

Haochen Shi

Ph.D. Candidate in Computer Science
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Research Interests

LLM-Centric Agents, Latent Reasoning, Test-Time Scaling, Multimodal Learning, Embodied AI, Natural Language Processing.

Education

Ph.D. in Computer Science (in progress) Sept 2021 – Present

Université de Montréal / Mila, Montréal, QC, Canada

- Advisor: Prof. Bang Liu

M.S. in Computer Science Sept 2018 – Mar 2021

Zhejiang University (ZJU), Hangzhou, China

- Advisors: Prof. Jian Shao and Prof. Siliang Tang

B.S. in Software Engineering Sept 2014 – Jun 2018

Huazhong University of Science and Technology (HUST), Wuhan, China

Research Experience

Ph.D. Candidate Sept 2021 – Present

Université de Montréal / Mila, advised by Prof. Bang Liu

- **LLM-centric agents** (in collaboration with Microsoft Research): Developed agent frameworks spanning embodied instruction following (OPEx, ACL 2024), multi-agent strategic reasoning (Findings of ACL 2024), world dynamics modeling for interactive environments (Findings of EMNLP 2024), and mixture-of-expert LLM agents for financial decision-making (ICLR 2025 Workshop).
- **Programmatic skill learning**: Designed Programmatic Skill Networks for continual compositional skill acquisition in open-ended environments, combining LLM-driven fault localization with maturity-aware gating (COLM 2026).
- **Recursive reasoning models**: Propose input conditioning, a new test-time scaling axis for recursive reasoners, achieving SOTA performance across six reasoning tasks while using up to two orders of magnitude fewer model FLOPs than the evaluated scaling baselines ([Project page](#)).

Research Assistant Sept 2018 – Mar 2021

Zhejiang University, Hangzhou, China

- **Multimodal learning**: Developed graph-based methods for grounded image captioning (AAAI 2021, 2022) and grounded video description (ACM MM 2020), including a consensus graph framework that reduced object hallucination by 9%. Contributed to hierarchical graph reasoning for video-language inference (ICCV 2021).
- **Semi-supervised and active learning**: Proposed a unified graph-based framework combining semi-supervised learning with active learning via adversarial examples and virtual label propagation (ICCV 2021).
- **NLP – knowledge extraction and entity understanding**: Proposed adversarial training methods for fine-grained entity typing under distribution shift (IJCAI 2020) and distantly supervised relation extraction (AAAI 2021). Built the ZJU EDL System for NIST TAC KBP2019 EDL track (ranked 4th internationally).

Selected Publications

(*: equal contribution)

LLM Agents and Embodied Learning

Frameworks for LLM-based agents in embodied, interactive, and open-ended environments.

Haochen Shi, Xingdi Yuan, Bang Liu. “Evolving Programmatic Skill Networks.” *COLM 2026*.

Haochen Shi, Zhiyuan Sun, Xingdi Yuan, Marc-Alexandre Côté, Bang Liu. “OPEx: A Component-Wise Analysis of LLM-Centric Agents in Embodied Instruction Following.” *ACL 2024*.

Zhiyuan Sun*, **Haochen Shi***, Marc-Alexandre Côté, Glen Berseth, Xingdi Yuan, Bang Liu. “Enhancing Agent Learning through World Dynamics Modeling.” *Findings of EMNLP 2024*.

Dekun Wu*, **Haochen Shi***, Zhiyuan Sun, Bang Liu. “Deciphering Digital Detectives: Understanding LLM Behaviors and Capabilities in Multi-Agent Mystery Games.” *Findings of ACL 2024*.

Qianggang Ding, **Haochen Shi**, Jiadong Guo, Bang Liu. “TradExpert: Revolutionizing Trading with Mixture of Expert LLMs.” *Advances in Financial AI Workshop, ICLR*, 2025.

Multimodal Understanding and Grounding

Graph-based methods for vision-language reasoning, grounding, and generation.

Wenqiao Zhang*, **Haochen Shi***, Jiannan Guo*, et al. “MAGIC: Multimodal relational Graph adversarial inference for Diverse and Unpaired Text-based Image Captioning.” *AAAI 2022*.

Juncheng Li, Siliang Tang, Linchao Zhu, **Haochen Shi**, et al. “Adaptive Hierarchical Graph Reasoning with Semantic Coherence for Video-and-Language Inference.” *ICCV 2021*.

Wenqiao Zhang*, **Haochen Shi***, Siliang Tang, et al. “Consensus Graph Representation Learning for Better Grounded Image Captioning.” *AAAI 2021*.

Wenqiao Zhang, Xin Eric Wang, Siliang Tang, Haizhou Shi, **Haochen Shi**, et al. “Relational Graph Learning for Grounded Video Description Generation.” *ACM MM 2020*.

Robust Learning and Knowledge Extraction

Adversarial robustness, active learning, and knowledge extraction under noisy supervision.

Jiannan Guo*, **Haochen Shi***, Yangyang Kang, et al. “Semi-supervised Active Learning for Semi-supervised Models.” *ICCV 2021*.

Tao Chen*, **Haochen Shi***, Liyuan Liu, Siliang Tang, et al. “Empower Distantly Supervised Relation Extraction with Collaborative Adversarial Training.” *AAAI 2021*.

Haochen Shi, Siliang Tang, Xiaotao Gu, Bo Chen, Zhigang Chen, Jian Shao, Xiang Ren. “Alleviate Dataset Shift Problem in Fine-grained Entity Typing with Virtual Adversarial Training.” *IJCAI 2020*.

Teaching & Service

Teaching Assistant – Advanced Projects in Machine Learning (IFT6759)	2024 Winter
Teaching Assistant – NLP with Deep Learning (IFT6289)	2023 Winter
Technical Assistant – NLP Workshop: Knowledge Graphs (IVADO)	2021 Winter
Teaching Assistant – Multiple NLP and AI courses, Zhejiang University	2019–2021

Awards

Tianzhou-Chen Scholarship (Top 1%) – Zhejiang University	2020
Outstanding Graduate – Zhejiang University	2020
CETC Scholarship – China Electronics Technology Group Corporation	2020
Ranked 4th in NIST TAC KBP2019 EDL Track	2019

Skills

Programming:	Python, C/C++, TypeScript, MATLAB, $\text{\LaTeX}$
ML / AI:	PyTorch, Hugging Face Transformers, DeepSpeed, vLLM
Tools:	Git, Docker, Linux, AWS, SLURM, Weights & Biases
Languages:	Chinese Mandarin (native), English (fluent)