Tianyi (Billy) Ma

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Education

University of Notre Dame South Bend, USA
Ph.D. in Computer Science *Jun. 2022 – present*

- **Research Interest:** (Hyper)Graph Representation Learning, Graph Prompt Learning, Large Language Models (LLMs), Self-supervised Learning, Deep Learning, Machine Learning, Data Mining, Social Network Analysis, AI for Education.

University of Southern California Los Angeles, USA
M.S. in Computer Science *Aug. 2020 – Jun. 2022*

University of Colorado, Boulder Boulder, USA
B.S. in Computer Science *Aug. 2016 – May. 2020*

Work Experience

Amazon, Inc. Seattle, USA
Applied Scientist (Intern) *May. 2025 - Aug. 2025*

- **Customer Memory Retrieval**: Designed a retrieval system integrated with Vector Quantization and Late Interaction to identify key customer preferences for downstream recommendation tasks.

Amazon, Inc. Seattle, USA
Applied Scientist (Intern) *July. 2024 - Oct. 2024*

- **GenAI based Customer Understanding and Recommendation.**

Edtera, Inc. San Diego, USA
Project Researcher & Software Engineer (Intern) *May. 2021 - Jun. 2022*

- **Recommendation System:** Designed and developed a model to recommend exercises for students, bridging their knowledge gap in various subjects.
- **Hate Speech Detection:** Developed an advanced hate speech detection program to avoid bad words when recognizing and reading the text embedded in images on the Edtera Collaboration Learning platform.

Tencent, Ltd. Shenzhen, CN
Software Engineer (Intern) *May. 2019 – Aug. 2019*

- **Leela Chess Zero (Lc0):** Implemented, deployed, and trained a deep neural network–based chess engine, called Lc0, for Chinese Chess on Tencent Lightspeed & Quantum Studio Group AI platform.
- **Happy Mahjong:** Developed a robot to autonomously play Tencent's mobile game Happy Mahjong on Android devices, encompassing mahjong tile recognition, optimal move computation, and screen interaction execution.

Baidu Institute of Technology Beijing, CN
Lecture Assistant (Intern) *Jun. 2018 – Aug. 2018*

- Coordinated with ML/AI lecturers, disseminated curriculum materials, and supervised students throughout the courses to ensure the successful achievement of learning outcomes.

Research Experience

University of Notre Dame South Bend, USA
Research Assistant (Full-time) *Jun. 2022 – present*

- **Drug Trafficking Community Detection:** To detect the drug trafficking community on social media, designed a novel hypergraph contrastive learning framework *HyGCL-DC* over the built drug trafficking hypergraph, which incorporates informative content features and complex higher-order relationships among online users. Based on *HyGCL-DC*, implemented an application called *iNetworking* to identify and visualize drug trafficking communities on social media.

  To identify darknet drug traffickers' activities on social media, developed a multi-modal learning project *iPortrait* to leverage both the style information (i.e., photography style and writing styles) and content information (i.e., image and text) to match drug traffickers between darknet markets and social media. All research projects are funded by the Department of Justice (DOJ), United States.

Carnegie Mellon University Pittsburgh, USA
Research Assistant (Part-time) *Jan. 2022 - Jun. 2022*

- **Student Response Prediction**: Utilized survival analysis and model to evaluate the relationship between the user response time to a problem, which reflects the level of mastery of the corresponding knowledge, and educational or psychological features in RoboTutor, an intelligent tutor platform spearheaded by Carnegie Mellon University.

Selected Conference & Publications

- **AutoData: A Multi-Agent System for Open Web Data Collection**

  Tianyi Ma, Yiyue Qian, Zheyuan Zhang, Zehong Wang, Xiaoye Qian, Feifan Bai, Yifan Ding, Xuwei Luo, Shinan Zhang, Keerthiram Murugesan, Chuxu Zhang, Yanfang Ye.

  NeurIPS'25: The Thirty-Ninth Annual Conference on Neural Information Processing Systems

- **Hypergraph Representation Learning with Adaptive Broadcasting and Receiving**

  Tianyi Ma, Yiyue Qian, Chuxu Zhang, and Yanfang Ye

  ICDM'25: The 25th IEEE International Conference on Data Mining

- **LLM-Empowered Class Imbalanced Graph Prompt Learning for Online Drug Trafficking Detection**

  Tianyi Ma, Yiyue Qian, Zehong Wang, Zheyuan Zhang, Chuxu Zhang, Yanfang Ye

  ACL'25 (Findings): Findings of the Association for Computational Linguistics: ACL 2025

- **Adaptive Graph Enhancement for Imbalanced Multi-relation Graph Learning**

  Tianyi Ma, Yiyue Qian, Chuxu Zhang, Yanfang, Ye. (co-first author)

  WSDM'25: The 18th ACM International Conference on Web Search and Data Mining

- **Hypergraph Contrastive Learning for Drug Trafficking Community Detection**

  Tianyi Ma, Yiyue Qian, Chuxu Zhang, and Yanfang Ye

  ICDM'23: The 23rd IEEE International Conference on Data Mining

- **Dual-level Hypergraph Contrastive Learning with Adaptive Temperature Enhancement**

  Yiyue Qian, **Tianyi Ma**, Chuxu Zhang, and Yanfang Ye

  WWW'24: The ACM Web Conference 2024

- **Adaptive Expansion for Hypergraph Learning**

  Tianyi Ma, Yiyue Qian, Chuxu Zhang, and Yanfang Ye

  Preprint, Under review

Skills Summary

- **Programming Languages & Platforms:** Python (PyTorch, TensorFlow, Hugging Face), C++, JavaScript, HTML, MATLAB, R, Linux, AWS, SQL, Colab, etc.
- **Soft Skills:** Problem Solving, Leadership, Critical Thinking, Creative Thinking.
- **Languages:** Mandarin, English.

Award

"What Would You Fight For (WWYFF)?" Series | *University of Notre Dame* 2023

- Fighting to combat the opioid crisis via AI and Data-driven Techniques.

Services

- **Conference Program Committee:** COLING'24, KDD'24, CIKM'24.
- **Journal Reviewer:** Transactions on Big Data, Discover Data, Transactions on Dependable and Secure Computing.
- **Outreach Program Judger:** Learning Sphere Projects at Northpoint Elementary School, 2023 & 2024.
- **Teaching Assistant Leader:** Computer Security (CSE-40567/60567), SPR2024.
- **Research Mentor:** ND Summer Enrichment Program, 2024.
- **Volunteer:** Purdue CDF Freedom School Program, 2023 & 2024.