SON N.T. TU

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December 19, 2024

Research Interests: Hamilton–Jacobi equations, free boundary problems, integro-differential equations, optimal control, homogenization, dynamical systems

Appointments

- *Visiting Assistant Professor* — Aug 2022 – Present
  Department of Mathematics, Michigan State University (MSU), East Lansing, MI
  Mentor: Olga Turanova
- *Teaching Assistant* — 2015 – 2016
  Vietnam National University, Ho Chi Minh City (VNU-HCMC), Vietnam
- *Applied Mathematician and Data Scientist (Internship)* — Jan 2022 – May 2022
  Ordinal Science, Madison, WI

Education

- Mathematics Ph.D., University of Wisconsin-Madison (UW-Madison) — 2016 – 2022
  Advisor: Hung Tran
- B.S. Honor program in Mathematics, University of Science, VNU-HCMC — 2011 – 2015

Publications and Preprints

In Preparation

13. Russell Schwab, **Son N. T. Tu**, and Olga Turanova, *Viscosity Solutions for Integro-Differential equations, revisited*, in preparation (2024).
12. **Son N. T. Tu** and Jianlu Zhang, *Generalized convergence of solutions for nonlinear Hamilton-Jacobi equations in $\mathbb{R}^n$-space*, in preparation (2024).
11. **Son N. T. Tu** and Thu Nguyen, *FinNet: Solving Time-Independent Differential Equations with Finite Difference Neural Network*, preprint (2022) · arXiv:2202.09282 [cs.LG].
10. **Son N. T. Tu** and Jianliang Qian, *A numerical solver for Hamilton–Jacobi equations with implicit state-constraint boundary conditions*, in preparation (2024)

In Submission

9. Russell Schwab, **Son N. T. Tu**, and Olga Turanova, *Well-posedness for viscosity solutions of the one-phase Muskat problem in all dimensions.* Submitted (2024) · arxiv:2404.10972 [math.AP]

Published

8. Bingyang Hu, **Son N. T. Tu**, and Jianlu Zhang, *Polynomial convergence rate for quasiperiodic homogenization of Hamilton–Jacobi equations.* (Accepted) Communications in Partial Differential Equations (2024) · arXiv:2405.11516 [math.AP]
7. **Son N.T. Tu** and Jianlu Zhang, *On the regularity of stochastic effective Hamiltonian.* (To appear) Proceedings of the American Mathematical Society (2024) · arxiv:2312.15649 [math.AP]
6. **Son N.T. Tu** and Jianlu Zhang, *Generalized convergence of solutions for nonlinear Hamilton–Jacobi equations with state-constraint.* Journal of Differential Equations 406 (Oct. 2024), 87-125

5. Farid Bozorgnia, Dohyun Kwon, and **Son N.T. Tu**, *The regularity with respect to domains of the additive eigenvalues of superquadratic Hamilton–Jacobi equation.* Journal of Differential Equations, 402, (Sep. 2024), 518-553

4. Yuxi Han and **Son N.T. Tu**, *Remarks on the vanishing viscosity process of state-constraint Hamilton–Jacobi equations.* Applied Mathematics & Optimization, 86(3) (Jun. 2022)

3. **Son N.T. Tu**, *Vanishing discount for Hamilton–Jacobi equation in nested domains.* Journal of Differential Equations, 317, (Apr. 2022), 32-69

2. Yeon-Eung Kim, Hung Vinh Tran, and **Son N.T. Tu**, *State-constraint static Hamilton–Jacobi equations in nested domains.* SIAM Journal on Mathematical Analysis, 52(5) (Sep. 2020), 4161–4184

1. **Son N.T. Tu**, *Rate of Convergence for Periodic Homogenization of Convex Hamilton–Jacobi Equations in One Dimension.* Asymptotic Analysis, 121(2) (Jan. 2021), 171–194

Refereed conference proceedings & papers

1. Thu Nguyen, Quang M. Le, **Son N.T. Tu**, and Binh Nguyen, *Unequal Covariance Awareness for Fisher Discriminant Analysis and Its Variants in Classification.* 2022 International Joint Conference on Neural Networks (IJCNN), (Jul. 2022)

Awards and Honors

- *Research Travel Support from the Office of Postdoctoral Affairs*, MSU 2024
- *2023–2024 Postdoctoral Prize for Excellence in Teaching*, Department of Mathematics, MSU 2024
- *Teaching Assistant Superior Rating* FA 2017, FA 2018, FA 2019, FA 2020
  Mathematics Department, UW-Madison
- *Graduate Research Travel Grant*, Graduate School, UW-Madison 2021
- *GSSC Fellowship*, Graduate School, UW-Madison 2021
- *Excellence in Research Award*, Mathematics Department, UW-Madison 2020
- *Outstanding Teaching Assistant Award*, Mathematics Department, UW-Madison 2020
- *Vietnam Education Foundation (VEF) Fellowship* (declined) 2016
- *Valedictorian Award*, University of Sciences, VNU-HCMC, Vietnam 2015
- *Third prize, Vietnam Mathematical Olympiad* (VMO) 2011
- *World Finalist*, Shing-Tung Yau High School Mathematics Awards, Beijing, China 2010

Professional Services

- *Referee for Mathematics Journals:* Journal of Mathematical Physics (JMP), Journal of Geometric Analysis (JGA), Discrete and Continuous Dynamical Systems (DCDS), Proceedings of the American Mathematical Society (PAMS)
- *Co-organizer: AMS 2025 Spring Central Sectional Meeting*, University of Kansas Mar 29-30, 2025
- *Co-organizer, Madison PDEs Conference*, UW-Madison
  (Originally scheduled for April 2020; canceled due to COVID-19)
- *Co-organizer, AMS Student Chapter Seminar*, UW-Madison 2018–2019

Teaching Experience

Michigan State University	Role	# Students	Term
Topic in Optimal Control Theory, MTH 496-002 (Capstone course)	Instr. of Record	21	Spring 2025
Multivariable Calculus, MTH 234	Instr. of Record	191	Fall 2024
Matrix Algebra with Computational Applications, MTH/CMSE 314	Instr. of Record	30	Summer 2024
Multivariable Calculus, MTH 234	Instr. of Record	170	Spring 2024
Multivariable Calculus, MTH 234	Instr. of Record	60	Fall 2023
Linear Algebra and Application to Data Science, MTH/CMSE 314	Instr. of Record	60	Spring 2023
Linear Algebra and Application to Data Science, MTH/CMSE 314	Instr. of Record	60	Fall 2022
University of Wisconsin–Madison	Role	# Students	Term
College Algebra, Math 112	Instr. of Record	60	Fall 2021
College Algebra, Math 112	Instr. of Record	30	Spring 2021
Undergraduate PDE, Math 619	Teaching Assistant	~ 30	Spring 2021
Business Calculus, Math 211	Recitation Instr.	~ 30	Fall 2020
Mathematical Analysis I, Math 521	Teaching Assistant	~ 30	Summer 2020
College Algebra, Math 112	Recitation Instr.	~ 60	Fall 2019
Multi-variable Calculus, Algebra & Differential Equations, Math 375	Recitation Instr.	~ 30	Spring 2019
Multi-variable Calculus, Algebra & Differential Equations, Math 376	Recitation Instr.	~ 30	Fall 2018
Business Calculus, Math 211	Recitation Instr.	~ 60	Fall 2017
Linear Algebra & Differential Equations, Math 319	Recitation Instr.	~ 60	Spring 17
Multi-variable Calculus 2, Math 222	Recitation Instr.	~ 60	Fall 2016
Vietnam National University, HCMC	Role	# Students	Term
Calculus II, MATH2153 (Excellent Program - Univ. of Informatics)	Recitation Instr.	~ 60	Spring 2016
Calculus III, MATH253 (Adv. Comp. Sci. - Univ. of Science)	Recitation Instr.	~ 60	Fall 2015

Outreach

- (Scheduled) Interactive STEM demonstration — Mar 2025
  for middle school students, as part of the *Girls Math and Science Day*, MSU
- Lead an interactive STEM demonstration table on "*Soap Bubbles and Minimal Surfaces*" — Mar 09, 2024
  for middle school students, as part of the *Girls Math and Science Day*, MSU
- Judge for *University Undergraduate Research and Arts Forum 2023 (UURAF 2023)*, MSU — Apr 14, 2023

Undergraduate Research Mentoring

- *Undergraduate Research Mentor* for Minh Nguyen, MSU — Summer 2024 – Summer 2025
  Uniqueness set for Hamilton-Jacobi equations with state-constraints
  Awarded *College of Natural Science Undergraduate Research Support Scholarship* for Summer 2024.
- *Directed Studies* (MTH490): Minh Nguyen, MSU — Spring 2024
  Topic: *Optimal control theory and viscosity solutions to Hamilton–Jacobi equations*
  with *Best Presentation Award* at the *21st Math Student Conference*, MSU
- *Directed Reading Program:* William Robert Korbitz and Luanda Cai, UW-Madison — Spring 2019
  Topic: *Optimal Control for Linear Systems*
- *Undergraduate PDEs Summer School:* Daotong Ge and Hangyu Pi, UW-Madison — Summer 2017
  Co-mentored with Hung Tran

Selected Presentations

Selected Invited talks

21. PDEs Seminar, University of Tennessee - Knoxville — Nov 07, 2024
20. Colloquium, Minnesota State University - Mankato — Oct 29, 2024
19. Analysis Seminar, University of Maryland, College Park — Oct 24, 2024
18. Analysis and PDE Seminar, Michigan State University — Oct 16, 2024
17. (Online) Analysis Seminar, Texas Tech University — Oct 14, 2024
16. Mini-workshop: Summer School in PDEs and Applications 2024, VIASM and SGU — Jul 27, 2024
15. (Online) Virtual Student PDEs Seminar, UW–Madison — May 30, 2024
14. PDEs Seminar, The Ohio State University — Apr 09, 2024
13. (Online) Seminars on Analysis and Stochastic Analysis, Auburn University — Mar 27, 2024
12. (Online) Early Career Math Colloquium, University of Arizona — Mar 21, 2024
11. SIAM Great Lakes Meeting (SIAMGL) 2023, Michigan State University — Oct 15, 2023
    Minisymposium: Nonlinear PDEs & Optimal Transport with Applications
10. Differential Equations and Nonlinear Analysis Seminar, North Carolina State University — Nov 09, 2023
9. Applied Analysis Seminar, Stinghua University, China — August 03, 2023
8. Analysis Seminar, University of Science, VNU-HCMC — Jun 20, 2023
7. Madison PDEs Conference, UW-Madison — May 15-19, 2023
6. (Online) Academy of Mathematics and Systems Science, Chinese Academy of Science — Apr 19, 2023
5. (Online) Academy of Mathematics and Systems Science, Chinese Academy of Science — Apr 26, 2023
4. Applied Math Seminar, University of North Carolina - Charlotte — Sep 24, 2021
3. (Online) Graduate School of Mathematical Sciences, The University of Tokyo — Oct 27, 2020
2. PDEs and Geometric Analysis Seminar, UW-Madison — Sep 23, 2019
1. 11th Summer Meeting Conference, University of Science, VNU-HCMC — Jul 30, 2019

Selected Contributed Talks and Posters

8. Poster: IMSI's workshop Mathematical Modeling of Biological Interfacial Phenomena — Dec 09 – 13, 2024
   The Institute for Mathematical and Statistical Innovation, University in Chicago
7. Boston University/Keio University/Stinghua University Workshop 2024 — Jun 01, 2024
   on Differential Equations, Dynamical Systems and Applied Mathematics
6. Analysis and PDE Seminar, Michigan State University — Apr 17, 2024
5. 88th Midwest PDEs Seminar, The Ohio State University — Apr 26 – 28, 2024
4. Poster: 8th Annual Scholar Showcase — Apr 06, 2024
   Office of International Students and Scholars, Michigan State University
3. Concentration week on Geometry and Analysis, University of Texas A&M — Jul 29, 2022
2. Geometric and Harmonic Analysis 2019, University of Connecticut — Mar 30, 2019
1. Poster: CNA Workshop 2019: Mathematical Models for Pattern formation — Mar 08, 2019
   Carnegie Mellon University

Selected Conferences, Workshops Attended, & Research Visits

5. (Scheduled) AIM workshop: *Integro-differential equations in many-particle interacting systems* Apr 14 – 18, 2025
   American Institute of Mathematics
   Richard N. Merkin Center for Pure and Applied Mathematics, Caltech
4. (Scheduled) AMS 2025 Spring Central Sectional Meeting, University of Kansas Mar 29-30, 2025
3. IMSI's workshop *Mathematical Modeling of Biological Interfacial Phenomena* Dec 09 – 13, 2024
   The Institute for Mathematical and Statistical Innovation, University in Chicago
2. University of Seoul, hosted by Dohyun Kwon Jul 04 – 08, 2024
1. Chinese Academy of Science, hosted by Jianlu Zhang Jul 26 – Aug 07, 2023

Other Skills

- Computing Proficiency: Python, Matlab, Linux