ARNAJA MITRA

Website **LinkedIn**
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Education

PhD in Mathematics 2019–Present
The University of Texas at Dallas Dallas, TX
GPA: 3.797/4
Supervisors: Prof. Dmitry Rachinskiy, Prof. Wieslaw Krawcewicz, Late Prof. Zalman Balanov
Doctoral Thesis: Equivariant Hopf Bifurcation in Symmetric Systems

M.Sc. in Mathematics 2016–2018
Savitribai Phule Pune University Pune, India
GPA: 9.9/10 (University Gold Medalist)

B.Sc. (Hons.) in Mathematics 2013–2016
The University of Burdwan Burdwan, India
GPA: 83.5% (3^{rd} position in the entire University)

Research Interests

Dynamical Systems, Bifurcation Problems, Nonlinear Analysis, Applied Mathematical Modeling, Neural Networks

Publications

Thesis: Equivariant Hopf Bifurcation in Symmetric Systems
My thesis primarily focuses on the equivariant degree theory and its application in symmetric dynamical systems, both with and without memory. When traditional Singularity theory methods encounter challenges or fail (due to issues with smoothness or genericity), methods from equivariant degree theory can address these problems.

Hopf Bifurcation of Relative Periodic Solution in Systems of Symmetrically Coupled Oscillators (In progress) Summer 2023–Present
Consider a system of coupling n-identical electromechanical oscillators (motors) to a rotating inertial disk via elastic mechanical connections.

Equivariant Global Hopf Bifurcation in Abstract Nonlinear Parabolic Equations Fall 2021–Summer 2023
Authors: Arnaja Mitra, Zalman Balanov, Wieslaw Krawcewicz, Dmitry Rachinskiy (Submitted to the Journal of Differential Equations and is under review)
We developed an equivariant degree-based method for studying symmetric global Hopf bifurcation problems in a parabolic system.

Additional Projects

Optimizing the Tokenizer of a Transformer (BERT) for Better Performance August 7, 2023–Present
Mentor: Dr. Karolyn Babalola (In progress)
Women in Data Science and Mathematics (WiSDM 2023) at Institute for Pure and Applied Mathematics (IPAM)

Oscillatory Instabilities In Frictional Granular Matter Fall 2020
Mentor: Prof. Dmitry Rachinskiy (Class project)
We achieved a result that explained how small disturbances could amplify themselves, and this discovery has relevance in understanding the physics of earthquakes.

Selected Honors and Awards

- Travel Grant for the AWM Research Symposium 2023 (NSF DMS 2113506) — 2023
- NSM Conference Travel Award — 2023
- Travel Award for the 10^{th} International Congress on Industrial and Applied Mathematics (SIAM and NSF DMS 2233032) — 2023
- Julia Williams Van Ness Merit Scholarship — 2022
- Early-career AMS-NSF-Simons-ICM Travel Grant (Including Kovalevskaya Grant) (Offered) — 2022
- Mei Lein Fellowship — 2021
- The Lokmanya Tilak (Mathematics) Prize — 2020
- The Indian Mathematical Conference Poona, Golden Jubilee Prize — 2020
- The Prof. M.K. Agarwal M.A/M.Sc. Mathematics Prize — 2020
- Wrangler Paranjape Mathematics Prize — 2020
- Late Principal Ranglar Gopalkrishna Laxman Chandratraya Gold Medal — 2020
- Late Shri Damodar Ganesh Ramadasi Gold Medal — 2020
- Pandit G.M. Joshi Memorial Gold Medal — 2020
- Rani Katyayani Memorial Prize and Medal — 2019
- Innovation in science Pursuit for Inspired Research Scholarship (Department of Science and Technology, India) — 2013–2018

Posters and Talks

- **AWM Pittsburgh Chapter Seminar** (Invited, Virtual-Scheduled) — November 10, 2023
  University of Pittsburgh
- **AWM Research Symposium** (2023) (Poster Presented) — September 30–October 2, 2023
  Clark Atlanta University
- **SIAM Student Chapter Talk** (Invited, Virtual) — September 13, 2023
  Suny University at Buffalo
- 10^{th} **International Congress on Industrial and Applied Mathematics** (Poster Presented) — August 20–25, 2023
  Waseda University
- **Nonlinear Analysis Graduate Students' Summer** 2023 **Seminar Series** — May 22, 2023
  The University of Texas at Dallas
- **Mathematics Graduate Students Workshop** — December 20, 2021
  The University of Texas at Dallas

Conferences and Workshops Attended

- **AWM Research Symposium** (2023) (Received Travel Grand) — September 30–October 2, 2023
  Clark Atlanta University, Atlanta, USA
- 10^{th} **International Congress on Industrial and Applied Mathematics (ICIAM** 2023**)** (Received Travel Grand) — August 20–25, 2023
  Waseda University, Tokyo, Japan
- **Research Collaboration Workshop, "Women in Data Science and Mathematics (WiSDM)"** (Received Travel Grand) — August 7–11, 2023
  Institute for Pure Applied Mathematics (IPAM), An NSF Math Institute, University of California, Los Angeles, USA
- **Nonlinear Analysis Graduate Students' Summer** 2023 **Seminar Series** — May 22–June 19, 2023
  The University of Texas at Dallas, Dallas, USA
- **Texas Women in Math Symposium** 2023 **(TWIMS** 2023**)** (Received Travel Grant) — March 4–5, 2023
  The University of Texas at Austin, Austin, USA

Conferences and Workshops Attended (contd..)

The International Congress of Mathematicians 2022 **(ICM** 2022) (Virtual) (Offered Travel Grand) July 6–14, 2022
International Mathematical Union

Special Metrics in Complex Geometry May 16–20, 2022
The University of Texas at Dallas, Dallas, USA

Celebration for Women in Mathematics (Virtual) May 12, 2022
Mathematical Science Research Institute

International Workshop on Applications of Geometric Methods of Functional Analysis May 3–5, 2022
The University of Texas at Dallas, Dallas, USA

Teaching Experience

Teaching Assistant: The University of Texas at Dallas August 2019–Present

Applied Calculus 1 (MATH 1325), Calculus 2 (MATH 2419), Calculus of Several Variable (MATH 2415), College Algebra (MATH 1314), Differential Geometry (MATH 3380), Differential Equations (MATH 2420), Discrete Mathematics and Combinatorics (MATH 3315), Integral Calculus (MATH 2414), Linear Algebra (MATH 2415), Nonlinear Analysis 1 (MATH 6325), Precalculus (MATH 2415), Real Analysis (MATH 6301), Topology (MATH 4341), Trigonometry (MATH 1316)

Service Activities

The University of Texas at Dallas

- "Graduate Writing Group" for Fall 2023 (Leadership) — September 16–October 21, 2023
- Summer Platform for Undergraduate Research (SPUR) (Judge) — July 28, 2023
- Nonlinear Analysis Graduate Students' Summer 2023 Seminar Series (Organizer) — May 22–June 19, 2023
- Sommiloni of Bengali Students (Committee Chair) — November 2022–Present
- Women in STEAM Living Learning Community (Leadership) — October 2022–Present
- Special Metrics in Complex Geometry (Co-organizer) — May 16–20, 2022

Professional Affiliation

- American Mathematical Society — 2021–Present
- Association for Women in Mathematics — 2021–Present
- Society for Industrial and Applied Mathematics — 2021–Present
- Women in STEAM, Living Learning Community **(The University of Texas at Dallas)** — 2022–Present

Selected Courses

Differential Equations and Dynamical Systems, Applied Dynamical Systems, Stability and Bifurcation Switch Systems, Nonlinear Analysis, Functional Analysis, Numerical Analysis, Differential Equations, Partial Differential Equations

Differential Calculus, Integral Calculus, Integral Equations and Transforms, Advanced Calculus, Boundary Value Problem, Mathematical Probability and Statics, Computer Fundamentals, Stochastic Dynamic Programming

Algebra, Linear Algebra, Analytic Geometry and Vector Analysis, Differential Geometry, Complex Analysis, Real Analysis, Tensor Calculus, Combinatorics, Graph Theory, Lattice Theory, Linear Programming and Game Theory

Additional Degree and Certification Courses

- **The University of Texas at Dallas:** Master of science in Mathematics (Mathematics Specialization)
- **Coursera:** Introduction to Programming with Matlab
- **Udemy:** Python for Data Science and Machine Learning Bootcamp (In progress)
- **Udemy:** The Complete Python Pro Bootcamp for 2023 (In progress)
- **The University of Texas at Dallas:** Graduate Teaching Certification Course (In progress)

Skills

- **Programming Languages:** Mathematica, Matlab, R, Python, Pytorch, Numpy, Pandas, Scikit learn, HUggingface
- **Miscellaneous:** Gap, LaTeX