SON N.T. TU

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Research Interest

- Nonlinear partial differential equations, free boundary problems, Hamilton-Jacobi equations, optimal control, homogenization, dynamical systems.

Academic Appointments

- *Visiting Assistant Professor*. Department of Mathematics, Michigan State University, East Lansing, MI. August 2022 - present. Mentor: Olga Turanova.

Education

- University of Wisconsin-Madioson, Madison, WI.
  Mathematics Ph.D., received August 2022. Advisor: Hung Vinh Tran.
- University of Science, Vietnam National University, Ho Chi Minh City.
  Mathematics B.S., received October 2015; honors in Mathematics & Computer Science.

Publications and Preprints

Journals and preprints.

9. Bingyang Hu, Son N. T. Tu, and Jianlu Zhang.
   Polynomial convergence rate for quasiperiodic homogenization of Hamilton–Jacobi equations.
   Submitted (2024), arXiv:2405.11516 [math.AP].

8. 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].

7. Son N.T. Tu and Jianlu Zhang.
   On the regularity of stochastic effective Hamiltonian
   Submitted (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

- *2023 – 2024 Postdoctoral Prize for Excellence in Teaching* with the Department of Mathematics at Michigan State University.
- Awarded superior rating for teaching by UW-Madison Math Department (Fall 2017, Fall 2018, Fall 2019, and Fall 2020) as a Teaching Assistant.
- 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, nominee (2016).
- Valedictorian Award, University of Sciences, Vietnam National University, HCMC, (2015).
- Third prize, Vietnam Mathematical Olympiad (VMO), (2011).
- World Finalist, Shing-Tung Yau High School Mathematics Awards, Beijing, China, (2010).

Outreach, Research Mentoring and Service

- *Undergraduate research:* Minh Nguyen (MSU), Uniqueness set for Hamilton-Jacobi equation with state-constraint, Summer 2024.
- *Directed Studies* (undergraduate): Minh Nguyen (MSU), Optimal control theory and viscosity solution to Hamilton-Jacobi equation, Spring 2024, with *Best Presentation Award* at the 21st Math Student Conference, MSU.
- Leading an interactive STEM demonstration table on "Soap Bubbles and Minimal Surfaces" for middle school students, as part of the Girls Math and Science Day Committee, on March 9, 2024, MSU.
- Referee for mathematics journal:

  - *The Journal of Geometric Analysis* (`https://www.springer.com/journal/12220`)
  - *Discrete and Continuous Dynamical Systems* (`https://www.aimsciences.org/DCDS`)
- Judging for UURAF 2023 (*University Undergraduate Research and Arts Forum 2023*), MSU.
- Co-organizer, *AMS Student Chapter Seminar*, UW-Madison from 2018-2019.
- *Directed Reading Program:* UW-Madison, Spring 2019. Mentoring two undergraduate students at UW-Madison: William Robert Korbitz and Luanda Cai on Optimal Control for linear systems.
- *Undergraduate PDE summer school*, UW-Madison, Summer 2017. Served as an assistant mentor for Hung Tran, mentoring two undergraduate students at UW-Madison: Daotong Ge and Hangyu Pi.

Research Visits

3. University of Seoul, July 4 - 8, 2024, hosted by Dohyun Kwon.
2. North Carolina State University, November 6 - 9, 2023, hosted by Khai Nguyen.
1. Chinese Academy of Science, July 26 - August 7, 2023, hosted by Jianlu Zhang.

Talks

28. *Remarks on the well-posedness of Viscosity Solutions for the One-Phase Muskat Problem*, Mini-workshop, Summer school in PDE and Application 2024, Vietnam Institute for Advanced Study in Mathematics (VIASM) and Saigon University (SGU) (July 27, 2024).
27. *Convergence Rate for* 1D *Quasi-Periodic Homogenization of Hamilton-Jacobi Equations*,

    Boston University/Keio University/Stinghua University Workshop 2024 on Differential Equations, Dynamical Systems and Applied Mathematics, Boston University (June 1, 2024).
26. *Convergence Rate for* 1D *Quasi-Periodic Homogenization of Hamilton-Jacobi Equations*, Virtual student PDE seminar, University of Wisconsin – Madison (May 30, 2024).
25. *Convergence Rate for* 1D *Quasi-Periodic Homogenization of Hamilton-Jacobi Equations*, 88^{th} Midwest PDE seminar, The Ohio State University (Apr 26, 2024).
24. *Convergence Rate for 1D Quasi-Periodic Homogenization of Hamilton-Jacobi Equations*, Analysis and PDE seminar, Michigan State University (Apr, 17 2024).
23. *Properties of the effective Hamiltonian and homogenization of the Hamilton-Jacobi equation*, PDE seminar, The Ohio State University (Apr 9, 2024).
22. *Poster: On the regularity of the stochastic Hamiltonian*, 8th Annual Scholar Showcase: Office of International Students and Scholars, Michigan State University (April 6 2024).
21. *Properties of the effective Hamiltonian and homogenization of the Hamilton-Jacobi equation*, Seminars on Analysis and Stochastic Analysis, Auburn University (Mar 27 2024).
20. *Properties of the effective Hamiltonian and homogenization of the Hamilton-Jacobi equation*, Early Career Math Colloquium, University of Arizona (Mar 21 2024).
19. *Generalized Convergence of Hamilton–Jacobi equations with state-constraint*, Differential Equations and Nonlinear Analysis seminar, North Carolina State University (Nov 9 2023).
18. *Remarks on the rate of convergence for vanishing viscosity procedure*, Minisymposium: Recent Advances in the Analysis of Partial Differential Equations, SIAM Great Lakes Meeting (SIAMGL) 2023, Michigan State University (Oct 2023).

17. *Generalized convergence of solutions to contact Hamilton–Jacobi equations with state-constraint*, Minisymposium: Nonlinear partial differential equations and optimal transport with applications , SIAM Great Lakes Meeting (SIAMGL) 2023, Michigan State University (Oct 15 2023).
16. *Generalized convergence of solutions to contact Hamilton–Jacobi equations with state-constraint*, Applied Analysis seminar, Stinghua University (August 2023).
15. *Generalized convergence of solutions to contact Hamilton–Jacobi equations with state-constraint*, Analysis Seminar, University of Science, Vietnam National University (June 2023).
14. *Generalized convergence of solutions to contact Hamilton–Jacobi equations with state-constraint*, Madison PDEs conference, UW-Madison (May 2023).
13. **Online** *The regularity with respect to domains of the additive eigenvalues of superquadratic Hamilton–Jacobi equation*, Academy of Mathematics and Systems Science, Chinese Academy of Science (Apr 2023).
12. **Online** *Remarks on the rate of convergence for vanishing viscosity procedure*, Academy of Mathematics and Systems Science, Chinese Academy of Science (Apr 2023).
11. *Remarks on rate of vanishing viscosity for Hamilton–Jacobi equations*, Concentration week on Geometry and Analysis, University of Texas A&M (Jul 2022).
10. *Remarks on the rate of convergence for vanishing viscosity procedure, Physical Applied Math Seminar*, UW-Madison (Oct 2021).
9. *Remarks on the rate of convergence for vanishing viscosity procedure*, Applied Math Seminar, UNC-Charlotte (Sep 2021).
8. **Online** *Vanishing discount problems for Hamilton–Jacobi equations on changing domains*, Graduate School of Mathematical Sciences, The University of Tokyo (Oct 2020).
7. *Two-scale convergence and homogenization*, Physical Applied Math seminar, UW-Madison (Apr 2020).
6. *State constraints static Hamilton–Jacobi equations in nested domains*, Physical Applied Math seminar UW-Madison, (Sep 2019).
5. *State constraints static Hamilton–Jacobi equations in nested domains*, PDE and Geometric Analysis seminar, UW-Madison (Sep 2019).
4. *State constraints static Hamilton–Jacobi equations in nested domains*, Summer meeting 2019, University of Science, Vietnam National University (Jul 2019).
3. Contributed Talk: *Some recent works on homogenization of Hamilton–Jacobi equations*, Geometric and Harmonic Analysis 2019, University of Connecticut (Mar 2019).
2. *Poster: Homogenization of Hamilton–Jacobi equation: Rate of convergence*, CNA Workshop 2019: Mathematical Models for Pattern formation, Carnegie Mellon University (Mar 2019).
1. *Rate of convergence for periodic homogenization of convex Hamilton–Jacobi equations in one dimension*, Physical Applied Math seminar, UW-Madison (Sep 2018).

Teaching

Michigan State University.

- Summer 2024: Matrix Algebra with Computational Applications, MTH/CMSE 314, one sections.
- Spring 2024: Directed Studies, MTH 490: Optimal Control Theory and Hamilton–Jacobi equations.
- Spring 2024: Multivariable Calculus, MTH 234, large lecture.
- Fall 2023: Multivariable Calculus, MTH 234, two sections.
- Spring 2023: Linear Algebra and Application to Data Science, MTH/CMSE 314, two sections.
- Fall 2022: Linear Algebra and Application to Data Science, MTH/CMSE 314, one section.

University of Wisconsin–Madison.

- Instructor: Summer 2021, Fall 2021: College algebra, Math 112.
- Teaching Assistant:
  - Spring 2021: Undergraduate PDE, Math 619.
  - Summer 2020: Mathematical Analysis I, Math 521.
  - Fall 2020: Business Calculus, Math 211.
  - Fall 2019: College algebra, Math 112.
  - Fall 2018, Spring 2019: Multi-variable Calculus, Algebra & Differential Equations, Math 375, 376.
  - Fall 2017: Business Calculus, Math 211.
  - Spring 2017: Linear Algebra & Differential Equations, Math 319.
  - Fall 2016: Calculus 2, Math 222.

Vietnam National University.

- 2015–2016: Teaching assistant for MATH2153 (Calculus II), MH253 (Calculus III), Vietnam National University, HCMC.