Di Hou

National University of Singapore

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Appointments

Research Fellow (Postdoctoral) 2026 – 2027 (expected)
Department of Mathematics, National University of Singapore Singapore
Advisor: Prof. Kim-Chuan Toh

Education

Ph.D. in Mathematics | Advisor: Prof. Kim-Chuan Toh 2022 - 2026
Department of Mathematics, National University of Singapore, Singapore

Bachelor of Science in Mathematics (Honors) 2018 - 2022
Department of Mathematics, Jilin University, Changchun, China

Research Interests

- Mathematical Optimization
- Scientific Computing

Publications

[1] Di Hou, Tianyun Tang, Kim-Chuan Toh, Shiwei Wang. On the efficient computation of proximal operators of affine-constrained nonconvex functions.
Mathematics of Operations Research (2026), published online. [DOI]

[2] Di Hou, Tianyun Tang, Kim-Chuan Toh. A low-rank augmented Lagrangian method for Polyhedral-SDP and Moment-SOS relaxations of polynomial optimization.
Mathematical Programming (2026), pp. 1–53. [DOI]

[3] Di Hou, Tianyun Tang, Kim-Chuan Toh. RiNNAL+: a Riemannian ALM solver for SDP-RLT relaxations of mixed-binary quadratic programs.
Mathematical Programming Computation, 18 (2026), pp. 679–735. [DOI]

[4] Di Hou, Tianyun Tang, Kim-Chuan Toh. A low-rank augmented Lagrangian method for doubly nonnegative relaxations of mixed-binary quadratic programs.
Operations Research, 74(3) (2025), pp. 1626–1647. [DOI]

[5] Di Hou, Ling Liang, Kim-Chuan Toh. A sparse smoothing Newton method for solving discrete optimal transport problems.
ACM Transactions on Mathematical Software, 50(3) (2024), pp. 1–26. [DOI]

[6] Jinda Yang, Haiming Song, Xinxin Li, Di Hou. Block mirror stochastic gradient method for stochastic optimization.
Journal of Scientific Computing, 94, Article 69 (2023). [DOI]

Preprints

Manuscripts are available upon request. * Corresponding author.

[1] Di Hou, Kim-Chuan Toh. A logarithmic-dual-update Bregman ADMM for optimal transport.
Mathematical Programming, submitted. [arXiv]

[2] Kristo Nugraha Lian, Nehal Ahmed Shaikh, Di Hou*, Xingyu Xie, Kim-Chuan Toh. McADMM: A Multi-Clique Augmented Lagrangian-Based Algorithm for Large-Scale Sparse SDPs with Bound Constraints.
ACM Transactions on Mathematical Software, submitted. [arXiv]

[3] Lei Yang, Haihang Lan, Di Hou*, Ling Liang, Kim-Chuan Toh. An inexact Halpern-accelerated preconditioned generalized proximal point algorithm for the maximal monotone inclusion problem.
Journal of Scientific Computing, submitted. [arXiv]

[4] Di Hou, Kim-Chuan Toh. A dual-certificate procedure for cut generation and presolving in polynomial optimization.
SIAM Journal on Optimization, submitted.

[5] Nachuan Xiao, Di Hou*, Kim-Chuan Toh. Dual parameterization for nonconvex constrained optimization.
SIAM Journal on Optimization, submitted.

[6] Di Hou, Thai P.D. Nguyen, Kim-Chuan Toh, Guanyi Wang. Sparsity-cone SDP relaxations and applications to variable fixing for sparse quadratic programs.
Operations Research, submitted. [arXiv]

Research Software

- **RiNNAL+**: MATLAB solver for SDP–RLT relaxations of mixed-binary quadratic programs. Jointly developed with Tianyun Tang and Kim-Chuan Toh. [Code]
- **RiNNAL**: MATLAB solver for doubly nonnegative relaxations of mixed-binary quadratic programs. Jointly developed with Tianyun Tang and Kim-Chuan Toh. [Code]

Recognitions

- Top Graduate Researcher Award, Faculty of Science, NUS, 2026 (sole recipient).
- Best Graduate Researcher Award, Department of Mathematics, NUS, 2026 (sole recipient).
- EASIAM 2026 Travel Award, 2026.
- PhD Conference Award, NUS, 2025.
- President's Graduate Fellowship, NUS, Singapore, 2022-2026.
- Graduate Tutor Merit Award (Tier 1), NUS, Singapore, 2024, 2025, 2026.
- Top Ten Undergraduate Student Award, Changchun City, China, 2022.
- Top Ten Undergraduate Student Award, Jilin University, China, 2022.
- National First Prize Award, Chinese Mathematics Competitions, 2021.
- National Scholarship, China, 2018-2022.

Teaching

Teaching Assistant, National University of Singapore

- MA 4260 Stochastic Operations Research, semester 2, AY 2025/26
- DSA2102 Essential Data Analytics Tools: Numerical Computation, semester 2, AY 2024/25
- MA 3236 Non-Linear Programming, semester 1, AY 2024/25
- DSA3102 Essential Data Analytics Tools: Convex Optimisation, semester 2, AY 2023/2024
- DSA3102 Essential Data Analytics Tools: Convex Optimisation, semester 1, AY 2023/2024

Talks

RiNNAL-X: Low-rank ALM for structured SDP relaxations

Computational Robotics Group Seminar, Harvard University (online) June 2026

RiNNAL-POP: A low-rank augmented Lagrangian method for polyhedral-SDP and moment-SOS relaxations of polynomial optimization

19th East Asia SIAM (EASIAM) Annual Meeting, Jeju, Korea Aug. 2026
SIAM Conference on Optimization (OP26), Edinburgh, UK June 2026
Mini Workshop on Optimization, NUS Dec. 2025

RiNNAL+: A Riemannian ALM solver for SDP-RLT relaxations of MBQP

8th PKU Workshop for Outstanding PhD Students in Computational and Applied Mathematics, Peking University, Beijing, China Nov. 2025
International Conference on Continuous Optimization (ICCOPT), Los Angeles, U.S. July 2025

RiNNAL: A low-rank ALM for doubly nonnegative relaxations of mixed-binary QP

9th NUS Graduate Symposium in Mathematics, NUS May 2025

A sparse smoothing Newton method for solving discrete optimal transport problems

NUS-SJTU PhD Forum, NUS Nov. 2024

Service

Referee for Journals

- Optimization Methods and Software
- ACM Transactions on Mathematical Software
- Optimization and Engineering
- Numerical Algebra, Control and Optimization

Other Services

- President of NUS SIAM Student Chapter, Jul. 2025 – Jul. 2026.
- Secretary of NUS SIAM Student Chapter, Jul. 2024 – Jul. 2025.
- Vice president of NUS Mathematics Graduate Society, Jul. 2025 – Present.