Curriculum Vitae

Shuang Liu

CONTACT INFORMATION

Department of Mathematics
University of North Texas
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EMPLOYMENT

University of North Texas — Denton, TX USA
Assistant Professor — Aug. 2023–Now

University of Califonia, San Diego — La Jolla, CA USA
Stefan E. Warschawski Assistant Professor — Jan. 2021–Jun. 2023
Mentor: Li-Tien Cheng and Bo Li

Los Alamos National Laboratory — Los Alamos, NM USA
Postdoc Research Associate — Jan. 2020–Jan. 2021
Mentor: Xianzhu Tang

EDUCATION

University of South Carolina — Columbia, SC USA
Ph.D. in Applied and Computational Mathematics — Aug. 2015–Dec. 2019

- Thesis: Numerical methods for a class of reaction-diffusion equations with free boundaries.
- Advisor: Xinfeng Liu

Henan Normal University — Xinxiang, Henan, China
M.S., College of Mathematics and Information Science — Sept. 2012–Jul. 2015

- Thesis: A Liouville type theorem for higher order Hardy–Hénon equation in R^n.
- Advisor: Zongming Guo

Henan Normal University — Xinxiang, Henan, China
B.S., College of Mathematics and Information Science. — Sept. 2008–Jul. 2012

- Major in Computer Science

RESEARCH INTERESTS

1. Numerical Methods for Partial Differential Equations and Moving Boundary Problems, Scientific Computing
   - Integration factor methods and ETD/ETDRK schemes
   - Embedded boundary method
   - Front tracking methods and front fixing methods
   - Fast local level set method
   - Binary level set method
   - Scientific computing: fast algorithms and parallel computing
2. Computational and Mathematical Biology/Physics
   - Moving boundary problems for invasive behavior under competition between two/three species
   - Cell polarization and cell movement
   - Biomolecular modeling and Monte Carlo simulations
   - Free boundary Grad-Shafranov problem

COMPUTER SKILLS

- Programming Languages: C/C++, PETSc, Julia, Matlab, R, Maple.
- CPU/Integrated GPU Parallel Computing

COMPUTATIONAL PACKAGE

- *Free-boundary GS solver:* A parallel PETSc–based cut cell free–boundary MHD equilibrium solver (primary developer)
- *AMG Accelerated Cut Cell Algorithm:* A universal AMG accelerated cut cell solver (primary developer)

PUBLISHED

* : corresponding author

1. **Shuang Liu**, Yue Wu, and Xueping Zhao*, A ternary mixture model with dynamic boundary conditions. Mathematical Biosciences and Engineering, 2024. DOI: 10.3934/mbe.2024091.
2. Zhichao Peng, Daniel Appelö, and **Shuang Liu***. Universal AMG accelerated embedded boundary method without small cell stiffness. Journal of Scientific Computing, 2023, DOI: 10.1007/s10915-023-02353-9.
3. **Shuang Liu**, Li-Tien Cheng, and Bo Li*. Cell polarity and movement with reaction-diffusion and moving boundary: rigorous modeling and robust simulations. SIAM Journal on Applied Mathematics (2023): S515-S537.
4. **Shuang Liu** and Xinfeng Liu*. Exponential Time Differencing Method for a Reaction- Diffusion System with Free Boundary. Communications on Applied Mathematics and Computation(2023): 1-18.
5. **Shuang Liu**, Zirui Zhang, Hsiao-Bing Cheng, Li-Tien Cheng*, and Bo Li. Explicit-Solute Implicit-Solvent molecular simulation with binary level-set, adaptive–mobility, and GPU. Journal of Computational Physics, (2022): 111673.
6. **Shuang Liu***, Qi Tang, and Xian-Zhu Tang. A parallel cut-cell algorithm for the free-boundary Grad–Shafranov problem. SIAM Journal on Scientific Computing 43, no. 6 (2021): B1198-B1225.
7. Kamruzzaman Khan, **Shuang Liu**, Timothy M. Schaerf, and Yihong Du*. Invasive behaviour under competition via a free boundary model: a numerical approach. Journal of Mathematical Biology 83, no. 3 (2021): 1–43.
8. **Shuang Liu** and Xinfeng Liu*. Krylov implicit integration factor method for a class of stiff reaction-diffusion systems with moving boundaries. Discrete & Continuous Dynamical Systems-B 25, no. 1 (2020): 141–159.
9. **Shuang Liu** and Xinfeng Liu*. Numerical methods for a two-species competition–diffusion model with free boundaries. Mathematics 2018, 6, 72.
10. **Shuang Liu**, Yihong Du, and Xinfeng Liu*. Numerical studies of a class of reactiondiffusion equations with Stefan conditions. International Journal of Computer Mathematics 97, no. 5 (2020): 959–979.
11. Tingzhi Cheng* and **Shuang Liu**. A Liouville type theorem for higher order Hardy–Hnon equation in R^n. Journal of Mathematical Analysis and Applications 444, no. 1 (2016): 370–389.

HORNORS AND AWARDS

- Texas NExT Fellowship, MAA 07/2023-06/2025
- AMS Simons Travel Grant, AMS, 07/2021-06/2023 $5,000
- Research fund of Department of Mathematics, UCSD $4,000
- 5th Annual STEM Faculty Launch Program at WPI 10/2019
- 2019 National Science Foundation (NSF)–Mathematical Sciences Graduate Internship at Los Alamos National Laboratory 06/10/2019–08/16/2019
- The 2019 George W. Johnson Graduate Fellowship, UofSC $3000
- Visiting student scholarship (University of New England, Australia) 07/2018
- SAMSI 2017 IMSM Workshop (North Carolina State University) 07/2017
- The Outstanding First Year Graduate ACM Student Award, UofSC 04/2016
- Travel Award by Graduate School of University of South Carolina $500*2
- Travel Award by AMS or SIAM $250+$400+$500

TEACHING EXPERIENCE

Instructor (08/21/2023–now) University of North Texas

- Math 1650: Pre-calculus, Fall 2023 & Spring 2024
- Math 2700: Linear Algebra and Vector Geometry, Spring 2025 & Fall 2025
- Math 3350: Introduction of Numerical Analysis, Spring 2026
- Math 3410: Differentical Equations I, Spring 2026

Instructor (01/04/2021–06/30/2023) University of California at San Diego

- Math 3C: Pre-calculus, Spring & Fall 2021
- Math 20B: Calculus For Science & Engineering, Winter & Fall 2021, Spring 2022
- Math 142A: Introduction to Analysis I, Winter 2022
- Math 170A: Introduction to Numerical Analysis: Linear Algebra, Fall 2022, Winter & Spring 2023
- Math 170C: Introduction to Numerical Analysis: Ordinary Differential Equations, Spring 2023

Instructor (08/20/2015–12/16/2019) University of South Carolina

- Math 122: Calculus for Business Administration and Social Sciences, Spring 2018
- Math 111: Basic College Mathematics, Fall 2017

Teaching Assistant (08/20/2015–12/16/2019) University of South Carolina

- Math 141: Conducted recitation sessions for Calculus I
- Math 142: Conducted recitation sessions for Calculus II
- Maple Labs: Demonstrated how to use Maple to solve mathematical problems for undergraduate.
- Math Tutor for undergraduate students in Math Tutoring Center

SELECTED ACADEMIC TALKS AND ACTIVITIES

- AI for Biology and Medicine (AI4BM) Symposium Oct. 2025
- The SIAM TX-LA 2025 conference Sept. 2025
- SIAM Conference on Computational Science and Engineering (CSE25) Mar. 2025
- Applied Math Seminar at Texas Tech University Nov. 2024
- Department Research Colloquium at Southern Methodist University Oct. 2024
- Talk at Dr. Jyoti Shah's lab group at University of North Texas Jun. 2024
- Applied Mathematics at University of Arkansas (Virtual) Apr. 2024
- Shuang Liu Research Discussion Meeting at University of North Texas Mar. 2024
- JMI Research Team Building Section in JMI MCNATT Institute for Logistics Research at University of North Texas, Denton, TX Nov. 2023
- Millican Colloquium in Department of Mathematics at University of North Texas Nov. 2023
- 2023 Fall Southeastern Sectional Meeting at University of South Alabama, Mobile, AL Oct. 2023
- Mathematics in Action (MiA): Modeling and Analysis in Biology Jun. 2023
- Southern California Applied Mathematics Symposium (SOCAMS) Apr. 2023
- Job Talking at University of California, Riverside Jan. 2023

- 5th Annual Meeting of SIAM TXLA 2022 Nov. 2022
- AMS Western Sectional special session on Mathematical Modeling of Biological and Social Systems Oct. 2022
- Southern California Applied Mathematics Symposium (SOCAMS) May 2022
- Postdoc Seminar at UCSD April 2022
- Applied Mathematics Seminar at University of Georgia Sept. 2021
- Center For Computational Mathematics Seminar at UCSD May 2021
- Applied and Computational Mathematics Seminar at University of South Carolina Mar. 2021
- Postdoc Seminar at University of California, San Diego Apr. 2021
- Talk at Dr. Daniel Appelös group at Michigan State University Mar. 2021
- Seminars on Mathematics for Complex Biological Systems at University of California, San Diego Dec. 2020
- Principal Talk at SIAM Northern State Section Student Chapters Conference at Utah State University Oct. 2020
- Talk in TDS SciDAC Webinar in Applied Mathematics and Plasma Physics Group at Los Alamos National Laboratory (LANL) Aug. 2019
- Job Talking Presentation at Worcester Polytechnic Institute Oct. 2019
- Talk in Earth and Environmental Science Group at LANL Aug. 2019
- Nonlinear Evolution Equations & Wave Phenomena at U of Georgia Apr. 2019
- Applied and Computational Mathematics Seminar (ACM) at University of South Carolina Feb. 2019
- 1st Annual Symposium on Multi-scale Cell Fate at UC, Irvine Oct. 2018
- 42nd SIAM Conference on Applied Mathematics at University of North Carolina at Chapel Hill Mar. 2018
- 9th Annual Graduate Student Mini–conference in Computational Mathematics at University of South Carolina Feb. 2018

SERVICE

University

- Computing for Arts + Sciences (CAS) Computing Committee, UNT 2023-now
- Center for Computational Life Sciences (CCLS) Executive Committee, UNT 2024-now
- Association for Women in Mathematics (AWM) Student Chapter at UNT, Faculty Advisor 2024-now

Department

- Chair of Outreach Committee 2025-2026
- Co-Chair of Applied and Computational Mathematics Seminar 2025-now
- Applied Mathematics Qualifying Exam Committee, UNT 2023-now
- Master's Thesis Defense Committee, UNT Oct. 2023 & Mar. 2025
- Integration Bee 2024 (proctor), UNT Apr. 2024
- Volunteering to tutor graduate students about Matlab and Python for their research, University of California, San Diego 2020-2022

- Serving to the Association for Women in Mathematics (AWM) in the faculty mentorship program, University of California, San Diego 2021
- High School Math Contest (proctor), University of South Carolina 2018

Supervision:

- Mr. Zunding Huang at University of California, San Diego 2021-2022
- Mr. Md Mostafa at University of North Texas 2025-now
- Mr. Kayode Oke at University of North Texas 2025-now

Journal Reviewer: Journal of Mathematical Biology, Discrete and Continuous Dynamical Systems - Series B, International Journal of Numerical Analysis and Modeling, Mathematical Methods in the Applied Sciences.

Mini-Symposium Organizer:

- 5th Annual Meeting of Society for Industrial and Applied Mathematics (SIAM) Conference Texas-Louisiana Section, Nov. 2022: Mathematical modeling and robust numerical algorithms in various biological processes;
- SIAM Conference on Computational Science and Engineering (CSE25), Mar. 2025: Applications of high performance computing and uncertainty analysis in complex biology systems