

# SON N.T. TU

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**Research Interest:** Hamilton-Jacobi equations , free boundary problems, integro-differential partial differential equation, 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 Submission and 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).
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

- *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, UW-Madison Math Department (FA 2017, FA 2018, FA 2019, FA 2020)*
- *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

- *Referee for mathematics journal:* Journal of Mathematical Physics, The Journal of Geometric Analysis, Discrete and Continuous Dynamical Systems, Proceedings of the American Mathematical Society.
- *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.
- *Judging for University Undergraduate Research and Arts Forum 2023 (UURAF 2023), MSU.*
- Co-organizer, Madison PDEs Conference, UW-Madison (originally scheduled for April 2020, canceled due to COVID).
- *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.

## Selected Presentations

### *Selected Invited talks*

17. Mini-workshop, Summer School in PDE and Application 2024, VIASM and SGU  
*Remarks on the well-posedness of Viscosity Solutions for the One-Phase Muskat Problem* 07-27-2024
16. **Online** Virtual Student PDE Seminar, UW–Madison 05-30-2024  
*Convergence Rate for 1D Quasi-Periodic Homogenization of Hamilton-Jacobi Equations*

15. Analysis and PDE Seminar, Michigan State University 04-17- 2024  
*Convergence Rate for 1D Quasi-Periodic Homogenization of Hamilton-Jacobi Equations*
14. PDE Seminar, The Ohio State University 04-09-2024  
*Properties of the effective Hamiltonian and homogenization of the Hamilton-Jacobi equation*
13. Seminars on Analysis and Stochastic Analysis, Auburn University 03-27-2024  
*Properties of the effective Hamiltonian and homogenization of the Hamilton-Jacobi equation*
12. **Online** Early Career Math Colloquium, University of Arizona 21-03-2024  
*Properties of the effective Hamiltonian and homogenization of the Hamilton-Jacobi equation*
11. Differential Equations and Nonlinear Analysis Seminar, North Carolina State University 09-11-2023  
*Generalized Convergence of Hamilton–Jacobi equations with state-constraint*
10. SIAM Great Lakes Meeting (SIAMGL) 2023, Michigan State University 15-10-2023  
Minisymposium: Nonlinear partial differential equations and optimal transport with applications  
*Generalized convergence of solutions to contact Hamilton–Jacobi equations with state-constraint*
9. Applied Analysis Seminar, Stingham University 09-2023  
*Generalized convergence of solutions to contact Hamilton–Jacobi equations with state-constraint*
8. Analysis Seminar, University of Science, Vietnam National University 06-2023  
*Generalized convergence of solutions to contact Hamilton–Jacobi equations with state-constraint*
7. Madison PDEs Conference, UW-Madison 05-17-2023  
*Generalized convergence of solutions to contact Hamilton–Jacobi equations with state-constraint,*
6. **Online** Academy of Mathematics and Systems Science, Chinese Academy of Science 04-2023  
*The regularity with respect to domains of the additive eigenvalues of superquadratic Hamilton–Jacobi equation*
5. **Online** Academy of Mathematics and Systems Science, Chinese Academy of Science 04-2023  
*Remarks on the rate of convergence for vanishing viscosity procedure*
4. Applied Math Seminar, UNC-Charlotte 09-2021)  
*Remarks on the rate of convergence for vanishing viscosity procedure*
3. **Online** Graduate School of Mathematical Sciences, The University of Tokyo 10-2020  
*Vanishing discount problems for Hamilton–Jacobi equations on changing domains*
2. PDE and Geometric Analysis Seminar, UW-Madison 09-2019  
*State constraints static Hamilton–Jacobi equations in nested domains*
1. Summer meeting 2019, University of Science, Vietnam National University 30-07-2019  
*State constraints static Hamilton–Jacobi equations in nested domains*

*Selected Contributed Talks and Posters*

6. Boston University /Keio University /Stingham University Workshop 2024 06-01-2024  
on Differential Equations, Dynamical Systems and Applied Mathematics  
*Convergence Rate for 1D Quasi-Periodic Homogenization of Hamilton-Jacobi Equations*
5. 88<sup>th</sup> Midwest PDE seminar, The Ohio State University 26-04-2024  
*Convergence Rate for 1D Quasi-Periodic Homogenization of Hamilton-Jacobi Equations*
4. **Poster:** 8th Annual Scholar Showcase: Office of International Students and Scholars, MSU 06-04-2024  
*On the regularity of the stochastic Hamiltonian*
3. Concentration week on Geometry and Analysis, University of Texas A&M 07-29-2022  
*Remarks on rate of vanishing viscosity for Hamilton–Jacobi equations*
2. Geometric and Harmonic Analysis 2019, University of Connecticut 03-2019  
*Some recent works on homogenization of Hamilton–Jacobi equations*
1. **Poster:** CNA Workshop 2019: Mathematical Models for Pattern formation 03-2019  
Carnegie Mellon University, *Homogenization of Hamilton–Jacobi equation: Rate of convergence*

## Teaching Experience

<b>Michigan State University</b>	Role	# Students	Term
Multivariable Calculus, MTH 234	Instr. of Record	191	FA 24
Matrix Algebra with Computational Applications, MTH/CMSE 314	Instr. of Record	30	SS 24
Multivariable Calculus, MTH 234	Instr. of Record	170	SP 24
Multivariable Calculus, MTH 234	Instr. of Record	60	FA 23
Linear Algebra and Application to Data Science, MTH/CMSE 314	Instr. of Record	60	SP 23
Linear Algebra and Application to Data Science, MTH/CMSE 314	Instr. of Record	60	FA 22
<b>University of Wisconsin–Madison</b>	Role	# Students	Term
College Algebra, Math 112	Instr. of Record	60	FA 21
College Algebra, Math 112	Instr. of Record	30	SS 21
Undergraduate PDE, Math 619	Teaching Assistant	~ 30	SP 21
Business Calculus, Math 211	Recitation Instr.	~ 30	FA 20
Mathematical Analysis I, Math 521	Teaching Assistant	~ 30	SS 20
College Algebra, Math 112	Recitation Instr.	~ 60	FA 19
Multi-variable Calculus, Algebra & Differential Equations, Math 375	Recitation Instr.	~ 30	SP 19
Multi-variable Calculus, Algebra & Differential Equations, Math 376	Recitation Instr.	~ 30	FA 18
Business Calculus, Math 211	Recitation Instr.	~ 60	FA 17
Linear Algebra & Differential Equations, Math 319	Recitation Instr.	~ 60	SP 17
Multi-variable Calculus 2, Math 222	Recitation Instr.	~ 60	FA 16
<b>Vietnam National University</b>	Role	# Students	Term
Calculus II, MATH2153 (Excellent Program - Univ. of Informatics)	Recitation Instr.	~ 60	SP 16
Calculus III, MATH253 (Adv. Comp. Sci. - Univ. of Science)	Recitation Instr.	~ 60	FA 15