

HAOYU HAN

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EDUCATION

Harvard University	<i>09 / 2024 - present</i>
Ph.D., Applied Mathematics. Working on optimization, Semi-definite programming, and reinforcement learning.	
University of Science and Technology of China (USTC)	<i>09 / 2020 - 07 / 2024</i>
B.S., Information and Computational Science (Computational Math)	

PUBLICATIONS

- [1] Haoyu Han, Heng Yang. **Building Rome with Convex Optimization.** *Robotics: Science and Systems (RSS) 2025 Best System Paper Award* ([Link](#))
- [2] Yulin Li, **Haoyu Han**, Shucheng Kang, Jun Ma, Heng Yang. **On the Surprising Robustness of Sequential Convex Optimization for Contact-Implicit Motion Planning.** *Robotics: Science and Systems (RSS) 2025* ([Link](#))
- [3] **Haoyu Han**, Heng Yang. **On the Nonsmooth Geometry and Neural Approximation of the Optimal Value Function of Infinite-Horizon Pendulum Swing-up.** *Learning for Dynamics and Control (L4DC) 2024* ([Link](#)).

AWARDS

Best System Paper Award, Robotics: Science and Systems (RSS)	<i>06 / 2025</i>
China National Scholarship (award student perform good in exam)	<i>09 / 2022</i>
China Optics Valley Scholarship	<i>09 / 2023</i>

RESEARCH EXPERIENCE

Convex optimization for Structure-from-Motion (SfM) [1]

Keywords: SfM; Foundation models; Bundle adjustment; CUDA

Individual Contributor Advisor: Prof. Heng Yang

Harvard University

May 2024 - Dec 2024

- Proposed a scaled bundle adjustment formulation that lifts 2D keypoint measurements to 3D with learned depth from foundation models, solving it to global optimality with Semi-definite programming relaxations.
- Wrote CUDA solver dubbed XM and built an SfM pipeline with XM as the optimization engine; showed XM-SfM compares favorably in reconstruction quality while being significantly faster, more scalable, and initialization-free.

Sequential Convex Optimization for Contact-Implicit Planning [2]

Keywords: Contact-implicit planning; Numerical optimization solver; Trajectory optimization

Harvard University

Major Contributor Advisor: Prof. Heng Yang

Sep 2024 - Dec 2024

- Developed a solver dubbed CRISP improving speed and robustness for contact-implicit motion planning where Karush–Kuhn–Tucker (KKT) systems may fail; proved sufficient conditions for convergence to first-order stationary points of a merit function.
- Released a high-performance C++ implementation of CRISP with a generic nonlinear programming interface.

Computation and Analysis on Optimal Control of a Pendulum [4]

Keywords: Optimal control; Pontryagin's maximum principle; Value function

Individual Contributor Advisor: Prof. Heng Yang

Harvard University

Aug 2023 - Dec 2023

- Computed the cost-to-go function of the pendulum with error under 10^{-4} , with and without control constraints, using a novel contour-line methodology and Pontryagin's maximum principle (PMP).
- Discovered a non-smooth spiral in the cost-to-go function, calculated its geometry, and proved existence using symmetry and ODE theory.

REVIEW EXPERIENCE

Reviewer of The International Journal of Robotics Research (IJRR).

Reviewer of IEEE Robotics and Automation Letters (RAL).

Reviewer of Transactions on Machine Learning Research (TMLR).

TEACHING

Teaching Assistant, Harvard ES/AM 158: Introduction to Optimal Control and Reinforcement Learning 2025

SKILLS

Computer Languages C, C++, C#, Python, CUDA
Tools L^AT_EX, Matlab, Mathematica, PyTorch, Unity, Qt, OpenCV, Markdown