Rui Fang

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APPOINTMENTS

Zassenhaus Assistant Professor (August 2025 – Present)

Department of Mathematics, The Ohio State University, Columbus, OH.

Faculty mentor: Professor Yulong Xing, xing.205@osu.edu.

EDUCATION

Ph.D. in Mathematics (August 2019 – August 2025)

University of Pittsburgh, Pittsburgh, PA.

Advisor: Professor William Layton, wjl@pitt.edu.

Dual B.S. in Mathematics (August 2015 – July 2019)

University of Cincinnati, Cincinnati, OH; Capital Normal University, Beijing, China.

RESEARCH INTERESTS

Numerical analysis and scientific computing, with applications to data assimilation, fluid dynamics, turbulence, scientific machine learning, optimization, Navier-Stokes, and other nonlinear and coupled PDEs. Finite element, discontinuous Galerkin, adaptive, ensemble, and structure-preserving methods, with emphasis on long-time accuracy, model and data uncertainty, and computational efficiency.

MACHINE LEARNING EXPERIENCE

Graduate Coursework: Cross-registered at **Carnegie Mellon University**: 10-601 Machine Learning; 10-703 Deep Reinforcement Learning & Control; 10-708 Probabilistic Graphical Models.
Research: Deep learning for particle-physics vertexing, resulting in the publication "A hybrid deep learning approach to vertexing," *Journal of Physics: Conference Series*, 2020.

PUBLICATIONS

Submitted and Under Review

1. A. Çıbık and **R. Fang**, "Numerical analysis of data assimilation for slightly compressible flow," submitted to *Numerical Methods for Partial Differential Equations*, 2026, arXiv:2608.27647.
2. A. Çıbık and **R. Fang**, "Data assimilation for slightly compressible flows," submitted to *SIAM Journal on Scientific Computing*, 2026, arXiv:2604.26896.

Published Articles

3. **R. Fang** and A. Pakzad, "Global recovery from local data: interior nudging for 2D Navier–Stokes equations in a physical domain," *Journal of Numerical Mathematics*, 2026, https://doi.org/10.1515/jnma-2026-0020.

4. A. Çıbık, **R. Fang**, W. Layton, and F. Siddiqua, "Data assimilation with model errors," *Computers & Mathematics with Applications*, vol. 213, pp. 172–189, 2026, https://doi.org/10.1016/j.camwa.2026.04.023.
5. A. Çıbık, **R. Fang**, and W. Layton, "Modular data assimilation for flow prediction," *Numerical Methods for Partial Differential Equations*, vol. 42, no. 1, e70066, 2026, https://doi.org/10.1002/num.70066.
6. **R. Fang**, "Numerical analysis of penalty-based ensemble methods," *Numerical Algorithms*, vol. 101, pp. 509–542, 2026, https://doi.org/10.1007/s11075-025-02014-y.
7. **R. Fang**, "Numerical analysis of locally adaptive penalty methods for the Navier–Stokes equations," *SeMA Journal*, vol. 83, pp. 355–378, 2026, https://doi.org/10.1007/s40324-025-00394-8.
8. A. Çıbık, **R. Fang**, W. Layton, and F. Siddiqua, "Adaptive parameter selection in nudging-based data assimilation," *Computer Methods in Applied Mechanics and Engineering*, vol. 433, Art. 117526, 2025, https://doi.org/10.1016/j.cma.2024.117526.
9. **R. Fang**, W.-W. Han, and W. Layton, "On a 1/2-equation model of turbulence," *International Journal of Numerical Analysis and Modeling*, vol. 22, no. 2, pp. 139–156, 2025, https://doi.org/10.4208/ijnam2025-1007.
10. W.-W. Han, **R. Fang**, and W. Layton, "Numerical analysis of a 1/2-equation model of turbulence," *Physica D: Nonlinear Phenomena*, vol. 471, Art. 134428, 2025, https://doi.org/10.1016/j.physd.2024.134428.
11. **R. Fang**, "Penalty ensembles for Navier–Stokes equations with random initial conditions and forcing," in *Addressing Modern Challenges in the Mathematical, Statistical, and Computational Sciences*, Springer Proc. Math. Stat., vol. 494, Springer, Cham, 2025, https://doi.org/10.1007/978-3-031-84869-8_38.
12. **R. Fang**, H. Schreiner, M. Sokoloff, C. Weisser, and M. Williams, "A hybrid deep learning approach to vertexing," *Journal of Physics: Conference Series*, vol. 1525, Art. 012079, 2020, https://doi.org/10.1088/1742-6596/1525/1/012079.

Manuscripts in Preparation

1. **R. Fang**, Y. Xing, "Optimization-based structure-preserving methods for the generalized Korteweg–de Vries equation," manuscript in preparation; submission planned for November 2026.
2. **R. Fang**, A. Pakzad, "Global in time stability and accuracy of IMEX-FEM nonlinear data assimilation schemes for the Navier-Stokes equations," manuscript in preparation; submission planned for November 2026.
3. **R. Fang**, N. Jiang, "Modular nudged ensemble algorithms for fast data assimilation of MHD flows," manuscript in preparation; submission planned for November 2026.

AWARDS AND GRANTS

- Selected for the 2025 Argonne Training Program on Extreme-Scale Computing (ATPESC), funded by Argonne National Laboratory—a highly competitive two-week program on HPC, parallel computing, and large-scale scientific simulations; completed 80 hours of study with certification.
- Joint Mathematics Meetings (JMM) Graduate Student Travel Grant, American Mathematical Society, $1,430, 2025.

- 2025 SIAM Annual Meeting (AN25) Travel Award, Association for Women in Mathematics (AWM), under NSF DMS-2113506, Montréal, Québec, Canada, 2025.
- 2nd Place, 3-Minute Thesis Competition, Mathematics Department, University of Pittsburgh, 2024.
- Andrew W. Mellon Predoctoral Fellow, University of Pittsburgh, 2023–2024.
- Arts and Sciences Fellowships, University of Pittsburgh, Spring 2020.

CONFERENCE TALKS

1. Upcoming: Joint Mathematics Meetings (JMM), Chicago, Illinois, January 12–15, 2027.
2. Great Lakes Section of SIAM Annual Meeting 2026 (GL26), West Lafayette, Indiana, September 19–20, 2026.
3. Recent Advances in Numerical PDEs, University of Pittsburgh, May 15–17, 2026.
4. Recent Advancements in Numerical Methods for Fluid Dynamics, Joint Mathematics Meetings (JMM), Washington, DC, 2026.
5. The Ohio State University Computational Math Seminar, Columbus, OH, October 30, 2025.
6. Frontiers in Applied Analysis, Carnegie Mellon University, Pittsburgh, PA, June 3–6, 2025.
7. Recent Advancements in the Numerical Analysis of Nonlinear Partial Differential Equations, Joint Mathematics Meetings (JMM), Seattle, 2025.
8. The 42nd Southeastern-Atlantic Regional Conference on Differential Equations (SEARCDE), West Virginia University, Morgantown, November 9–10, 2024.
9. Mathematical Models & Numerical Methods for Multi-Physics Systems, Pittsburgh, PA, May 2024.
10. Finite Element Circus, Brown University, Providence, RI, April 2024.
11. Association for Women in Mathematics, University of Pittsburgh, Pittsburgh, PA, September 2023.
12. The VI AMMCS (Applied Mathematics, Modeling and Computational Science) International Conference, Waterloo, ON, August 2023.

CONFERENCE ORGANIZATION

- Co-organizer, minisymposium "AMS Special Session on Approximations of Nonlinear Problems,'' Joint Mathematics Meetings, Chicago, January 12–15, 2027 (upcoming).

TEACHING

The Ohio State University | Instructor of Record (Fall 2025 – Present)

- Fall 2026: Math 2173 – Engineering Math B (approximately 80 students).
- Spring 2026: Math 2173 – Engineering Math B (two sections, approximately 180 and 120 students)
- Fall 2025: Math 2153 – Multivariable Calculus (approximately 180 students).

Taught uncoordinated courses; independently developed course syllabi, assignments, quizzes, and exams, and held full responsibility for instruction and grading. Student evaluations highlighted enthusiasm for teaching, accessibility, and a welcoming and inclusive classroom environment.

University of Pittsburgh | Teaching Assistant (Fall 2019 – Spring 2023)

- Undergraduate courses: Calculus I, II, III, and Business Calculus.
- Graduate courses: Matrices and Linear Operators.

SERVICE

Academic Service

- **Association for Women in Mathematics (AWM), Pittsburgh Chapter, University of Pittsburgh**
  President, 2024–2025; Vice President, 2023–2024; Treasurer, 2022–2023
  Organized monthly seminars featuring women mathematics graduate students from institutions in the U.S. and abroad. https://www.mathematics.pitt.edu/content/awm-seminar-series.

  Volunteered at the High School Girls Summer Math Camp in 2024, assisting with instruction and general camp activities. https://www.mathematics.pitt.edu/events/girlsatPitt.
- **Mathematics Graduate Student Organization (Math GSO), University of Pittsburgh**
  Student Officer, 2020–2025
  Represented graduate student interests and communicated with faculty. Organized open houses, fall picnics, and end-of-year events; designed departmental T-shirts.

Refereeing Service

- *Journal of Numerical Mathematics*
- *Numerical Algorithms*
- *International Journal of Numerical Analysis and Modeling*
- *Physics of Fluids*
- *Pittsburgh Interdisciplinary Mathematics Review* (Undergraduate student-run journal)

PROPOSAL DEVELOPMENT

Preparing a proposal this fall on data assimilation with model error for coupled multiphysics systems; funding sources include NSF Computational Mathematics, DOE ASCR Applied Mathematics, AFOSR Computational Mathematics, and ONR Applied and Computational Analysis programs.

REFERENCES

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