Minghao (Mark) Liu

The Hong Kong University of Science and Technology, Hong Kong SAR, China
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Seeking PhD position (Fall 2026) and research internship (Feb–Sep 2026), open to global opportunities.

Education

Hong Kong University of Science and Technology (HKUST) *2022 – 2026 (Expected)*
BEng in Computer Science | *Minor in Mathematics*
CGA: 3.902 / 4.3 (Top 2%)

Washington University in St. Louis *Fall 2024*
Exchange Student, McKelvey School of Engineering
GPA: 3.94 / 4.00

Research Interest

I have worked on **interpretable methods** to guide model behavior and enhance reliability, and on **systematic benchmarking** to diagnose the limitations of current language models. I also design **dynamic, scalable learning environments** and **robust evaluation metrics** that enable LLM agents to learn, reason, and perform beyond human-level competence. Building upon these directions, I am now transitioning my focus toward **Deep Research Agents**, with an emphasis on efficiently constructing effective **experience trajectories** that enable agents to learn reasoning with both **internal knowledge** and **web-integrated information**.

Publications

- **LeanForPhysics: Comprehensive Reasoning Framework for University-level Physics in Lean4**
  Yuxin Li[*], **Minghao Liu**[*], Ruida Wang[*†], Ji Wenzhao, Zhitao He, Rui Pan, Junming Huang, Tong Zhang, Yi R. Fung
  ICLR 2026 (in submission)
  [*]Equal contribution

- **MedEBench: Diagnosing Reliability in Text-Guided Medical Image Editing**
  Minghao Liu, Zhitao He, Zhiyuan Fan, Qingyun Wang, Yi R. Fung
  Findings of EMNLP 2025

- **Scaling Environments for LLM Agents: Fundamentals, Approaches, and Future Directions**
  Yuchen Huang, Sijia Li, Zhiyuan Fan, **Minghao Liu**, Wei Liu, Yi R. Fung
  SEA @ NeurIPS 2025

- **A Benchmark for Evaluating Purchase Intention Comprehension Abilities of Large Language Models in E-commerce**
  Wenxuan Ding[*], Weiqi Wang[*], Sze Heng Douglas Kwok, **Minghao Liu**, Tianqing Fang, Jiaxin Bai, Xin Liu, Changlong Yu, Zheng Li, Chen Luo, Qingyu Yin, Bing Yin, Junxian He, Yangqiu Song
  Findings of EMNLP 2024
  [*]Equal contribution

Projects & Research Experience

UROP, HKUST *Advisor: Dan Xu* *Jun–Aug 2023*
Developed a **conditional diffusion model** and **UNet backbone** for monocular depth estimation, with an image infilling algorithm and a one-step unrolled diffusion technique during training to mitigate the distribution shift between training and inference.

UROP, HKUST *Advisor: Yu Hu* *Sep–Dec 2023*

Modeled **brain-wide neural dynamics** using a recurrent Firing Rate Network, trained synaptic connectivity via PINning, and analyzed functional motifs.

KnowComp Group, HKUST *Advisor: Yangqiu Song* *Feb 2024 – Sep 2024*

- Studied neural activity correspondences with **knowledge graph** structures for NLP (**BrainASER**).
- Built **IntentionQA** benchmark to evaluate LMs' comprehension of purchase intentions in E-commerce.

Washington University in St. Louis *Advisor: Marion Neumann* *Sep 2024 – Dec 2024*
Developed an inductive recommendation system on a large co-purchasing graph by adapting **GraphSAGE**, embedding node pairs to compensate for missing neighbor information, sampling only one-hop neighbors to avoid misleading indirect connections, and incorporating structural features such as the clustering coefficient to augment the graph representation.

RenLab, HKUST *Advisor: Yi R. (May) Fung, Qingyun Wang* *Feb 2025 – June 2025*
Researched **text-guided medical image editing** and developed **MedEBench**, a comprehensive benchmark of 1,182 clinical image–prompt triplets spanning 70 tasks and 13 anatomical regions. Designed clinically grounded metrics for **Editing Accuracy**, **Contextual Preservation**, and **Visual Quality**, and further diagnosed failure patterns through an innovative **attention grounding** method aligning language and visual tokens.

Final Year Project *Advisors: Yi R. (May) Fung, Tong Zhang* *May 2025 – Oct 2025*
Initiated **PHYSlib**, a Lean4 library for formalizing university-level physics with unit-aware, machine-verified reasoning. Built **LeanPhysBench**, a benchmark of 200 formalized physics statements, and evaluated multiple models to reveal limitations in physics knowledge transfer within language models.

RenLab, HKUST *Advisor: Yi R. (May) Fung* *Sep 2025 – Ongoing*

- Leading the development of an **LLM-agent simulation framework** for public policy, building datasets from **official records** and conducting **multi-round simulations** to model outcomes, track decision changes, explain reasoning processes, and train models for **critical thinking**.
- Developing **Deep Research Agents** with an emphasis on efficiently constructing effective **experience trajectories** that enable agents to perform reasoning using both **internal knowledge** and **web-integrated information**, motivated by applications in **Enterprise Deep Research**.

Awards & Scholarships

- First Prize – 37th Chinese Physics Olympiad (Provincial Level) 2020
- First Prize – 38th Chinese Physics Olympiad (Provincial Level) 2021
- First Prize – Chinese Mathematical Olympiad in Senior (Provincial Level) 2021
- Talent Development Scholarship – HKSAR Government Scholarship Fund 2023
- University's Scholarship Scheme for Continuing Undergraduate Students 2023–24
- HKUST Alumni Endowment Fund High Flyers Program Scholarship 2023–24
- HKSAR Government Scholarship Fund – Reaching Out Award 2024–25
- Dean's List 2022–25

Standardized Tests

- IELTS: 7.0

Service

SEA @ NeurIPS 2025 reviewer.

Extracurricular Activities

- Mechanical Engineer – HKUST RoboMaster Team ENTERPRIZE Sep 2022 – Feb 2023