Haoyu Han

Contact Information

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Research Interests

- Machine Learning on Graphs
- Large Language Models
- AI for Education, E-Commerce, and Science

Education

Michigan State University (MSU), USA 08/2021 – 10/2026

- Ph.D., Computer Science and Engineering
- Advisor: Dr. Jiliang Tang

University of Science and Technology of China (USTC), China 09/2018 – 05/2021

- Master of Science, Computer Science

University of Science and Technology of China (USTC), China 09/2014 – 05/2018

- Bachelor of Engineering, Computer Science
- Talented Program

Research Experience

Harvard Medical School, Harvard University Expected: 10/2026
Incoming Postdoctoral Research Fellow, Department of Biomedical Informatics

- Mentor: Prof. Marinka Zitnik

Data Science and Engineering Lab, Michigan State University 08/2021 – Present
Research Assistant, Department of Computer Science and Engineering

- Topics: Machine Learning on Graphs, Graph-LLM Synergy
- Mentor: Dr. Jiliang Tang

Modern Recommendation System Group, Meta Platforms 05/2025 – 08/2025
Research Scientist Intern

- Topic: Integrating Social Graphs and Large Language Models for Large-Scale Recommendation
- Mentor: Dr. Yinglong Xia, Yuming Liu

Search Experience Science Group , Amazon.com 05/2024 – 11/2024
Applied Scientist Intern

- Topic: Graph Retrieval Augmented Generation, Improving LLMs reasoning ability with Graphs
- Mentor: Dr. Yaochen Xie, Dr. Shuiwang Ji

Machine Learning Unit, Okinawa Institute of Science and Technology 05/2023 – 07/2023
Research Intern

- Topic: Active learning for Graph Neural Networks
- Mentor: Dr. Makoto Yamada

Machine Learning Group, TigerGraph 05/2022 – 08/2022
Research Intern

- Topic: Link prediction, Recommendation, and Large-Scale Graph Neural Networks
- Mentor: Dr. Bill Shi

Knowledge Graph Group, Meituan-Dianping 09/2019 – 03/2021
Research Intern

- Topic: Large-Scale Graph Neural Networks, POI recommendation
- Mentor: Dr. Fuzheng Zhang and Mengdi Zhang

State Key Laboratory of Cognitive Intelligence 06/2018 – 06/2021
Research Assistant

- Topic: Knowledge Graph, Recommendation
- Mentor: Dr. Enhong Che and Dr. Qi Liu

NLP Group, Bytedance 09/2017 – 07/2018
Research Assistant

- Topic: Topic Modeling, Word Segmentation
- Mentor: Dr. Tengfei Bao

Honors and Awards

- Silver reviewer award, ICML 2026
- Honorable Mention, SDM Doctoral Forum Poster Awards 2025
- SDM travel award 2024, 2025
- Graduate School Travel Fellowship, MSU 2023, 2024, 2025
- NeurIPS scholar award 2023
- Second place in NeurIPS OGB-LSC competition 2022
- First place in the Multimodal Single-Cell Data Integration competition of NeurIPS 2021
- Outstanding Master's Thesis Award 2021
- Yang Yuanqing Scholarship (Top Research Scholarship in USTC) 2018
- Outstanding Graduate in USTC 2018
- Excellent young volunteers of USTC 2017
- Gold Award of International Genetically Engineered Machine competition 2016

Publications

Google Scholar: https://scholar.google.com/citations?user=X8Y3Bk4AAAAJ&hl=en
- Impact: **1700**+ Citations, h-index: **16**, i10-index: **19**

Submissions Under Review & Preprint

2. "Recovering High-Order Hypergraph Structures with Multi-view Visual Experts"
Hua Liu, Fei Xing, **Haoyu Han**, Tyler Derr, Wenqi Fan, Yanbin Wei, Yang Chen, Zebin Chen, Yu Zhang. Submitted to *The AAAI Conference on Artificial Intelligence*(**AAAI**), 2027.

1. "Retrieval-Augmented Generation with Graphs (GraphRAG)"
Haoyu Han*, Yu Wang*, Harry Shomer, Kai Guo, Jiayuan Ding, Yongjia Lei, Mahantesh Halappanavar, Ryan A. Rossi, Subhabrata Mukherjee, Xianfeng Tang, Qi He, Zhigang Hua, Bo Long, Tong Zhao, Neil Shah, Amin Javari, Yinglong Xia, Jiliang Tang.
Submitted to *Foundations and Trends in Machine Learning*, 2026.

Conference and Journal Papers

* indicates equal contribution

31. "Node-wise Filtering in Graph Neural Networks: A Mixture of Experts Approach"
Haoyu Han, Juanhui Li, Wei Huang, Xianfeng Tang, Hanqing Lu, Chen Luo, Hui Liu, Jiliang Tang.
In Proceedings of *ACM International Conference on Web Search and Data Mining* (**WSDM**), 2027.

30. "An Embarrassingly Simple Graph Heuristic Reveals Shortcut-Solvable Benchmarks for Sequential Recommendation"
Haoyu Han, Li Ma, Hanbing Wang, Bingheng Li, Daochen Zha, Chun How Tan, Huiji Gao, Xin Liu, Stephanie Moyerman, Sanjeev Katariya, Hui Liu, Jiliang Tang.
In Proceedings of *The Conference on Neural Information Processing Systems* (**NeurIPS**), Evaluations and Datasets Track, 2026.

29. "Understanding Graph Self-Supervised Pre-training under Distribution Shifts: A Scaling Law Perspective"
Bingheng Li, Shikun Liu, Yu Song, Jay Revolinsky, **Haoyu Han**, Subhabrata Mukherjee, Jiayuan Ding, Jiliang Tang.
In Proceedings of *The Conference on Neural Information Processing Systems* (**NeurIPS**), 2026.

28. "Beyond Static Retrieval: Opportunities and Pitfalls of Iterative Retrieval in GraphRAG"
Kai Guo, Xinnan Dai, Shenglai Zeng, Harry Shomer, **Haoyu Han**, Yu Wang, Jiliang Tang.
In *Proceedings of Empirical Methods in Natural Language Processing* (**EMNLP**), 2026.

27. "ConnectionMind: Leveraging Social Networks and Large Language Models for Personalized Recommendation at Meta"
Haoyu Han, Yuming Liu, Lei Huang, Lizhu Zhang, Jiliang Tang, Xiangjun Fan.
In *Proceedings of International ACM Conference on Knowledge and Information Management* (**CIKM**), 2026.

26. "Benchmarking Knowledge-Extraction Attack and Defense on Retrieval-Augmented Generation"
Zhisheng Qi, Utkarsh Sahu, Li Ma, **Haoyu Han**, Ryan Rossi, Franck Dernoncourt, Mahantesh Halappanavar, Nesreen Ahmed, Yushun Dong, Yue Zhao, Yu Zhang, Yu Wang
In *Proceedings of ACM SIGKDD Conference on Knowledge Discovery and Data Mining* (**KDD**), Datasets and Benchmarks Track, 2026 (**Oral, top 4.5%**).

25. "RAG vs. GraphRAG: A Systematic Evaluation and Key Insights"
Haoyu Han, Harry Shomer, Yu Wang, Yongjia Lei, Kai Guo, Zhigang Hua, Bo Long, Hui Liu, Charu C. Aggarwal, Jiliang Tang.
In *Proceedings of ACM SIGKDD Conference on Knowledge Discovery and Data Mining* (**KDD**), Datasets and Benchmarks Track, 2026.

24. "Why Retrieval-Augmented Generation Fails: A Graph Perspective"
Kai Guo, Xinnan Dai, Zhibo Zhang, Nuohan Lin, Shenglai Zeng, Jie Ren, **Haoyu Han**, Jiliang Tang
In *Proceedings of ACM SIGKDD Conference on Knowledge Discovery and Data Mining* (**KDD**), Research Track, 2026.

23. "From Flat to Structural: Enhancing Automated Short Answer Grading with GraphRAG"
Yucheng Chu, **Haoyu Han**, Shen Dong, Hang Li, Kaiqi Yang, Yasemin Copur-Gencturk, Joseph Krajcik, Namsoo Shin, Hui Liu
In *Proceedings of the International Conference on Educational Data Mining* (**EDM**), 2026

22. "Reasoning by Exploration: A Unified Approach to Retrieval and Generation over Graphs"
Haoyu Han, Kai Guo, Harry Shomer, Yu Wang, Yucheng Chu, Hang Li, Li Ma, Jiliang Tang.
In *The Web Conference* (**WWW**), 2026. (**Oral**).

21. "Graph2Video: Leveraging Video Models to Model Dynamic Graph Evolution"
Hua Liu, Yanbin Wei, Fei Xing, Tyler Derr, **Haoyu Han**, Yu Zhang
In *The AAAI Conference on Artificial Intelligence* (**AAAI**), 2026.

20. "Enhancing ID and Text Fusion via Alternative Training in Session-based Recommendation"
Juanhui Li, **Haoyu Han**, Zhikai Chen, Harry Shomer, Wei Jin, Amin Javari, Jiliang Tang.
In *The Asia-Pacific Chapter of the Association for Computational Linguistics* (**AACL**), 2026.

19. "Human-AI Collaboration for Knowledge-in-Use Assessment Design: Leveraging LLMs with RAG"
Juanhui Li, Tingting Li, Hang Li, **Haoyu Han**, Pengfei He, Peng He and Hui Liu.
In *IEEE International Conference on Teaching, Assessment and Learning for Engineering* (**IEEE TALE**), 2025.

18. "Empowering GraphRAG with Knowledge Filtering and Integration"
Kai Guo, Harry Shomer, Shenglai Zeng, **Haoyu Han**, Yu Wang, Jiliang Tang.
In *Proceedings of Empirical Methods in Natural Language Processing* (**EMNLP**), 2025.

17. "Unveiling Mode Connectivity in Graph Neural Networks"
Bingheng Li, Zhikai Chen, **Haoyu Han**, Shenglai Zeng, Jingzhe Liu, Jiliang Tang.
In *ACM SIGKDD Conference on Knowledge Discovery and Data Mining* (**KDD**), 2025.

16. "Reasoning with Graphs: Structuring Implicit Knowledge to Enhance LLMs Reasoning"
Haoyu Han, Yaochen Xie, Hui Liu, Xianfeng Tang, Sreyashi Nag, William Headden, Hui Liu, Yang Li, Chen Luo, Shuiwang Ji, Qi He, Jiliang Tang.
In *Findings of the Association for Computational Linguistics* (**ACL Findings**), 2025.

15. "Mixture of Structural-and-Textual Retrieval over Text-rich Graph Knowledge Bases"
Yongjia Lei, **Haoyu Han**, Ryan A. Rossi, Franck Dernoncourt, Nedim Lipka, Mahantesh M. Halappanavar, Jiliang Tang, Yu Wang.
In *Findings of the Association for Computational Linguistics* (**ACL Findings**), 2025.

14. "Enhancing LLM-Based Short Answer Grading with Retrieval-Augmented Generation"
Yucheng Chu, Peng He, Hang Li, **Haoyu Han**, Kaiqi Yang, Yu Xue, Tingting Li, Joseph Krajcik, Jiliang Tang.
In *International Conference on Educational Data Mining* (**EDM**), 2025.

13. "Mixture of Link Predictors on Graphs"
Haoyu Han*, Li Ma*, Juanhui Li, Harry Shomer, Hui Liu, Xiaofeng Gao, Jiliang Tang.
In *Proceedings of the Advances in Neural Information Processing Systems* (**NeurIPS**), 2024.

12. "Spectral-Aware Augmentation for Enhanced Graph Representation Learning"
Kaiqi Yang, **Haoyu Han**, Wei Jin, Hui Liu.
In *Proceedings of the 33rd ACM International Conference on Information and Knowledge Management* (**CIKM**), 2024.

11. "Label-free Node Classification on Graphs with Large Language Models (LLMs)"
Zhikai Chen, Haitao Mao, Hongzhi Wen, **Haoyu Han**, Wei Jin, Haiyang Zhang, Hui Liu, Jiliang Tang.
In *Proceedings of the International Conference on Learning Representations* (**ICLR**), 2024.

10. "Structural Fairness-aware Active Learning for Graph Neural Networks"
Haoyu Han, Xiaorui Liu, Li Ma, MohamadAli Torkamani, Hui Liu, Jiliang Tang, Makoto Yamada.
In *Proceedings of the International Conference on Learning Representations* (**ICLR**), 2024.

9. "Amazon-M2: A Multilingual Multi-locale Shopping Session Dataset for Recommendation and Text Generation"
Wei Jin, Haitao Mao, Zheng Li, Haoming Jiang, Chen Luo, Hongzhi Wen, **Haoyu Han**, Hanqing Lu, Zhengyang Wang, Ruirui Li, Zhen Li, Monica Xiao Cheng, Rahul Goutam, Haiyang Zhang, Karthik Subbian, Suhang Wang, Yizhou Sun, Jiliang Tang, Bing Yin, Xianfeng Tang.

In *Proceedings of the Advances in Neural Information Processing Systems* (**NeurIPS**), *Datasets and Benchmarks Track*, 2023.

8. "Demystifying Structural Disparity in Graph Neural Networks: Can One Size Fit All?"
   Haitao Mao, Zhikai Chen, Wei Jin, **Haoyu Han**, Yao Ma, Tong Zhao, Neil Shah, Jiliang Tang.
   In *Proceedings of the Advances in Neural Information Processing Systems* (**NeurIPS**), 2023.
7. "Towards Label Position Bias in Graph Neural Networks"
   Haoyu Han, Xiaorui Liu, Feng Shi, MohamadAli Torkamani, Charu C. Aggarwal, Jiliang Tang.
   In *Proceedings of the Advances in Neural Information Processing Systems* (**NeurIPS**), 2023.
6. "Enhancing Graph Representation Learning with Decorrelated Propagation"
   Haoyu Han*, Hua Liu*, Wei Jin, Xiaorui Liu, Hui Liu.
   In *ACM SIGKDD Conference on Knowledge Discovery and Data Mining* (**KDD**), 2023.
5. "LazyGNN: Large-Scale Graph Neural Networks via Lazy Propagation"
   Rui Xue, **Haoyu Han**, MohamadAli Torkamani, Jian Pei, Xiaorui Liu.
   In *International Conference on Machine Learning* (**ICML**), 2023.
4. "Alternately Optimized Graph Neural Networks"
   Haoyu Han, Xiaorui Liu, Haitao Mao, MohamadAli Torkamani, Feng Shi, Victor Lee, Jiliang Tang.
   In *International Conference on Machine Learning* (**ICML**), 2023.
3. "Inverse APPNP: Solution for OGB-LSC 2022 MAG240M"
   Haoyu Han*, Hang Li*, Hongzhi Wen*, Wei Jin, Feng Shi, Victor Lee, Jiliang Tang.
   In *Conference on Neural Information Processing Systems* (**NeurIPS**), *Competition Track*, 2022.
2. "STGCN: A Spatial-Temporal Aware Graph Learning Method for POI Recommendation"
   Haoyu Han, Mengdi Zhang, Min Hou, Fuzheng Zhang, Zhongyuan Wang, Hongwei Wang, Enhong Chen, Jianhui Ma, Qi Liu.
   In *IEEE International Conference on Data Mining* (**ICDM**), 2020.
1. "Constructing Educational Concept Maps with Multiple Relationships from Multi-source Data"
   Xiaoqing Huang, Qi Liu, Chao Wang, **Haoyu Han**, Jianhui Ma, Enhong Chen, Yu Su, Shijin Wang.
   In *IEEE International Conference on Data Mining* (**ICDM**), 2019.

Tutorials

- "Democratizing RAGs with Structured Knowledge"
  Yu Wang, Zhisheng Qi, Yongjia Lei, **Haoyu Han**, Harry Shomer, Kaize Ding, Yu Zhang, Ryan Rossi and Hui Liu
  In *The International Conference on Web Search and Data Mining* (**WSDM**), 2026.
- "Empowering Retrieval-augmented Generation with Graph-structured Knowledge"
  Yu Wang, **Haoyu Han**, Harry Shomer, Kai Guo, Yongjia Lei, Xianfeng Tang, Qi He, Jiliang Tang.
  In *SIAM International Conference on Data Mining* (**SDM**), 2025.
- "Large-Scale Graph Neural Networks: Navigating the Past and Pioneering New Horizons"
  Rui Xue, **Haoyu Han**, Tong Zhao, Neil Shah, Jiliang Tang, Xiaorui Liu
  In *The Association for the Advancement of Artificial Intelligence* (**AAAI**), 2024.
- "Large-Scale Graph Neural Networks: Navigating the Past and Pioneering New Horizons"
  Rui Xue, **Haoyu Han**, Tong Zhao, Neil Shah, Jiliang Tang, Xiaorui Liu
  In *SIAM International Conference on Data Mining* (**SDM**), 2024.
- "Large-Scale Graph Neural Networks: The Past and New Frontiers"
  Rui Xue, **Haoyu Han**, Tong Zhao, Neil Shah, Jiliang Tang, Xiaorui Liu
  In *ACM SIGKDD Conference on Knowledge Discovery and Data Mining* (**KDD**), 2023.

Proposal Writing

- Empowering Graph Neural Networks from a Data Perspective
  PI: Dr. Jiliang Tang
  Amount: $1,200,000
  Role: Co-designed and co-wrote the section on improving the scalability of GNNs.
  Result: Funded by the NSF
- Graph Foundation Models
  PI: Dr. Jiliang Tang
  Amount: $200,000
  Role: Co-designed and co-wrote the proposal.
  Result: Funded by the Meta
- AI long form grading that reflects faculty style
  PI: Dr. Jiliang Tang
  Amount: $750,000
  Role: Designed and wrote the section on leveraging GraphRAG for automated grading.
  Result: Funded by the Gates Foundation
- Multi-Modal and Structured Retrieval-Augmented Generation for Large Language Models
  PI: Dr. Jiliang Tang
  Amount: $600,000
  Role: Designed and Wrote the thrust on structured Graph-Augmented Retrieval and Generation.
  Result: Submitted to NSF.
- Identify Privacy Vulnerabilities and Protect Data in LLM-Based Systems
  PI: Dr. Yue Xing and Dr. Jiliang Tang
  Amount: $1,200,000
  Role: Co-designed and Co-wrote the section of privacy protection of GraphRAG.
  Result: Planned submission to the NSF SATC.

Teaching Experience

- **Co-instructor** for CSE 482 Big Data Analysis (Undergraduate Level) Fall 2025
  - Michigan State University
- **Co-instructor** for CSE 941 Selected Topics for Artificial Intelligence (Graduate Level) Spring 2025
  - Michigan State University
- Teaching Assistant for CSE 881 Data Mining (Graduate Level) Spring 2024
  - Michigan State University
- Teaching Assistant for CSE 881 Data Mining (Graduate Level) Spring 2023
  - Michigan State University
- CSE 482 Big Data Analytics Fall 2023
  - Michigan State University
  - Gave a lecture on “Anomaly detection”
- Teaching Assistant for Analog and Digital Circuits (Undergraduate Level) Fall 2016
  - University of Science and Technology of China

Mentoring

- **Bingheng Li**, Ph.D. Student, Michigan State University 09/2024 – 10/2025

  Projects: (1) Unveiling Mode Connectivity in Graph Neural Networks; (2) Understanding Graph Self-Supervised Pre-training under Distribution Shifts

  Outcome: Mentored two papers - **accepted at KDD 2025** and **submitted to ICLR 2026**.

- **Yongjia Lei**, Ph.D. Student, University of Oregon 09/2024 – 06/2025

  Project: Mixing Structural and Textual Retrieval in GraphRAG

  Outcome: Mentored paper **accepted at ACL Findings 2025**.

- **Yucheng Chu**, Ph.D. Student, Michigan State University 03/2025 – 05/2025

  Project: Enhancing LLM-based Grading with Retrieval-Augmented Generation

  Outcome: Mentored paper **accepted at EDM 2025**.

- **Li Ma**, Visiting Ph.D. Student, Shanghai Jiao Tong University 09/2023 – 05/2024

  Project: Enhancing Link Prediction via a Mixture of Experts

  Outcome: Mentored paper **accepted at NeurIPS 2024**.

- **Zhikai Chen**, Ph.D. Student, Michigan State University 08/2023 – 11/2023

  Project: Leveraging Large Language Models for Node Labeling

  Outcome: Mentored paper **accepted at ICLR 2024**.

- **Kaiqi Yang**, Ph.D. Student, Michigan State University 09/2022 – 07/2023

  Project: Improving Graph Contrastive Learning from a Spectral Perspective

  Outcome: Mentored paper **accepted at CIKM 2024**.

- **Haitao Mao**, Ph.D. Student, Michigan State University 09/2022 – 05/2023

  Project: Demystifying Structural Disparity in Graph Neural Networks

  Outcome: Mentored paper **accepted at NeurIPS 2023**.

- **Rui Xue**, Ph.D. Student, North Carolina State University 09/2022 – 01/2023

  Project: Accelerating Graph Neural Network Training via Lazy Propagation

  Outcome: Mentored paper **accepted at ICML 2023**.

Services

Workshop Organizer

- "**Large Language Model For E-Commerce Workshop**", WSDM 2027
- "**Machine Learning on Graphs in the era of Generative Artificial Intelligence**, KDD 2025
- "**Large Language Model For E-Commerce Workshop**", KDD 2025
- "**Large Language Model For E-Commerce Workshop**", WWW 2025

University and College Service

- Ph.D. Student Representative, Computing Services Advisory Committee (CSAC), College of Engineering, Michigan State University 2024–2025

Area Chair

- SIGKDD Conference on Knowledge Discovery and Data Mining (KDD) 2026

Session Chair

- International World Wide Web Conference (WWW) 2026

Program Committee Member & Conference Reviewer

- International Conference on Machine Learning (ICML) 2023 - 2025
- International Conference on Learning Representations (ICLR) 2023 - 2026
- Proceedings of the Advances in Neural Information Processing Systems (NeurIPS) 2022 - 2025
- Association for the Advancement of Artificial Intelligence (AAAI) 2024 - 2025
- SIGKDD Conference on Knowledge Discovery and Data Mining (KDD) 2024
- Association for Computational Linguistics (ACL) 2024 - 2025
- International Conference on Web Search and Data Mining (WSDM) 2023 - 2024
- International World Wide Web Conference (WWW) 2023 - 2024
- Artificial Intelligence and Statistics (AISTATS) 2025 - 2026

Journal Reviewer

- Transactions on Knowledge Discovery from Data (TKDD) 2023 - 2024
- Transactions on Knowledge and Data Engineering (TKDE) 2022 - 2024
- Transactions on Information Systems (TOIS) 2024
- Transactions on Intelligent Systems and Technology (TIST) 2025

Volunteering

- Student Volunteer, Conference on Neural Information Processing Systems (NeurIPS) 2024
- Student representative, CSE Graduate Student Orientation, Michigan State University 2022
- Student Volunteer, SIGKDD Conference on Knowledge Discovery and Data Mining (KDD) 2022
- Volunteer, Fangcao Volunteer Association, USTC 2014 - 2017