SON N.T. TU

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September 03, 2024

Research Interest

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

Academic Appointments

- 08/2022 - Present, *Visiting Assistant Professor*, Department of Mathematics, Michigan State University, East Lansing, MI. Mentor: Prof. Dr. Olga Turanova.
- 08/2015 - 05/2016, *Teaching Assistant*, Vietnam National University, Ho Chi Minh City.

Education

- 2016 - 2022, Mathematics Ph.D., University of Wisconsin-Madison, US. Advisor: Prof. Dr. Hung Tran.

- 2011 - 2015, B.S. Honor program in Mathematics, University of Science, Vietnam National University, Ho Chi Minh City. Advisor: Prof. Dr. Khai Nguyen.

Publications and Preprints

In preparation.

11. Russell Schwab, Son N. T. Tu, and Olga Turanova, *Viscosity Solutions for Integro-Differential equations, revisited*, in preparation (2024).

10. Son N. T. Tu and Jianlu Zhang, *Generalized convergence of solutions for nonlinear Hamilton-Jacobi equations in $\mathbb{R}^n$-space*, in preparation (2024).

Submitted.

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].

Published.

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*, Department of Mathematics, Michigan State University (2024).

- 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*, declined (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

- *Coorganizer: AMS 2025 Spring Central Sectional Meeting*, University of Kansas, March 29-30, 2025.

- *Mentoring Undergraduate research:* Minh Nguyen (MSU), Uniqueness set for Hamilton-Jacobi equation with state-constraint, Summer 2024 – Summer 2025.

- *Mentoring 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:* Journal of Mathematical Physics, The Journal of Geometric Analysis, Discrete and Continuous Dynamical Systems, Proceedings of the American Mathematical Society.

- *Judging for University Undergraduate Research and Arts Forum 2023* (UURAF 2023), MSU.

- *Coorganizer, 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

4. University of Seoul, July 4 - 8, 2024, hosted by Dohyun Kwon.

3. North Carolina State University, November 6 - 9, 2023, hosted by Khai Nguyen.

2. Chinese Academy of Science, July 26 - August 7, 2023, hosted by Jianlu Zhang.

1. The University of North Carolina at Charlotte, September 2021, hosted by Loc Nguyen.

Selected Presentations

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*, 88th 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.

- Fall 2024: Multivariable Calculus, MTH 234, large lecture, 197 students.

- 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, 170 students.

- 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.