

Minghao (Mark) Liu

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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

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 (under submission)

*Equal contribution (part of FYP by Yuxin Li & Minghao Liu); [†]Student advisor

• MedEBench: Diagnosing Reliability in Text-Guided Medical Image Editing

Minghao Liu, Zhitao He, Zhiyuan Fan, Qingyun Wang, Yi R. Fung

Findings of EMNLP 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

Jun–Aug 2023 Advisor: Dan Xu

- Developed a **conditional diffusion model** for monocular depth estimation from RGB images.
- Built an **Efficient-UNet** with residuals and optimized up/down-sampling to preserve depth structures.
- Designed a two-step **depth infilling algorithm** for handling missing values in NYU Depth V2.
- Applied **Step-Unrolled Denoising (SUD)** and masked losses to mitigate distribution shift on incomplete maps.
- Finetuned under compute limits to improve depth completeness and global scene consistency.

UROP, HKUST

Sep–Dec 2023 Advisor: Yu Hu

- Modeled **brain-wide neural dynamics in zebrafish** using a recurrent **Firing Rate Network**.
- Implemented **firing rate evolution equations** with Poisson inputs and synaptic filtering.
- Simulated large-scale circuits and trained synaptic connectivity via **Partial In-Network Training (PINning)** with Recursive Least Squares.
- Analyzed structural patterns in connectivity to identify potential subnetworks and functional motifs.

KnowComp Group, HKUST

Feb 2024 – Sep 2024 Advisor: Yangqiu Song

- BrainASER (Led by Shi Haochen)**: Studied correspondences between neural activity and **knowledge graph** structures.
- Aligned fMRI data (Narratives dataset) with story-based stimuli to analyze brain-language interactions.

- Developed brain-inspired representations for downstream NLP tasks leveraging structural similarities with knowledge graphs.
- **IntentionQA (Led by Ding Wenxuan):** Built a benchmark to evaluate LMs’ understanding of purchase intentions in E-commerce.
- Preprocessed data, aligned products with intentions via ASER, and generated negative distractors.
- Evaluated 19 LMs, identifying reasoning limitations in predicting user intent and handling real-world E-commerce scenarios.

Washington University in St. Louis
Sep 2024 – Dec 2024
Advisor: Marion Neumann

- Developed an **inductive recommendation system** for new e-commerce products using the Amazon Co-Purchasing Network.
- Constructed a co-purchasing graph with 519K nodes and 964K edges, encoding product features, categories, and structural metrics.
- Applied a **modified GraphSAGE** for link prediction to enable recommendations for isolated nodes with limited data.
- Designed scalable, real-time updates for adaptive recommendations on dynamic product catalogs.

RenLab, HKUST
Feb 2025 – June 2025
Advisor: Yi R. (May) Fung, Qingyun Wang

- Researched **text-guided medical image editing** and developed evaluation frameworks for multimodal models.
- Contributed to **MedEBench**, a benchmark of 1,182 clinical image-prompt triplets across 70 tasks and 13 anatomical regions.
- Designed clinically grounded metrics for **Editing Accuracy, Contextual Preservation, and Visual Quality** using ROI-based assessments and attention-grounding analysis.
- Evaluated seven state-of-the-art models, identifying common failure patterns in medically meaningful edits.

Final Year Project
May 2025 – Oct 2025
Advisors: Ruida Wang[†], Tong Zhang, Yi R. (May) Fung

- Initiated **PHYSlib**, a Lean4 library for formalizing university-level physics concepts and statements on top of a **UnitSystem**, enabling rigorous machine-verified reasoning.
- Built **LeanPhysBench**, a benchmark of 200 textbook and competition-level formalized physics statements.
- Conducted systematic evaluations on 5 open-source and 2 closed-source models, revealing poor knowledge transfer in Lean-expert models. (*Equal contribution with Yuxin Li; [†] Student advisor*).

RenLab, HKUST
Sep 2025 – Ongoing

Advisor: Yi R. (May) Fung

- Developing agent-based simulation systems to assess and predict the societal impact of public policies.
- Modeling agents within political and institutional frameworks for real-world policy comparisons.

Standardized Tests

- IELTS: 7.0

Awards & Scholarships

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| • 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 |

Extracurricular Activities

- Mechanical Engineer – HKUST RoboMaster Team ENTERPRIZE

Sep 2022 – Feb 2023