

Curriculum Vitae

Shuang Liu

CONTACT INFORMATION Department of Mathematics
University of North Texas
Denton, TX 76203
Email: Shuang.Liu@unt.edu

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

University of California, 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

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 reaction-diffusion 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.

SUBMITTED HONORS AND AWARDS

- 07/2021-06/2023 AMS Simons Travel Grant, AMS \$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

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
• 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

SUPERVISION Mr. Zunding Huang at University of California, San Diego 2021-2023

**SELECTED
ACADEMIC
TALKS**

- JIM Research Team Building Section in JIM 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, Denton, TX Nov. 2023
- 2023 Fall Southeastern Sectional Meeting at University of South Alabama, Mobile, AL Oct. 2023
- Mathematics in Action (MiA2023): Modeling and Analysis in Biology and Material Sciences Jun. 2023
- AMS Western Sectional special session on Mathematical Modeling of Biological and Social Systems Oct. 2022
- Southern California Applied Mathematics Symposium (SOCAMS) May 2022
- Applied Mathematics Seminar at University of Georgia Sept. 2021
- Center For Computational Mathematics Seminar at UCSD May 2021
- Applied and Computational Mathematics (ACM) Seminar at University of South Carolina 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
- 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