Chunhui Zhang, Ph.D. student at Dartmouth

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Research Focus

RL Post-Training and Multimodal Alignment on Language, vision, and audio

Education

Dartmouth College — Hanover, NH, USA
Ph.D. candidate in Computer Science — Aug. 2023–Feb. 2026 (expected)
Advisor: Professor Soroush Vosoughi

Brandeis University — Waltham, MA, USA
M.S. in Computer Science — Sep. 2021–Jun. 2023
GSAS Research Fellowship

Northeastern University — China
B.S. in Computer Science — Sep. 2017–Jun. 2021
Outstanding Honor Thesis Award

Experience

Amazon — Seattle, WA, USA
Applied Scientist Intern — Sep. 2025 – Dec. 2025
RL Post-Training for Multimodal Computer-Use Agents (CUA) in Rufus (reorganized into Amazon AGI Nova prior to internship end)
Post-trained multimodal LLMs (7–32B) for low-latency Graphical User Interface (GUI) agents via **adaptive reasoning**.
Implemented verl and vLLM to support **on-policy RL** and **SFT** on ground-truth hard trajectories, bridging OOD gaps and stabilizing visual grounding in GUI environments.

Google DeepMind — Mountain View, CA, USA
Research Intern — Jun. 2025 – Sep. 2025
Gemma 3n Post-Training for Real-Time Interaction (Frontier AI & GenAI)
Developed a synthetic audio–text data framework that eliminates reliance on human-crafted streaming labels while maintaining accuracy within **1%** of non-streaming models and scaling to web-scale data.
Built a **full-stack RL+SFT framework** for audio LLMs, achieving state-of-the-art performance in real-time streaming ASR/AST.
Engineered a high-throughput rollout and training pipeline in PyTorch and SGLang for Gemma 3n, accelerating RL (GRPO, DAPO) by 5×.
Contributed to **Gemma 3n technical report** and open-source support.

Honda Research Institute USA San Jose, CA, USA
Research Intern Jun. 2024–Sep. 2024
Multimodal LLM Post-Training (8B–70B) for Social Reasoning
Published a *spotlight* paper at ICML 2025 (Top 2.59%). Filed a US patent. Developed long-context multimodal LLMs and accelerated inference-time scaling using vLLM framework. Enabled long-context modeling of human behavior and autonomous driving in multimodal environments; scalable to LLMs up to 70B/405B parameters.

Selected Publications

Overcoming Multi-step Complexity in Theory-of-Mind Reasoning: A Scalable Bayesian Planner
Chunhui Zhang, Zhongyu Ouyang, Sean Dae Houlihan, Kwonjoon Lee, Nakul Agarwal, Soroush Vosoughi, Shao-Yuan Lo
ICML 2025 ***(Spotlight, Top 2.59%)***
Paper | Code
First scalable solution for multi-step Theory-of-Mind reasoning. Uses Bayesian inverse planning for global planning, then lets LLMs focus on local reasoning. Works on 70B+ models where others fail.

Growing Through Experience: Scaling Episodic Grounding in Language Models
Chunhui Zhang, Elsie Wang, Zhongyu Ouyang, Xiangchi Yuan, Soroush Vosoughi
ACL 2025 Main Conference ***(Oral Presentation, Top 3.24%)***
Paper | Code
Post-trained reasoning LLMs (across 3B, 8B, 70B) on MCTS-sampled data from physical simulators.

Pretrained Image-Text Models are Secretly Video Captioners
Chunhui Zhang*, Yiren Jian*, Zhongyu Ouyang, Soroush Vosoughi
NAACL 2025 Main Conference ***(Oral Presentation, Top 2.88%)***
Paper | Code
RL post-training recipe that achieved **Top-2** on PapersWithCode video captioning leaderboard, outperforming industry MLLM captioners.

Knowing More, Acting Better: Hierarchical Representation for Embodied Decision-Making
Chunhui Zhang, Zhongyu Ouyang, Zheyuan Liu, Soroush Vosoughi
EMNLP 2025 Findings
Paper

Refines vision-language-action LLM representations to enable more effective PPO-based RL training in embodied AI.

Working Memory Identifies Reasoning Limits in Language Models
Chunhui Zhang, Yiren Jian, Zhongyu Ouyang, Soroush Vosoughi
EMNLP 2024 Main Conference | Paper | Code
Introduced working memory as a diagnostic tool for LLM reasoning limits. This work inspired a follow-up NAACL paper on long-context multimodal understanding.

Temporal Working Memory: Query-Guided Segment Refinement for Enhanced Multimodal Understanding
Xingjian Diao*, **Chunhui Zhang***, Weiyi Wu, Zhongyu Ouyang, Peijun Qing, Ming Cheng, Soroush Vosoughi, Jiang Gui
NAACL 2025 Findings | Paper | Code
Inspired by working memory in my EMNLP 2024 paper, this work is a follow-up study on long-context video-language understanding.

Under Review

Model Priors Shape Experience: RL for Complex Audio Long-form Reasoners
Chunhui Zhang
Code
First to implement Qwen2.5-Omni and vLLM for faster RL reasoning across audio and other unified modalities.

Selected Collaborations

Superficial Self-Improved Reasoners Benefit from Model Merging
Xiangchi Yuan, **Chunhui Zhang**, Zheyuan Liu, Dachuan Shi, Soroush Vosoughi, Wenke Lee
EMNLP 2025 | Paper | Code

SoundMind: RL-Incentivized Logic Reasoning for Audio-Language Models
Xingjian Diao, **Chunhui Zhang**, Keyi Kong, Weiyi Wu, Chiyu Ma, Zhongyu Ouyang, Peijun Qing, Soroush Vosoughi, Jiang Gui
EMNLP 2025 ***(Oral Presentation)***

Is It Navajo? Accurate Language Detection in Endangered Athabaskan Languages
Ivory Yang, Weicheng Ma, **Chunhui Zhang**, Soroush Vosoughi

NAACL 2025 ***(Oral Presentation, Top 2.88%)*** | Paper | Code

Learning Musical Representations for Music Performance Question Answering
Xingjian Diao, **Chunhui Zhang**, Tingxuan Wu, Ming Cheng, Zhongyu Ouyang, Weiyi Wu, Jiang Gui
EMNLP findings 2024

Expedited Training of Visual Conditioned Language Generation via Redundancy Reduction
Yiren Jian, Tingkai Liu, Yunzhe Tao, **Chunhui Zhang**, Soroush Vosoughi, Hongxia Yang
ACL 2024 ***(Oral Presentation, Top 3.10%)***

Aligning Relational Learning with Lipschitz Fairness
Yaning Jia*, **Chunhui Zhang***, Soroush Vosoughi
ICLR 2024 – Note: Co-first author Jia was a master student I mentored.

Mitigating Emergent Robustness Degradation on Graphs while Scaling-up
Xiangchi Yuan*, **Chunhui Zhang***, Yijun Tian, Yanfang Ye, et al.
ICLR 2024 – Note: Co-first author Yuan was a master student I mentored.

When Sparsity Meets Contrastive Models: Less Data Can Bring Better Class-Balanced Representations
Chunhui Zhang, Chao Huang, Yijun Tian, Qianlong Wen, et al.
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.
ICLR 2023

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.
CIKM, 2022.

Full publication list *includeing 30+ papers at ICML, NeurIPS, ICLR, ACL, NAACL, EMNLP, WWW (TheWebConf), KDD, CIKM, ICDM, ICWSM, etc. available at chunhuizng.github.io*

Honors and Awards

ICML Spotlight Recognition (Top 2.59%)	2025
ACL Oral Presentation Award (Top 3.24%)	2024, 2025
NAACL Oral Presentation Award (Top 2.88%)	2025
AAAI-DCAA Best Paper Runner-up Award	2023
Graduate School of Arts and Sciences Fellowship	2021–2023

Service

Program Committee/Reviewer: ICML, ICLR, NeurIPS, ACL, NAACL, EMNLP, UAI, AISTATS, AAAI (2023–2025)

Journal Reviewer: TMLR, IEEE TKDE, IEEE TNSE, ACM TIST, Neurocomputing