

# 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-Madison, 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. Russell Schwab, Son N. T. Tu and Olga Turanova. *Well-posedness for the one-phase Muskat problem in all dimensions.* In preparation (2024).
8. Son N. T. Tu, Bingyang Hu and Jianlu Zhang. *On the rate of convergence for homogenization of Hamilton–Jacobi equation in one-dimensional almost-periodic setting.* In preparation (2024).
7. Son N.T. Tu and Jianlu Zhang.  
*On the regularity of stochastic effective Hamiltonian*  
Submitted (2023), <https://arxiv.org/abs/2312.15649>.
6. Son N.T. Tu and Jianlu Zhang.  
*Generalized convergence of solutions for nonlinear Hamilton–Jacobi equations with state-constraint.*  
Submitted (2023), arXiv:2303.17058.
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.*  
Submitted (2022), arXiv:2210.05544.
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, 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).

### Talks

22. **Scheduled** PDE seminar, Ohio State University (Apr 9 2024).
21. **Invited talk:** *Properties of the effective Hamiltonian and homogenization of the Hamilton-Jacobi equation*, Seminars on Analysis and Stochastic Analysis, Auburn University (Mar 27 2024).
20. **Invited talk:** *Properties of the effective Hamiltonian and homogenization of the Hamilton-Jacobi equation*, Early Career Math Colloquium, University of Arizona (Mar 21 2024).
19. **Invited talk:** *Generalized Convergence of Hamilton–Jacobi equations with state-constraint*, Differential Equations and Nonlinear Analysis seminar, North Carolina State University (Nov 2023).
18. **Invited talk:** *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. **Invited talk:** *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 2023).
16. **Invited talk:** *Generalized convergence of solutions to contact Hamilton–Jacobi equations with state-constraint*, Applied Analysis seminar, Stingham University (August 2023).
15. **Invited talk:** *Generalized convergence of solutions to contact Hamilton–Jacobi equations with state-constraint*, Analysis Seminar, University of Science, Vietnam National University (June 2023).
14. **Invited talk:** *Generalized convergence of solutions to contact Hamilton–Jacobi equations with state-constraint*, Madison PDEs conference, UW-Madison (May 2023).
13. **Online Invited talk:** *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 Invited talk:** *Remarks on the rate of convergence for vanishing viscosity procedure*, Academy of Mathematics and Systems Science, Chinese Academy of Science (Apr 2023).
11. **Contributed Talk:** *Remarks on rate of vanishing viscosity for Hamilton–Jacobi equations*, Concentration week on Geometry and Analysis, University of Texas A&M (Jul 2022).
10. **Invited talk:** *Remarks on the rate of convergence for vanishing viscosity procedure*, Physical Applied Math Seminar, UW-Madison (Oct 2021).
9. **Invited talk:** *Remarks on the rate of convergence for vanishing viscosity procedure*, Applied Math Seminar, UNC-Charlotte (Sep 2021).
8. **Online Invited talk:** *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. **Invited talk:** *State constraints static Hamilton–Jacobi equations in nested domains*, PDE and Geometric Analysis seminar, UW-Madison (Sep 2019).
4. **Invited talk:** *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. **Invited talk:** *Rate of convergence for periodic homogenization of convex Hamilton–Jacobi equations in one dimension*, Physical Applied Math seminar, UW-Madison (Sep 2018).

## Outreach, Research Mentoring and Service

- Undergraduate research: Minh Nguyen (MSU), uniqueness set for Hamilton–Jacobi equation with state-constraint, 2024.
- 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.
- *Directed Studies:* MTH490 Spring 2024: Optimal Control Theory and Hamilton–Jacobi equations: mentoring one undergraduate, Michigan State University.

- Referee for mathematics journal:
  - *The Journal of Geometric Analysis* (<https://www.springer.com/journal/12220>)
  - *Discrete and Continuous Dynamical Systems* (<https://www.aims sciences.org/DCDS>)
- Judging for UURAF 2023 (*University Undergraduate Research and Arts Forum 2023*).
- 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.

## Teaching

### Michigan State University.

- 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.