Chunhui Zhang, Ph.D. student at Dartmouth

Homepage: https://chunhuizng.github.io
Email: chunhui.cheung@gmail.com
Address: 15 Thayer Dr, Dartmouth College, Hanover, NH 03755　　**Phone**: 1-7816521380

Research Focus

Large Language Models (LLMs) and Multimodal AI with emphasis on:

- **Reasoning & Planning:** MCTS-LLM, PRM-RL, working memory
- **Multimodality:** vision, audio (speech/music), and language
- **Post-Training:** instruction tuning, DPO, reinforcement learning
- **Mechanistic interpretability:** Working memory for long reasoning

Education

Dartmouth College　　　　　　　　　　　Hanover, NH, US
Ph.D. student in Computer Science　Aug. 2023 – April. 2026 (expected)
Advisor: Professor Soroush Vosoughi

Brandeis University　　　　　　　　　　　Waltham, MA, US
Master of Science, Computer Science　　Sep. 2021 – Jun. 2023
GSAS Fellowship, Research-Based

Northeastern University　　　　　　　　　　　CN
Bachelor of Science, Computer Science　　Sep. 2017 – Jun. 2021
Outstanding Honor Thesis Award

Experience

Honda Research Institute USA　　　　　San Jose, CA, USA
Research Intern　　　　　　　　　　Jun. 2024 – Sept. 2024
Project: Multimodal LLM Post-Training (8B - 70B) and Synthetic Data
Developed a **global-local multi-agent planning system** capable of understanding human behaviors in **multimodal environments**, achieving a **4.6%** improvement over state-of-the-art solutions. The post-trained small agents facilitate inference-time alignment and scaling up to 405B params. The paper is under review at ICLR 2025, rated with 6665.
Host: Dr. Shao-Yuan Lo

Under review

Behavior Modelling Agent: Scaling Multimodal Theory-of-Mind with Weak-to-Strong Bayesian Reasoning
Preprint | Code | *A global-local structure uses Bayesian inverse planning for global planning, then allows LLMs to fully focus on local reasoning.*

Chunhui Zhang, Sean Dae Houlihan, Kwonjoon Lee, Nakul Agarwal, Zhongyu Ouyang, Soroush Vosoughi, Shao-Yuan Lo

Scaling Episodic Grounding by Post-Training on MCTS Behavior Data
[Preprint](#) | [Code](#) | *Post-training agentic LLMs (DPO on 3B, 8B, and 70B) on MCTS-sampled data from physical simulator to conduct planning.*
Chunhui Zhang, Elsie Wang, Zhongyu Ouyang, Xiangchi Yuan, Yijun Tian, Soroush Vosoughi

Pretrained Image-Text Models are Secretly Video Captioners
[Preprint](#) | [Code](#) | *A general post-training recipe trains a **Top-2 best** multi-modal captioner on PaperwithCode Leaderboarder beating industry-level captioners*
Chunhui Zhang, Yiren Jian, Zhongyu Ouyang, Soroush Vosoughi

Working Memory Retains Essential Temporal Multimodal Sequences for Audio-Video-Language Modelling
[Preprint](#) | [Code](#)
Chunhui Zhang, Xingjian Diao, Weiyi Wu, Zhongyu Ouyang, Peijun Qing, Ming Cheng, Soroush Vosoughi, Jiang Gui

Is It Navajo? Accurate Language Detection in Endangered Athabaskan Languages
[Preprint](#) | [Code](#)
Ivory Yang, Weicheng Ma, **Chunhui Zhang**, Soroush Vosoughi

Publications

Working Memory Identifies Reasoning Limits in Language Models
Chunhui Zhang, Yiren Jian, Zhongyu Ouyang, Soroush Vosoughi
The Conference on Empirical Methods in Natural Language Processing (EMNLP), 2024.

Learning Musical Representations for Music Performance Question Answering
Xingjian Diao, **Chunhui Zhang**, Tingxuan Wu, Ming Cheng, Zhongyu Ouyang, Weiyi Wu, Soroush Vosoughi, Jiang Gui
Findings of the Association for Computational Linguistics: Empirical Methods in Natural Language Processing (Findings of EMNLP), 2024.

Expedited Training of Visual Conditioned Language Generation via Redundancy Reduction

Yiren Jian, Tingkai Liu, Yunzhe Tao, **Chunhui Zhang**, Soroush Vosoughi, Hongxia Yang
*Annual Meeting of the Association for Computational Linguistics (**ACL, Oral Presentation**), 2024.*

Aligning Relational Learning with Lipschitz Fairness
{Yaning Jia, **Chunhui Zhang**}, Soroush Vosoughi.
*International Conference on Learning Representations (**ICLR**), 2024.*
Note: Co-first author Jia was a master student who was mentored by me. Thanks Jia.

Mitigating Emergent Robustness Degradation on Graphs while Scaling-up
{Xiangchi Yuan, **Chunhui Zhang**}, Yijun Tian, Yanfang Ye, et al.
*International Conference on Learning Representations (**ICLR**), 2024.*
Note: Co-first author Yuan was a master student who was mentored by me. Thanks Yuan.

Graph Mixed Supervised Learning via Generalized Knowledge
Xiangchi Yuan, Yijun Tian, **Chunhui Zhang**, Yanfang Ye, Nitesh V Chawla, et al.
*ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (**KDD**), 2024.*

GCVR: Reconstruction from Cross-View Enable Sufficient and Robust Graph Contrastive Learning
Qianlong Wen, Zhongyu Ouyang, **Chunhui Zhang**, Yiyue Qian, Chuxu Zhang, Yanfang Ye
*The Conference on Uncertainty in Artificial Intelligence (**UAI**), 2024.*

Symbolic Prompt Tuning Completes the App Promotion Graph
Zhongyu Ouyang, **Chunhui Zhang**, Shifu Hou, Shang Ma, Chaoran Chen, Toby Li, Xusheng Xiao, et al.
European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML PKDD), 2024

How to Improve Representation Alignment and Uniformity in Graph-based Collaborative Filtering?
Zhongyu Ouyang, **Chunhui Zhang**, Shifu Hou, Chuxu Zhang, Yanfang Ye
*International AAAI Conference on Web and Social Media (**ICWSM**), 2024.*

Breaking the Trilemma of Privacy, Utility, and Efficiency via Controllable Machine Unlearning
{Zheyuan Liu, Guangyao Dou}, Yijun Tian, **Chunhui Zhang**, Eli Chien, Ziwei Zhu
*ACM International World Wide Web Conference (**WWW/TheWebConf**), 2024.*

When Sparsity Meets Contrastive Models: Less Data Can Bring Better Class-Balanced Representations
Chunhui Zhang, Chao Huang, Yijun Tian, Qianlong Wen, et al.
*International Conference on Machine Learning (**ICML**), 2023.* AAAI-DCAA 2023 Best Paper Runner-up Award

Chasing All-Round Graph Representation Robustness: Model, Training, and Optimization
Chunhui Zhang, Yijun Tian, Mingxuan Ju, Zheyuan Liu, et al.
*International Conference on Learning Representations (**ICLR**), 2023.*

Mind the Gap: Mitigating the Distribution Gap in Graph Few-shot Learning
Chunhui Zhang, Hongfu Liu, Jundong Li, Yanfang Ye, et al.
*Transactions on Machine Learning Research (**TMLR**), 2023.*

Fair Graph Representation Learning via Diverse Mixture-of-Experts
{Zheyuan Liu, **Chunhui Zhang**}, Yijun Tian, Erchi Zhang, et al.
*ACM International World Wide Web Conference (**WWW/TheWebConf**), 2023.*
Note: Co-first author Liu (in alphabetical order) was an undergraduate who was mentored by me. Thanks Liu.

Boosting Graph Neural Networks via Adaptive Knowledge Distillation
Zhichun Guo, **Chunhui Zhang**, Yujie Fan, Yijun Tian, et al.
*AAAI Conference on Artificial Intelligence (**AAAI**), 2023.*

Heterogeneous Graph Masked Autoencoders
Yijun Tian, Kaiwen Dong, **Chunhui Zhang**, et al.
*AAAI Conference on Artificial Intelligence (**AAAI**), 2023.*

Heterogeneous Temporal Graph Neural Network Explainer
Jiazheng Li, **Chunhui Zhang**, Chuxu Zhang.

ACM International Conference on Information and Knowledge Management (CIKM), 2023.

Label-invariant Augmentation for Semi-Supervised Graph Classification

Han Yue, **Chunhui Zhang**, Chuxu Zhang, and Hongfu Liu.
Conference on Neural Information Processing Systems (NeurIPS), 2022.

Co-Modality Imbalanced Graph Contrastive Learning

Yiyue Qian, **Chunhui Zhang**, Yiming Zhang, Qianlong Wen, Yanfang Ye, et al.
Conference on Neural Information Processing Systems (NeurIPS), 2022.

Look Twice as Much as You Say: Scene Graph Contrastive Learning for Self-Supervised Image Caption Generation

Chunhui Zhang, Chao Huang, Youhuan Li, Xiangliang Zhang, Yanfang Ye, et al.
ACM International Conference on Information and Knowledge Management (CIKM), 2022.

GraphBERT: Bridging Graph and Text for Malicious Behavior Detection on Social Media

Jiele Wu, **Chunhui Zhang**, Zheyuan Liu, Erchi Zhang, Steven Wilson, et al.
IEEE International Conference on Data Mining (ICDM), 2022.

Towards Tailored Models on Private AIoT Devices: Federated Direct Neural Architecture Search

Chunhui Zhang, Xiaoming Yuan, Qianyun Zhang, Guangxu Zhu, Lei Cheng, and Ning Zhang.
IEEE Internet of Things Journal (IEEE-IoTJ), Feb. 2022.

Honors and scholarships		
ACL Oral Presentation Award		2024
Graduate School of Arts and Sciences Fellowship		2021 – 2023
GSAS Ph.D. Student Conference Award		2023
Travel and Research Grant		2022
CIKM Travel Grant Award		2022
AAAI-DCAA Best Paper Runner-up Award		2023

Teaching experience		
Teaching Assistant, Computer Science, Brandeis Spring 2023		Fall 2021 &

CS 133A: Graph Mining

Graphs are capable of modeling complex social, technological, and biological systems. This course covers the core concepts, models, and algorithms of graph mining.

Teaching Assistant, Computer Science, Brandeis　　Spring & Fall 2022

CS 165B: Deep Learning

This course covers the core methods and algorithms of deep learning techniques.

Program Committee/Conference Reviewer

NeurIPS 2023, NeurIPS Datasets and Benchmarks track 2023, AAAI 2023, Learning on Graphs 2023, NeurIPS 2022, CIKM 2022, ICDM 2022, IEEE HPCC 2020

Journal Reviewer

IEEE Transactions on Knowledge and Data Engineering, IEEE Transactions on Network Science and Engineering, ACM Transactions on Intelligent Systems and Technology, Neurocomputing, Big Data