Tongtong Li

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Employment

Research Associate **August 2021 — Present**
Department of Mathematics, Dartmouth College *Hanover, NH*

- Supervisor: Anne Gelb

Education

Doctor of Philosophy in Mathematics, July 2021
University of Pittsburgh *Pittsburgh, PA*

- Dissertation Title: *Mixed Formulations for Fluid-poroelastic Structure Interaction*
- Advisor: Ivan Yotov

Master of Science in Mathematical Finance, June 2016
Rutgers, the State University of New Jersey *New Brunswick, NJ*

- Thesis Title: *Pricing Finite-maturity European Put-Heston Option with Barrier Discontinuity by FDM*
- Advisor: David Eliezer

Bachelor of Economics, June 2014
Huazhong Agricultural University *Wuhan, China*

- Thesis Title: *Research of Chinese Agricultural Commodity Futures Market Volatility Spillover Effect Based on BEKK-GARCH Model – Taking DCE Yellow Soybean as an Example*
- Advisor: Guang Zeng

Research interests

- **Numerical Analysis:** numerical solution of partial differential equations, finite element methods, numerical conservation laws, high order methods
- **Data Assimilation:** sequential inference, ensemble learning
- **Bayesian Inverse Problems:** hierarchical Bayesian learning, Bayesian inference
- **Applications:** computational fluid dynamics, interaction of fluid flow and poroelastic media, sea ice modeling

Awards

Dartmouth College

- Travel Award: 17th U. S. National Congress on Computational Mechanics (USNCCM17). Albuquerque, NM, July 2023.
- First Place Award (Outstanding Graduate Student Research Poster) for AWM Graduate Student Poster Competition. Seattle, WA, May 2023.
- Travel Award: AWM Workshop at SIAM Conference on Optimization (OP23). Seattle, WA, May 2023.
- Travel Award: SIAM Convening on Climate Science, Sustainability, and Clean Energy. Tysons, VA, Oct. 2022.
- Second Place Award for Poster Presentation: High Performance Computing (HPC) Day. University of Massachusetts Lowell, Sept. 2022.
- SIAM Early Career Travel Award: SIAM Conference on Mathematical Planet Earth (MPE22). Pittsburgh, PA, July 2022.

University of Pittsburgh

- Thomas C. Hales Distinguished Research Award
- Mathematics Teaching Assistant Excellence Award
- Nominated for the Elizabeth Baranger Teaching Award
- Arts and Sciences Graduate Fellowship (two times)

Huazhong Agricultural University

- Valedictorian
- National Scholarship (10/852, two times)
- Best College Student Award (8/18625)
- Xingfa Scholarship (20/852)
- Academic Scholarship (every year)
- First Class Award (Meritorious): Mathematical Contest in Modeling (COMAP MCM)

Publications

1. T.Li, A. Gelb and Y. Lee, *A structurally informed data assimilation approach for nonlinear partial differential equations.* Arxiv: 2309.02585. Submitted.

2. S. Caucao, A. Dalal, T. Li and I. Yotov, *Mixed finite element methods for the Navier–Stokes–Biot model.* In: Springer Lecture Notes in Computer Science (LNCS), 2023. Accepted.

3. T.Li, A. Gelb and Y. Lee, *Improving numerical accuracy for the viscous-plastic formulation of sea ice.* J. Comput. Phys., 487: 112184, 2023. DOI: 10.1016/j.jcp.2023.112184.

4. T. Li, S. Caucao and I. Yotov, *An augmented fully mixed formulation for the coupling of the quasi-static Navier-Stokes and Biot models.* IMA J. Numer. Anal., 2023. DOI: 10.1093/imanum/drad036.

5. S. Caucao, T. Li and I. Yotov, *A multipoint stress-flux mixed finite element method for the Stokes-Biot model.* Numer. Math., 2022. DOI: 10.1007/s00211-022-01310-2.

6. T. Li and I. Yotov, *A mixed elasticity formulation for fluid–poroelastic structure interaction.* ESAIM Math. Model. Numer. Anal., 56(1): 1–40, 2022. DOI: 10.1051/m2an/2021083.

7. T. Li, X. Wang and I. Yotov, *Non-Newtonian and poroelastic effects in simulations of arterial flows.* Arxiv: 2010.14072. Preprint.

8. S. Caucao, T. Li and I. Yotov, *A cell-centered finite volume method for the Navier-Stokes/Biot model.* In: Klöfkorn R., Keilegavlen E., Radu F., Fuhrmann J. (eds) Finite Volumes for Complex Applications IX - Methods, Theoretical Aspects, Examples. FVCA 2020. Springer Proceedings in Mathematics & Statistics, vol 323. Springer, Cham. DOI: 10.1007/978-3-030-43651-3_29.

9. T.Li, A. Gelb and Y. Lee, *Improving numerical accuracy for the viscous-plastic formulation of sea ice.* SIAM News website https://sinews.siam.org/Details-Page/improving-numerical-accuracy-for-the-viscous-plastic-formulation-of-sea-ice.

In Preparation

1. J.Friedman, T. Li and A. Gelb, *Using Bayesian spectral reprojection to resolve the Gibbs phenomenon.*

2. T. Li, S. Caucao and I. Yotov, *Analysis of fully discrete augmented scheme for the quasistatic Navier–Stokes–Biot model.*

Presentations

1. *Data assimilation for discontinuous state variables.* 17th U. S. National Congress on Computational Mechanics (USNCCM17), invited speaker, Albuquerque, NM, July 2023.

2. *Using Bayesian spectral reprojection to resolve the Gibbs phenomenon.* AWM Workshop at SIAM Conference on Optimization, poster presentation, Seattle, WA, May 2023.

3. *Data assimilation for discontinuous state variables.* Computational Mathematics Seminar, invited speaker, University of Pittsburgh, April 2023.

4. *Improving numerical accuracy for the viscous-plastic formulation of sea ice.* UNH-Dartmouth Postdoctoral Research Day, poster presentation, University of New Hampshire, April 2023.

5. *Data assimilation for discontinuous state variables.* Scientific Computing Seminar, invited speaker, Brown University, March 2023.

6. *An augmented fully-mixed formulation for the quasiststic Navier-Stokes-Biot model.* Finite Element Circus, Bridgewater State University, March 2023.

7. *Improving numerical accuracy for the viscous-plastic formulation of sea ice.* Mathematics & Statistics Colloquium, invited speaker, University of Massachusetts Lowell, November 2022.

8. *Improving numerical accuracy for the viscous-plastic formulation of sea ice.* Computational Mathematics Seminar Series, invited speaker, Louisiana State University, November 2022.

9. *Improving numerical accuracy for the viscous-plastic formulation of sea ice.* High Performance Computing (HPC) Day, poster presentation, UMass Lowell Inn and Conference Center, September 2022.

10. *Numerical methods on solving sea ice dynamics model based on a viscous-plastic formulation.* North American High Order Methods Conference (NAHOMCon), San Diego State University, July 2022.

11. *Numerical methods on solving sea ice dynamics model based on a viscous-plastic formulation.* SIAM Conference on Mathematical Planet Earth, invited speaker, Pittsburgh, PA, July 2022.

12. *Can we do better? – Exploring sea ice model from a numerical view.* Multidisciplinary University Research Initiatives (MURI) annual meeting, Dartmouth College, October 2021.

13. *A mixed elasticity model for flow in fractured poroelastic media.* SIAM Conference on Mathematical & Computational Issues in the Geosciences (online), June 2021.

14. *A new fully mixed formulation for the Stokes-Biot model.* Pitt AWM Student Seminar Series, invited speaker, University of Pittsburgh, June 2021.

15. *Mixed formulations for fluid-poroelastic structure interaction.* Sea Ice Modeling and Data Assimilation (SIMDA) Seminar, Dartmouth College, April 2021.

16. *Mixed finite element methods for fluid-poroelastic structure interaction.* Graduate Student Seminar, University of Pittsburgh, March 2021.

17. *Mixed formulations for fluid-poroelastic structure interaction.* Oden Institute Virtual Seminar, The University of Texas at Austin, March 2021.

18. *A cell-centered finite volume method for the Navier-Stokes/Biot model.* Finite Volumes for Complex Applications IX, poster presentation, Bergen, Norway (online), June 2020.

19. *A multipoint stress-flux mixed finite element method for the Stokes-Biot model.* Finite Element Circus, Virginia Polytechnic Institute and State University, November 2019.

20. *Introduction to tree-based methods.* Machine Learning Workshop, University of Pittsburgh, March 2019.

Conferences and workshops

- *17th U. S. National Congress on Computational Mechanics (USNCCM17).* Albuquerque, NM, July 2023.
- *SIAM Conference on Optimization (OP23).* Seattle, WA, May 2023.
- *Finite Element Circus.* Bridgewater State University, March 2023.
- *SIAM Convening on Climate Science, Sustainability, and Clean Energy.* Tysons, Virginia, October 2022.
- *North American High Order Methods Conference (NAHOMCon).* San Diego State University, July 2022.
- *SIAM Conference on Mathematical Planet Earth (MPE22).* Pittsburgh, PA, July 2022.
- *(Hybrid) SIAM Conference on Uncertainty Quantification (UQ22).* Atlanta, GA, April 2022.
- *Optimization Reading Group.* Dartmouth College, Spring 2022.
- *Tensorflow and Physics-informed Neural Network (PINN) Study Group.* Dartmouth College, Winter 2021.
- *Numerical Methods for Conservation Laws Study Group.* Dartmouth College, Fall 2021.
- *Computational Optimal Transport Reading Group.* Dartmouth College, Summer 2021.
- *(Hybrid) Finite Element Circus.* The Pennsylvania State University, November 2021.
- *SIAM Conference on Mathematical & Computational Issues in the Geosciences (GS21).* Milan, Italy (online), June 2021.
- *(Virtual) Finite Element Circus.* November 2020.
- *2nd Joint SIAM/CAIMS Annual Meeting (AN20) and SIAM Conference on Imaging Science (IS20).* Toronto, Ontario, Canada (online) June, 2020.
- *Finite Volumes for Complex Applications IX.* Bergen, Norway (online), June 2020.
- *Finite Element Circus.* Virginia Polytechnic Institute and State University, November 2019.
- *Machine Learning Study Group.* University of Pittsburgh, Spring 2019.
- *Pitt Research Center for Research Computing Cluster Training Workshop.* University of Pittsburgh, Spring 2019.
- *Freefem++ Workshop.* University of Pittsburgh, August 2017.

Additional research projects

1. *Empirical analysis of the relationship between GDP and oil price in China: A Bootstrap approach,* with Miao Yang, 2015-2016.

2. *Portfolio construction based on the movement of oil price,* with Miao Yang, 2015-2016.

3. *Prediction on the supply/demand dynamics in horticulture industry,* with Taotao Tu, 2013-2014.

4. *Analysis on factors affecting online payment within college students based on Probit model,* with Huijuan Chen, 2013-2014.

Teaching experience

Dartmouth College

Lecturer

- First Year Graduate Seminar (Data Assimilation, Graduate Level) Summer 2023
- Numerical Analysis (Numerical Linear Algebra, Graduate Level) Winter 2023
- Topics in Applied Mathematics/Current Problems in Applied Mathematics (Finite Element Method, Mixed Undergraduate and Graduate Levels) Spring 2022

Undergraduate student research mentoring

- Jack E. Friedman, *A Bayesian framework for spectral reprojection* (together with Anne Gelb) 2022-2023
- David J. Appleton, *L-curve informed regularization for spectral reprojection* (together with Anne Gelb) 2022-2023

Graduate student directed reading

- Jessica Rattray (Numerical Solution of PDEs) Spring 2023

University of Pittsburgh

Lecturer

- Analytical Geometry and Calculus 2 (1 section) Summer 2021
- Applied Differential Equations (1 section) Summer 2020
- Analytical Geometry and Calculus 1 (1 section) Summer 2017

Teaching Fellow 2019-2021

- Analytical Geometry and Calculus 1 (1 section)
- Analytical Geometry and Calculus 3 (4 sections)

Teaching Assistant 2017-2019

- Analytical Geometry and Calculus 1 (3 sections)
- Analytical Geometry and Calculus 2 (3 sections)
- Analytical Geometry and Calculus 3 (3 sections)
- Introduction to Theoretical Mathematics (2 sections)
- University Honors College Introduction to Analysis (1 section)

Rutgers, The State University of New Jersey

Course Assistant 2015-2016

- Numerical Analysis I (1 section, Graduate Level)
- Computational Finance (1 section, Graduate Level)

Synergistic activities

Dartmouth College

- Volunteer Session Leader and Panel Speaker, Sonia Kovalevsky Math Day May 2022

University of Pittsburgh

- Member, Math Department Graduate Student Organization 2019-2021
- Volunteer, Integration Bee, University of Pittsburgh March 2019

Huazhong Agricultural University

- Team Leader, Mathematical Modeling Team 2012-2014
- Leader for Class 2014, Career Planning Elite Training Camp 2011-2014
- Team Leader and Volunteer, Voluntary Teaching Organization 2011-2012

Industrial and Commercial Bank of China

- Internship Assistant Summer 2013

Peer Review of Articles

- Communications in Computational Physics (Global Science Press), International Journal of Numerical Analysis and Modeling, Multiscale Modeling and Simulation, Journal of Scientific Computing

Professional Affiliations

- Women in Numerical Analysis and Scientific Computing (WINASc) July 2022 – Present
- Society for Industrial and Applied Mathematics (SIAM) August 2016 – Present