Xinyue (Evelyn) Zhao

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Positions

Department of Mathematics, Vanderbilt University — **Nashville, TN**
Postdoctoral Scholar — *Starting from Aug. 2021*

Education

University of Notre Dame — **Notre Dame, IN**
Ph.D. in Applied & Computational Mathematics & Statistics (ACMS) — *Expected Aug. 2021*
M.S. Applied & Computational Mathematics & Statistics | GPA: 4.00/4.00 — May 2018
Advisor: Dr. Bei Hu
Thesis title: Stability and Bifurcation Analysis of Applied Free Boundary Problems
Research Interests: partial differential equations (PDEs), free boundary problems, mathematical biology

Renmin University of China — **Beijing, China**
M.S. Applied Mathematics | GPA: 3.94/4.00 — June 2018
B.S. Mathematics and Applied Mathematics | High Honors: Top 5% | Major GPA: 3.90/4.00 — June 2014
B.Econ. International Economics and Trade (Dual Degree) — June 2014

Research Experience

University of Notre Dame — **Notre Dame, IN**
Graduate Research Assistant, Advisor: Dr. Bei Hu — June 2017 - Present
- Work on multiple projects involving free boundary problems with applications in biology and physics.
- Develop mathematical models and carry out stability and bifurcation studies on free boundary systems.
- Design machine learning-based algorithms to solve free boundary problems and analyze the convergence of the algorithms.

Renmin University of China — **Beijing, China**
Honors Graduate Dissertation, Advisor: Dr. Yuanyuan Ke and Dr. Bei Hu — Aug. 2017 - May 2018
- Developed a spatially and temporally multiscale free boundary PDE model to describe tissue growth.
- Analyzed both analytically and numerically to determine the asymptotic behaviors of the solution.

Renmin University of China — **Beijing, China**
Graduate Research Assistant, Advisor: Dr. Litao Han — Feb. 2015 - May 2016
- Investigated the dynamics of drug resistance in HIV and its optimal treatment strategies.
- Studied basic reproduction number (R_0) by next generation matrix.
- Conducted data simulation on Matlab to evaluate different factors influencing R_0.

Publications

- **Zhao, X. E.**, Hao, W. & Hu, B. A neural network algorithm for solving the obstacle problems. *In preparation*.
- **Zhao, X. E.** & Hu, B. On the first bifurcation point for a free boundary problem modeling small arterial plaque. *Preprint*.
- **Zhao, X. E.**, Hao, W. & Hu, B. (2021) Convergence analysis of neural networks for solving a free boundary system. *Computers and Mathematics with Applications. Accepted for publication*.
- **Zhao, X. E.** & Hu, B. (2021) Bifurcation for a free boundary problem modeling a small arterial plaque. *Journal of Differential Equations. Accepted for publication*.
- **Zhao, X. E.** & Hu, B. (2020). Symmetry-breaking bifurcation for a free-boundary tumor model with time delay. *Journal of Differential Equations, 269,* 1829–1862
- **Zhao, X. E.** & Hu, B. (2020). The impact of time delay in a tumor model. *Nonlinear Analysis: Real World Applications, 51,* 103015.

Presentations

JMM 2021 AWM Workshop: Poster Presentations by Women Graduate Students — **Virtual**
Poster, "A free boundary tumor growth model with a time delay in cell proliferation" — *Jan. 2021*

Department of Mathematics at Ohio State University — **Virtual**
Invited talk, "A free boundary tumor growth model with a time delay in cell proliferation" — *Dec. 2020*

PSU CCMA Workshop on Mathematical Machine Learning and Application — **Virtual**
Poster, "Solving a Free Boundary System by Using Neural Networks" — Dec. 2020

Department of Mathematics at Penn State University — **Virtual**
Invited talk, "Convergence Analysis of Neural Networks for Solving a Free Boundary Problem" — Nov. 2020

Department of Mathematics at Northeast Normal University — **Virtual**
Invited talk, "A free boundary tumor growth model with time delay" — Nov. 2020

SIAM Conference on Analysis of Partial Differential Equations — **La Quinta, CA**
Contributed talk, "The impact of time delay in a tumor model" — Dec. 2019

Department of Mathematics at Penn State University — **Penn State, PA**
Invited talk, "A free boundary tumor growth model with time delay" — Dec. 2019

ACMS Department at the University of Notre Dame — **Notre Dame, IN**
Invited talk, "A free boundary tumor growth model with time delay" — Nov. 2019

The 39th Southeastern-Atlantic Regional Conference on Differential Equations — **Daytona Beach, FL**
Contributed talk, "The impact of time delay in a tumor model" — Oct. 2019

Colleges of Science and Engineering Joint Annual Meeting — **Notre Dame, IN**
Poster, "The impact of time delay in a tumor model" — Dec. 2018

Honors & Awards

- Striving for Excellence in College and University Teaching Certificate from ND Learning | Kanbe Center (Jan. 2021)
- Travel Grants ($330) from NSF for JMM 2021 AWM Workshop (Oct. 2020)
- Outstanding Teaching Assistant Honorable Mention ($100) from the Graduate Student Union at the University of Notre Dame (May 2020)
- SIAM Student Travel Award ($650) for SIAM Conference on Analysis of Partial Differential Equations (Dec. 2019)
- Notebaert Professional Development Award ($310) from the College of Science at the University of Notre Dame for SIAM Conference on Analysis of Partial Differential Equations (Dec. 2019)
- Conference Travel Grant ($500) from NSF for the 39th Southeastern-Atlantic Regional Conference on Differential Equations (Oct. 2019)
- Graduate Student Professional Development Award ($500) from ACMS Department at the University of Notre Dame for the 39th Southeastern-Atlantic Regional Conference on Differential Equations (Oct. 2019)
- Conference Travel Grant ($500) from NSF for the International Congress of Mathematicians 2018 Satellite Meeting: A Pan-Hemispheric Celebration of Mathematics in Miami (July 2018)
- Conference Travel Grant ($100) from NSF, Mathematical Biosciences Institute, and the School of Science at IUPUI for the 5th Midwest Women in Mathematics Symposium (Feb. 2017)
- Outstanding Graduates of Beijing in 2014, a national awards for top 1% graduates in Beijing
- Meritorious Winner in 2013 Mathematical Contest in Modeling, top 10% of all teams

Teaching Experience

University of Notre Dame — **Notre Dame, IN**

Tutorial Instructor for Applied Mathematics Methods Tutorial — Aug. 2018 - Dec. 2019
- Led 2 undergraduate recitations per semester, with each one containing ~30 students.
- Achieved 4.9/5.0 on course instructor feedback survey in recent semester.

Tutorial Instructor for Scientific Computing Lab (C++) — Aug. 2017 - Dec. 2017
- Conducted 2 undergraduate labs, with each one containing ~30 students.
- Tutored students in C++ programming and shell scripting.

Teaching Assistant for various courses Aug. 2016 - Present

- Graduate-level: Finite Elements in Engineering, Applied Partial Differential Equations, Nonlinear Dynamical Systems, Numerical Analysis, Applied Linear Algebra
- Undergrad-level: Introduction to Stochastic Modeling, Statistics for Business

Professional Experience

Online Media Group, Tencent **Beijing, China**
Data Analysis Intern March 2016 - June 2016

- Investigated online media data (view counts, hits/clicks, viewing times, interaction data, etc.) with statistical tools (Excel, SPSS) and developed weekly reports to promote Tencent video website.

Online Sales Group, Intel **Beijing, China**
Data Analysis Intern March 2014 - March 2015

- Analyzed online sales data to better promote products by implementing mathematical modelling, visualization and statistical tools (with Matlab, Excel, SQL).

Leadership & Service

Reviewer of peer-reviewed journals **Notre Dame, IN**

Association of Women in Science (Notre Dame Chapter) **Notre Dame, IN**
Volunteer at Notre Dame Pi Day 5K March 2017 - March 2019
Volunteer at AWIS-ND Concession Stand Nov. 2017

Graduate Student Union - University of Notre Dame **Notre Dame, IN**
Orientation Ambassadors Summer 2019

International Student and Scholar Affairs - University of Notre Dame **Notre Dame, IN**
Designer of the 2018 - 2019 International Orientation T-shirt April 2018
Designer of the 2017 - 2018 International Orientation T-shirt April 2017

Chinese Students & Scholars Association - University of Notre Dame (NDCSSA) **Notre Dame, IN**
Designer of the 2019 - 2020 NDCSSA T-shirt July 2019
Designer of the 2018 - 2019 NDCSSA T-shirt June 2018
Volunteer at the Lunar New Year Gala Feb. 2017

Student Union in School of Information - Renmin University of China **Beijing, China**
President May 2012 - May 2013
Director, Communications Department May 2011 - May 2012

Skills

Proficient: Matlab, C/C++, Mathematica, LaTeX, Excel
Experienced: Python, SPSS, Eviews, SPSS, Stata, SQL

Professional Memberships

Society for Industrial and Applied Mathematics (SIAM) Jan. 2017 - Present
Association of Women in Science (AWIS) Sept. 2016 - Present