Tan Cao

Curriculum Vitae

SUNY Korea
Department of Applied Mathematics and Statistics
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Research Interests

Optimization; Optimal Control; Nonsmooth Analysis and Differential Inclusions; Variational Analysis; Sweeping Processes; Reinforcement Learning.

Professional Appointments

2017–present **Associate Professor**, *SUNY Korea*, Applied Mathematics and Statistics
- Teach undergraduate courses in calculus, numerical analysis, discrete mathematics, and optimization.
- **Undergraduate Program Director**: academic advising and course-registration support for AMS students.
- **Chair of CEFW**: committee coordination on faculty evaluation, review, and academic governance.

2016–2017 **Mathematics Lecturer**, *Vietnamese-German University*, Ho Chi Minh City, Vietnam
- Developed and taught mathematics courses for the Foundation Year program.

Education

Aug 2016 **Ph.D. in Applied Mathematics**, *Wayne State University*, Detroit, MI, USA
Dissertation: *Optimal Control of a Perturbed Sweeping Process with Applications to the Crowd Motion Model*. Advisor: Prof. Boris Mordukhovich.

Jul 2009 **M.S. in Mathematics and Applications**, *University of Orléans*, France
Thesis: *Amenable groups*. Advisor: Prof. Indira Lara Chatterji.

Aug 2008 **B.S. in Mathematics**, *HCMC University of Pedagogy*, Vietnam
Thesis: *Numerical method in extremal problems*. Advisor: Prof. Dieu T. Cong.

Research Grants

2020–2023 **Basic Research Program (), National Research Foundation of Korea (NRF)**, *Principal Investigator, SUNY Korea*
Project: *Optimal Control of the Sweeping Process and Its Applications*. Total budget: 165,000,000 KRW (June 1, 2020 – February 28, 2023).

2026–2030 **Basic Research Program B (B), National Research Foundation of Korea (NRF)**, *SUNY Korea*
Grant application submitted; currently under review.

Awards and Honors

2016 Karl W. and Helen L. Folley Endowed Scholarship (Wayne State University).

2015 Nominated for the Heberlein Excellence in Teaching Award for Graduate Students (Wayne State University).

2015 AMS Travel Grant Support (Wayne State University).

2015 Karl W. and Helen L. Folley Endowed Scholarship (Wayne State University).

2011–2016 Graduate Teaching Assistant (Wayne State University).

2005–2008 University Monthly Scholarship for Excellent Students (HCMC University of Pedagogy).

2003–2004 Second Prize, Mathematics Competition of Ho Chi Minh City for High School Students.

2002–2003 Silver Medal, Southern Vietnam Mathematical Olympiad for High School Students.

Publications

Published / accepted.

1. **T. H. Cao**, B. S. Mordukhovich, D. Nguyen, T. Nguyen, and N. N. Thieu, *Optimal Control of Nonconvex Sweeping Processes with Variable Time via Finite-Difference Approximations*, accepted in *Nonlinear Analysis: Hybrid Systems* (2026).
2. **T. H. Cao**, Nilson Chapagain, Kangmin Cho, Haejoon Lee, Phung Ngoc Thi, and Nguyen Nang Thieu, *Optimal Control of Several Motion Models*, *Journal of Optimization Theory and Applications*, 205(3), 2025; Link.
3. **T. H. Cao**, Nathalie T. Khalil, Boris S. Mordukhovich, Dao Nguyen, and Fernando Lobo Pereira, *Crowd motion paradigm modeled by a bilevel sweeping control problem*, *IEEE Control Systems Letters*, 6 (2021), 385–390.
4. **T. H. Cao**, Nathalie T. Khalil, Boris S. Mordukhovich, Dao Nguyen, Trang Nguyen, and Fernando Lobo Pereira, *Optimization of controlled free-time sweeping process with applications to marine surface vehicle modeling*, *IEEE Control Systems Letters*, 6 (2021), 782–787.
5. **T. H. Cao**, Giovanni Colombo, Boris S. Mordukhovich, Dao Nguyen, and Trang Nguyen, *Applications of controlled sweeping processes to nonlinear crowd motion models with obstacles*, *IEEE Control Systems Letters*, 6 (2021), 740–745.
6. **T. H. Cao**, G. Colombo, B. S. Mordukhovich, and D. Nguyen, *Optimization of Fully Controlled Sweeping Processes*, *J. Differential Equations*, 295 (2021), 138–186.
7. **T. H. Cao**, G. Colombo, B. S. Mordukhovich, and D. Nguyen, *Optimization and discrete approximation of sweeping processes with controlled moving sets and perturbations*, *J. Differential Equations*, 274 (2021), 461–509.
8. **T. H. Cao** and B. S. Mordukhovich, *Applications of optimal control of a nonconvex sweeping process to optimization of the planar crowd motion model*, *Discrete and Continuous Dynamical Systems, Series B*, 24 (2019), 4191–4216.
9. **T. H. Cao** and B. S. Mordukhovich, *Optimal control of a nonconvex perturbed sweeping process*, *J. Differential Equations*, 266 (2019), 1003–1050.
10. **T. H. Cao** and B. S. Mordukhovich, *Optimality conditions for a controlled sweeping process with applications to the crowd motion model*, *Discrete and Continuous Dynamical Systems, Series B*, 21 (2017), 267–306.
11. **T. H. Cao** and B. S. Mordukhovich, *Optimal control of a perturbed sweeping process via discrete approximations*, *Discrete and Continuous Dynamical Systems, Series B*, 21 (2016), 3039–3053.

Submitted / under review.

- **T. H. Cao** and H. Saoud, *Convergence and Stability of a Catching-Up Algorithm for Differential Inclusions with Maximal Monotone Operators*, submitted to *Applied Mathematics and Optimization* (2026).

In preparation.

- **T. H. Cao**, B. S. Mordukhovich, T. Nguyen, and T. Phung, *Optimality Conditions for Nonconvex Sweeping Processes with Variable Time*.
- **T. H. Cao** and L. Vu, *Policy Gradient Method for the Mean-Variance Portfolio Optimization Problem under Regime-Switching Dynamics*.

Ongoing Research with Collaborators

- Bilevel optimal control of sweeping processes and applications.
- Applications of controlled sweeping processes to robotics.
- Optimal control of nonconvex sweeping processes with variable time.
- Catching-up algorithm with errors for sweeping processes driven by a fixed set.
- Nonlinear crowd motion models with obstacles.
- Optimal control of ODE systems with hysteresis via discrete approximations.
- Policy gradient methods for mean-variance portfolio optimization under regime-switching dynamics (with L.

Vu).

Student Supervision

Supervised **7** undergraduate students, **2** master students, **2** Ph.D. students, and **1** postdoctoral researcher.

Recent supervision (2024–2026).

- Geon Myeong Lee (AMS 487, Fall 2024) — Machine Learning Specialization.
- Jaewoo Yoo, Jibaek Jang, Jung Min Nam (AMS 487, Spring 2025).
- Se Jin Kim (AMS 487, Fall 2025) — optimal control; Jaewon Bae (AMS 487, Fall 2025) — convex optimization and reinforcement learning.
- Min Kim (AMS 487, Spring 2026).

Previous students and trainees.

- Thieu Nguyen (postdoctoral researcher; Ph.D., University of Limoges).
- Thi Phung (M.S., Vietnamese-German University; Ph.D. student, Wayne State University).
- Jinwoo Choi (AMS; M.S., Columbia University).
- Kangmin Cho (M.S. student, AMS); Nilson Chapagain (AMS); Haejoon Lee (AMS).
- Hansol Lim, Jiung Seo, Sinae Hong, Biniam Markos, Abhishek Kafle (MEC/AMS).

Referee Services

Completed **10** peer reviews across **7** journals/grants (2026 annual report). Journals include:

- *Journal of Optimization Theory and Applications*
- *Applied Mathematics & Optimization*
- *Applied Mathematical Modelling*
- *Evolution Equations and Control Theory*
- *Journal of Global Optimization*
- *Nonlinear Differential Equations and Applications*
- *Numerical Algorithms*; *Optimization Letters*; *Set-Valued Analysis*; *Acta Mathematica Scientia*

Conferences, Workshops, and Invited Talks

Oct 2026	International Workshop on Optimization, Variational Analysis and Control Theory (OVACT 2026), Hanoi, Vietnam — invited talk.
Dec 2025	Invited seminar: *The Fastest Path: From the Brachistochrone to Optimizing Crowd Dynamics*, Can Tho University, Vietnam.
Jul 2025	Workshop on Applied Mathematics 2025, Ton Duc Thang University (Khanh Hoa Campus), Vietnam — invited talk.
Sep 2024	International Conference on Control of State-Constrained Dynamical Systems, Padua, Italy.
Jul 2023	International Conference on Optimization and Variational Analysis with Applications, Hanoi, Vietnam.
Dec 2021	60th IEEE Conference on Decision and Control (CDC 2021), Austin, Texas, USA — co-organizer and co-chair, sessions on Learning-Based Control and Sweeping Processes I/II.
Sep 2019	International School and Workshop on Control of State-Constrained Dynamical Systems, Valparaíso, Chile.

Administrative Duties and University Service

Chair of CEFW; Undergraduate Program Director; academic advising; recommendation letters for graduate study and scholarships (per 2025–2026 annual reports).

Teaching Experience

Spring 2026	AMS 261 (Multivariable Calculus); AMS 326 (Numerical Analysis) — SUNY Korea.
Fall 2025	AMS 261 (Applied Calculus III); AMS 361 (Applied Calculus IV: Differential Equations) — SUNY Korea.
Spring 2025	AMS 301 (Finite Mathematical Structures); AMS 326 (Numerical Analysis) — SUNY Korea.
Fall 2024	AMS 301 (Finite Mathematical Structures); AMS 341 (Operations Research I) — SUNY Korea.
2017–2023	AMS 161, 210, 261, 261-REC, 301, 326, 341, 361 (various semesters) — SUNY Korea.
Fall 2016	Precalculus — Vietnamese-German University.
2012–2016	MAT/STA courses — Wayne State University.

Online Courses and Certificates

- Agentic AI (DeepLearning.AI), completed May 2026.
- Applied Data Science Program (MIT Professional Education), completed Nov 2024 – Mar 2025.
- Optimal Control & Reinforcement Learning (Carnegie Mellon University).
- Deep Reinforcement Learning (Hugging Face); AI Nanodegree; Deep RL Nanodegree (Udacity).
- Selected Coursera courses (2025–2026): AI Tools (Google); Prompt Engineering; Mathematics for Machine Learning; ChatGPT for Developers; Innovative Teaching with ChatGPT.
- Control of Mobile Robots; Traffic Management and Control.

References

- **Boris Mordukhovich, Distinguished University Professor** (Wayne State University). boris@math.wayne.edu. http://borismordukhovich.com.
- **Giovanni Colombo, Professor** (University of Padova). colombo@math.unipd.it. http://www.math.unipd.it/~colombo/.
- **Samir Adly, Full Professor** (Université de Limoges). samir.adly@unilim.fr.
- **Yuri S. Ledyaev, Professor** (Western Michigan University). ledyaev@wmich.edu.
- **Lionel Thibault, Professor** (Université de Montpellier II). lionel.thibault@univ-montp2.fr.
- **Pei-yong Wang, Professor** (Wayne State University). pywang@math.wayne.edu.