**

The Directed Reading Program provides undergraduates with the opportunity to work one-on-one with graduate students and post-docs in the Division of Applied Mathematics (APMA) on independent reading projects. It is a fantastic opportunity for motivating undergraduates to learn new mathematical & computational skills forge connections and explore higher-level mathematics outside of the undergraduate curriculum. <https://www.dam.brown.edu/drp/projects.html>

**Louisiana Tech University**, Ruston, Louisiana, USA

*Phys-209*

**Fall-2021**

Duties at various times have included taking full classes with student strength of 64. Study sessions on weekends and office hours. Conducting quiz, exam and daily assignments.

*Phys-261/262*

**September 2016 - August 2021**

Duties at various times have included office hours and leading weekly computer lab exercises. Also taking full classes with student strength of 20. During stay home order , prepared video resources for all the lab experiments to teach online for the students.

**Peer-Reviewed Journal Articles**

1. Vivek Oommen, Siavash Khodakarami, **Aniruddha Bora**, Zicheng Wang, and George Em Karniadakis. **Learning Turbulent Flows with Generative Models: Super-resolution, Forecasting, and Sparse Flow Reconstruction.** *Nature Communications*, 2026. [Link](#)
2. Shixuan Zhang, Ruby Leung, Bryce Harrop, **Aniruddha Bora**, Khemraj Shukla, and George Em Karniadakis. **Improved nudging strategy for constraining humidity and temperature fields in the E3SM Atmosphere Model.** *Geoscientific Model Development*, 2026. [Link](#)
3. Siavash Khodakarami, Vivek Oommen, **Aniruddha Bora**, and George Em Karniadakis. **Mitigating Spectral Bias in Neural Operators via High-Frequency Scaling for Physical Systems.** *Neural Networks*, 2025. [Link](#)
4. Hanxun Jin, Boyu Zhang, Qianying Cao, Enrui Zhang, **Aniruddha Bora**, Sridhar Krishnaswamy, George Em Karniadakis, and Horacio D. Espinosa. **Characterization and Inverse Design of Stochastic Mechanical Metamaterials Using Neural Operators.** *Advanced Materials*, 2025. [Link](#)
5. Vivek Oommen, **Aniruddha Bora**, Zhen Zhang, and George Em Karniadakis. **Integrating Neural Operators with Diffusion Models Improves Spectral Representation in Turbulence Modeling.** *Proceedings of the Royal Society A*, 2025. [Link](#)
6. Farnaz Rezaei, Weizhong Dai, Shayan Davani, and **Aniruddha Bora**. **A physics-informed neural network method for thermal analysis in laser-irradiated 3D skin tissues with embedded vasculature, tumor and gold nanorods.** *International Journal of Heat and Mass Transfer*, 245 (2025) 126980. [Link](#)
7. Laurence Finch, Weizhong Dai, and **Aniruddha Bora**. **An Artificial Neural Network Method for Simulation of Wave Propagation Based on the Rosenau-KdV-RLW Equation on Unbounded Domain.** *Mathematics*, 13(7) (2025) 1036. [Link](#)
8. Alan John Varghese, **Aniruddha Bora**, Mengjia Xu, and George Em Karniadakis. **TransformerG2G: Learning temporal graph embeddings with long-range historical information.** *Neural Networks*, 172 (2024) 106086. [Link](#)
9. Joshua P. Wilson, Weizhong Dai, **Aniruddha Bora**, and Jacob C. Boyt. **A new artificial neural network method for solving Schrödinger equations on unbounded domains.** *Communications in Computational Physics*, 32 (2022) 1039–1060. [Link](#)
10. **Aniruddha Bora**, Weizhong Dai, Joshua P. Wilson, Jacob C. Boyt, and Sergey L. Sobolev. **Neural network method for solving nonlocal two-temperature nanoscale heat conduction in gold films exposed to ultrashort-pulsed lasers.** *International Journal of Heat and Mass Transfer*, 190 (2022) 122791. [Link](#)
11. **Aniruddha Bora**, Weizhong Dai, Joshua P. Wilson, and Jacob C. Boyt. **Neural network method for solving parabolic two-temperature microscale heat conduction in double-layer thin films exposed to ultrashort-pulsed lasers.** *International Journal of Heat and Mass Transfer*, 178 (2021) 121616. [Link](#)
12. **Aniruddha Bora** and Weizhong Dai. **Gradient preserved method for solving heat conduction equation with variable coefficients in double layers.** *Applied Mathematics and Computation*, 386 (2020) 125516. [Link](#)

**Peer-Reviewed Conference & Workshop Papers**

13. **Aniruddha Bora**, Khemraj Shukla, Shixuan Zhang, Ruby Leung, and George Em Karniadakis. **Learning bias corrections for climate models using deep neural operators.** *AAAI*, 2023. [Link](#)
14. Jiawen Wei, **Aniruddha Bora**, Vivek Oommen, Chenyu Dong, Juntao Yang, George Em Karniadakis, and Gianmarco Mengaldo. **XAI4Climate: Attributing the role of climate**

change on extreme-weather precursors via interpretable machine learning. *Tackling Climate Change with Machine Learning, ICLR Workshop*, 2025. [Link](#)

#### Book Chapters

15. Somdatta Goswami, **Aniruddha Bora**, Yue Yu, and George Em Karniadakis. **Physics-informed deep neural operator networks**. *Machine Learning in Modeling and Simulation: Methods and Applications*, pp. 219–254, Springer, 2023. [Link](#)

#### Manuscripts Under Review / Submitted

16. **Aniruddha Bora**, Julie Chalfant, and Chrysostomos Chrysostomidis. **Physics-informed offline reinforcement learning eliminates catastrophic fuel waste in maritime routing**. (Submitted to *Science Advances*.) [Link](#)
17. **Aniruddha Bora**, Shixuan Zhang, Khemraj Shukla, Ruby Leung, and George Em Karniadakis. **Inception UNet (IUNet) and Multi-scale Multi-branch (M&M) UNet Plug-In Neural Operators for Online Bias Correction in E3SM**. (Under review at *Journal of Computational Physics*.)
18. Ramona Rubini, Siavash Khodakarami, **Aniruddha Bora**, George Em Karniadakis, and Michele Dassisti. **Process-Informed Forecasting of Complex Thermal**. (Under review at *Neural Networks*.) [Link](#)
19. **Aniruddha Bora**, Isabel K. Alvarez, Julie Chalfant, Chrysostomos Chrysostomidis, and George Em Karniadakis. **Enhancing Heat Sink Efficiency in MOSFETs using Physics-Informed Neural Networks: A Systematic Study on Coolant Velocity Estimation**. (Submitted to *International Journal of Heat and Mass Transfer*.) [Link](#)

#### Software & Formal Verification

20. **Aniruddha Bora**. **HeatEnergyDecay: Lean 4 proof of energy decay for linear heat-type flows**. [Link](#)

#### In Preparation

21. **Aniruddha Bora** and Weizhong Dai. **Artificial Neural Network Method for Solving Phase Lagging Heat Transport Equation**.

#### PRESENTATION/TALKS WORKSHOPS/POSTERS

- **Speaker at HydroML 2026**, Title: PIER (Physics-Informed, Energy-efficient, Risk-aware routing), date: May 19th, 2026.
- **Speaker at Global Innovation Rodeo at Texas House, SXSW 2026**, date: March 12th, 2026.
- **Oden Institute Seminar**, UT Austin, Title: PIER (Physics-Informed, Energy-efficient, Risk-aware routing): Toward Practical, Risk-Aware Voyage Planning, date: March 10th, 2026.
- **Rice AI Seminar Series**, Rice University, Title: Mathematically Diverse Multiscale Neural Operators: From Bias Correction to Inverse Forcings, date: October 10th, 2025.
- **Scientific Machine Learning for Differential Equations**, The Oden Institute for Computational Engineering & Sciences, The University of Texas at Austin, Title: Enhancing Heat Sink Efficiency in MOSFETs using Physics Informed Neural Networks (Poster). September 25-26, 2025.
- **East Coast Optimization Meeting, “Optimization and Digital Twins”**, George Mason University (Arlington Campus), Arlington, VA, Title: Enhancing Heat Sink Efficiency in MOSFETs using Physics Informed Neural Networks, date: April 17 - 18, 2025.

- **Applied mathematics symposium: artificial intelligence meets fluid dynamics**, Organizers: IIT Guwahati, IIT Hyderabad and VIT, India. Title: "Learning bias corrections for climate models using deep neural operators", date: 07/07/2023.
- **Machine Learning + X, Crunch Seminar, Brown University**, Title: Neural Network Method for Solving Parabolic Two-Step Microscale Heat Conduction in Double-Layer Thin Films Exposed to Ultrashort-Pulsed Lasers, date: 07/23/2021.
- **Computational Mathematics and Machine Learning Workshop, Lorentz Centre: Netherlands**, Title: Neural Network Method for Solving Parabolic Two-Step Microscale Heat Conduction in Double-Layer Thin Films Exposed to Ultrashort-Pulsed Lasers, date: 11/01/2021.
- **Science Seminar**, Louisiana Tech University, Ruston, USA, date: 11/28/2021.
- **Applications on Riemann Integration and Metric Space (WARIMS-2021)**, workshop on "Applications on Riemann Integration and Metric Space", department of basic sciences, school of technology, Assam Don Bosco University, date: 12/23/2021.
- **Machine Learning + X, Crunch Seminar, Brown University**, Title: Combining Differentiable PDE Solvers and Graph Neural Networks for Fluid Flow Prediction (paper review), date: 04/22/2022.
- **AAAI 2023 Spring Symposium Series**, Hyatt Regency, San Francisco Airport, California  
Topic: Learning bias corrections for climate models using deep neural operators  
date: March 27–29, 2023.

#### HONORS AND AWARDS

- Popular Choice Award (Noema-Laser), Nucleate Texas Demo Day, 2026.
- 2nd Place, Bobcat Innovation Challenge pitch competition (\$1,500), 11th April, 2026.
- BobCatalyst Innovation Accelerator Program (BIAP) Award, 8th April, 2026.
- Nucleate Activator Finalist, 2026 cohort.
- Harry J. Gaston, Jr. Memorial Scholarship in Engineering, Sept 2020- April 2021.
- College of Engineering and Science Scholarship, Louisiana Tech University, Sep 2019-Aug 2020.
- TA of the year, Louisiana Tech University, 2018-2019.
- College of Engineering and Science Scholarship, Louisiana Tech University, Nov 2018-Jul 2019.
- Mercedes-Benz Endowed Scholarship, Louisiana Tech University, 2017-2018.
- Highest Cumulative Grade Point Average, South Asian University, 2013-2014.
- 3rd position, 2nd South Asian Karate Championship, Bangalore, 2010.

#### GRANTS

- **Co-PI**. DOE genesis: Phase I - Drift-Aware Initialization of Coupled Earth System Models.
- **PI**. BobCatalyst Proof of Concept (POC) Grant, \$22,450.
- **PI**. BobCatalyst Innovation Accelerator Program (BIAP) Award, \$5,000.
- **PI**. PIER: Physics-Informed, Energy-efficient, Risk-aware routing, Texas State University, \$12,000. (Submitted: 2025; Funded: January 2026 - Present.)
- **PI**. ALCF Director's Discretionary Allocation Grant for Physics-Informed Generative AI (estimated commercial-cloud-equivalent value: \$190,000).
- **Co-PI**. ALCF Director's Discretionary Allocation Grant for quantification of extreme weather based on neural operator approximation, 2022.
- **Contributor** (proposal writing and development, Brown University). Machine Learning Methods for Phase Change Heat Transfer Modeling and Design, Multidisciplinary University Research Initiatives (MURI) Program (ONR), 2024.

PATENT

- Hierarchical Multi-Agent Reinforcement Learning for Scalable Adaptive Traffic Signal Control; Provisional Patent filed on April 28th, 2026.
- Physics-informed offline reinforcement learning eliminates catastrophic fuel waste in maritime routing; Provisional Patent filed on March 10th, 2026. Application number 63/996,145.
- Reinforcement Learning-Based Adaptive Collection Scheduling System for IoT-Enabled Waste Bins. Application number 64/033,319.

ADDITIONAL  
CERTIFICATES

**ATPESC 2022**, ARGONNE TRAINING PROGRAM ON EXTREME-SCALE COMPUTING, 2022.

**Machine Learning**, Stanford University, Coursera, 2019. [Certificate](#)

**Introduction to TensorFlow for Artificial Intelligence, Machine Learning, and Deep Learning**, deeplearning.ai, Coursera, 2019. [Certificate](#)

JOURNAL REVIEWER  
[LINK](#)

- Nature Machine Intelligence
- Journal of Computational Physics (Elsevier)
- Engineering Applications of Artificial Intelligence (Elsevier)
- Neural Computation
- International Journal of Applied Mechanics and Engineering
- Neurocomputing