# Lexiao Lai

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| **Employment** | **The University of Hong Kong** | Hong Kong, China |
| | Assistant Professor, Department of Mathematics | July 2024 - |

**Interests**

Nonconvex optimization, applied semialgebraic geometry, data science

**Education**

**Columbia University in the City of New York** — New York, U.S.
Ph.D. in Operations Research [thesis] — Sept. 2019 - May 2024
Advisor: Cédric Josz

**The University of Hong Kong** — Hong Kong, China
B.Sc. in Mathematics — Sept. 2015 - June 2019

**Publications**

1. Phase transitions in phase-only compressed sensing (with Junren Chen and Arian Maleki), *IEEE International Symposium on Information Theory (ISIT)*, 2025 [preprint] [proceeding]
2. Nonsmooth rank-one symmetric matrix factorization landscape (with Cédric Josz), *Optimization Letters*, 2025 [preprint] [journal]
3. Sufficient conditions for instability of the subgradient method with constant step size (with Cédric Josz), *SIAM Journal on Optimization*, 2024 [preprint] [journal]
4. Convergence of the momentum method for semialgebraic functions with locally Lipschitz gradients (with Cédric Josz and Xiaopeng Li), *SIAM Journal on Optimization*, 2023 [preprint] [journal doi]
5. Global stability of first-order methods for coercive tame functions (with Cédric Josz), *Mathematical Programming, 2023* [preprint] [journal]
6. Lyapunov stability of the subgradient method with constant step size (with Cédric Josz), *Mathematical Programming, 2023* [preprint] [journal]
7. Nonsmooth rank-one matrix factorization landscape (with Cédric Josz), *Optimization Letters*, 2022 [preprint] [journal doi]
8. Time-dependent surveillance-evasion games (with Elliot Cartee, Qianli Song, and Alexander Vladimirsky), *IEEE Conference on Decision and Control (CDC)*, 2019 [preprint] [proceeding]

**Preprints**

1. Manifold constrained steepest descent (with Kaiwei Yang), 2026 [preprint]
2. Certifying optimality in nonconvex robust PCA (with Pinxi Gong and Jianhao Ma), 2026 [preprint]
3. Global convergence of the subgradient method for robust signal recovery (with Zesheng Cai and Tiansheng Li), 2026 [preprint]
4. Non-convex self-concordant functions: Practical algorithms and complexity analysis (with Donald Goldfarb, Tianyi Lin, and Jiayu Zhang), 2025 [preprint]
5. On the diameter of subgradient sequences in o-minimal structures (with Mingzhi Song), 2025 [preprint]
6. Proximal random reshuffling under local Lipschitz continuity (with Cédric Josz and Xiaopeng Li), 2024 [preprint]

**Talks**

1. International Conference on Scientific Machine Learning, Hong Kong, December 3rd 2025, *On the diameter of subgradient sequences in o-minimal structures*
2. International Conference on Scientific Machine Learning, Hong Kong, December 3rd 2024, *Proximal random reshuffling under local Lipschitz continuity*
3. 14th Triennial International Conference of APORS, Hangzhou, November 17th 2024, *Proximal random reshuffling under local Lipschitz continuity*
4. International Symposium on Mathematical Programming, Montréal, July 23rd 2024, *Global stability of first-order methods for coercive tame functions*
5. IMS Young Mathematical Scientists Forum – Applied Mathematics, Singapore, January 9th 2024, *Global stability of first-order methods for coercive tame functions*

6. INFORMS Annual Meeting, Phoenix, October 17th 2023, *Global stability of first-order methods for coercive tame functions*

7. UCSD Optimization and Data Science Seminar, San Diego, October 4th 2023, *Global stability of first-order methods for coercive tame functions*

8. International Congress on Industrial and Applied Mathematics, Tokyo, August 24th 2023, *Global stability of first-order methods for coercive tame functions*

9. SIAM Conference on Optimization, Seattle, June 1st 2023, *Global stability of first-order methods with constant step size for coercive tame functions*

10. CUHK SEEM Department Seminar, Hong Kong, December 8th 2022, *Lyapunov stability of the subgradient method with constant step size*

11. HKU Optimization and Machine Learning Seminar, Hong Kong, December 6th 2022, *Lyapunov stability of the subgradient method with constant step size*

12. PGMODAYS, Paris, November 29th 2022, *Lyapunov stability of the subgradient method with constant step size*

13. INFORMS Annual Meeting, Indianapolis, October 17th 2022, *Lyapunov stability of the subgradient method with constant step size*

## Grants

1. ECS grant 27301425, *A study of first-order methods for structured nonconvex optimization problems in data science*, HKD778,276, Jan. 2026 - Dec. 2028

## Awards & Honours

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|---|---|
| · Columbia IEOR Department Fellowship | 2019 |
| · Walter Brown Memorial Prizes in Mathematics, HKU | 2019 |
| · Doris Chen Undergraduate Project Prize, HKU | 2018 |
| · Liu Ming-Chit Prize in Mathematics, HKU | 2018 |
| · Alan John Allis Prize in Mathematics, HKU | 2016,2017 |
| · Dean's Honours List, HKU | 2016,2017,2019 |
| · HKSAR Government Scholarship, HKU | 2015-2019 |

## Teaching Experience

As course instructor:
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|---|---|
| HKU: Operations Research I | 2025- |

As teaching assistant:
Columbia:
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|---|---|
| · Optimization Methods & Models | Spring 2024 |
| · Convex Optimization | Spring 2023 |
| · Optimization Methods & Models for Financial Engineering | Fall 2023 |
| HKU: Linear Algebra I | Spring 2019 |

## Student Mentering

PhD students:
· Kaiwei Yang (2025-)
· Mingzhi Song (2024-)
On thesis defending committee:
· Zimeng Wang (HKU)
· Tan Zhang (HKU)
Undergraduate students:
· Zesheng Cai (HKU)
· Shiyang Chen (HKU)
· Pinxi Gong (HKU)
· Tiansheng Li (HKU)
· Qi Peng (HKU)
· Han Zheng (HKU)

## Service

Session chair:
· *Optimization Theory and Algorithms I*, APORS Youth Forum, 2025
· *Recent advances in first-order methods*, International Conference on Continuous Optimization (ICCOPT), 2025
· HKMS-HKSIAM Joint Young Scholars Symposium, 2024

- *First-order methods and large-scale optimization*, International Symposium on Mathematical Programming (ISMP), 2024
- *Structured and tame optimization*, INFORMS Annual Meeting, 2023

Reviewer:
- AISTATS
- Applied Mathematics and Optimization
- Computational Optimization and Applications
- Journal of Optimization Theory and Applications
- Mathematics of Operations Research
- SIAM Journal on Optimization

**Internship**   TCL Corporate Research (Hong Kong) Company Limited   Hong Kong, China
Research Intern, AI Research Lab   May-Sept. 2021

**Computer Skills**   Python, MATLAB, LaTeX