YUANZHE HU

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EDUCATION

University of California, San Diego (UCSD) *Sep. 2024 – Mar. 2026 (expected)*
MS. in Computer Science Engineering

Huazhong University of Science and Technology (HUST) *Sep. 2020 – Jun. 2024*
B.S. in Artificial Intelligence (Honored Class, Qiming School)
GPA: 3.91/4.0

RESEARCH SUMMARY

Mathematical Foundations & Optimization for LLMs/SciML: Leveraged mathematical analysis to investigate training dynamics and generalization. Designed advanced algorithms for efficient LLM compression and training. Previous works include FARMS (ICML 2025)[1] for LLM layer-wise pruning, Model Balancing[2] (EMNLP 2024 Oral) for low-resource fine-tuning, and an ongoing project about analysis of multi-regime dynamics in SciML models[3].

Enhancing Memory and Reasoning in LLMs and Agents: Focused on enhancing long-term history processing and post-training reasoning. Previous works include MemoryAgentBench (ICLR 2026) [4] and MemoryAreana[5] for AI Agent memory comprehensive evaluation, M+ (ICML 2025) [6] for long-term information retention, K2-Think (Tech Report) [7] for large-scale reasoning, MIRIX (Open-source framework, 3K+ GitHub stars) for multi-agent memory systems, and Mem-alpha (Under Review) [8] for RL-based memory management.

PUBLICATIONS AND PREPRINTS

[1] **Yuanzhe Hu**, K. Goel, V. Killiakov, and Y. Yang, "Eigenspectrum analysis of neural networks without aspect ratio bias," in *ICML*, 2025.

[2] Z. Liu*, **Yuanzhe Hu***, T. Pang, Y. Zhou, P. Ren, and Y. Yang, "Model balancing helps low-data training and fine-tuning," in *EMNLP (Oral Presentation)*, 2024.

[3] **Yuanzhe Hu***, X. Wang*, Y. Wang*, X. Zhong*, H. Lu, T. Pang, M. W. Mahoney, Y. Yan, P. Ren, and Y. Yang, "Unveiling multi-regime patterns in sciml: Distinct failure modes and regime-specific optimization," in *Under Review*, 2026.

[4] **Yuanzhe Hu***, Y. Wang*, and J. McAuley, "Evaluating memory in llm agents via incremental multi-turn interactions," in *ICLR*, 2026.

[5] Z. He*, Y. Wang*, C. Zhi*, **Yuanzhe Hu***, T.-P. Chen*, L. Yin, Z. Chen, T. A. Wu, S. Ouyang, Z. Wang, J. Pei, J. McAuley, Y. Choi, and A. Pentland, "Benchmarking agent memory in interdependent multi-session agentic tasks," in *Under Review*, 2026.

[6] Y. Wang, D. Krotov, **Yuanzhe Hu**, Y. Gao, W. Zhou, J. McAuley, D. Gutfreund, R. Feris, and Z. He, "M+: Extending memoryllm with scalable long-term memory," in *ICML*, 2025.

[7] LLM 360 Team, Institute of Foundation Models, MBZUAI, "K2-think: A parameter-efficient reasoning system," in *Tech Report*, 2025.

[8] Y. Wang, R. Takanobu, Z. Liang, Y. Mao, **Yuanzhe Hu**, J. McAuley, and X. Wu, "Mem-α: Learning memory construction via reinforcement learning," in *Under Review*, 2025.

* Equal Contribution

RESEARCH AND INDUSTRIAL EXPERIENCE

Memory LLM and Agents Benchmarking and Construction [4]–[6], [8] Oct 2024 - Now
CSE Research Course, Supervisors: Yu Wang and Prof. Julian McAuley UC San Diego

- Led the development of **MemoryAgentBench**, a comprehensive benchmark designed to systematically assess the long-term memory of LLM agents via multi-turn interactions, with evaluation criteria based on principles of cognitive science.
- Designed the framework for MIRIX's Evaluation on multiple memory agent benchmarks and participated in code maintenance.
- Contributed to Reinforcement Learning(RL) on LLM Agent for long-term memory management, achieving 52% test accuracy on LongMemEval(S*) with only one-third of the full context window.
- Co-authored four research papers: MemoryAgentBench(ICLR 2026), MemoryArena and RL Memory Agents and the M+ (ICML 2025).

Empirical Analysis of SFT for Large Reasoning Models [7] Jun 2025 - Sep 2025
Research Collaborator, Supervisor: Prof. Zhiting Hu Institute of Foundation Models, MBZUAI

- My role in this project includes data pre-processing, model training, and technical report writing.
- Engineered and built the large-scale supervised fine-tuning (SFT) pipeline for models up to 70B parameters (e.g., LLaMA / Qwen) on multiple H200 GPU cluster.
- Leveraged the SFT pipeline to achieve strong results on reasoning benchmarks, while conducting comprehensive analysis on training dynamics, data selection, and loss behaviors.

De-biased LLM Pruning Based on Eigspectrum and MP-Law [1] Nov 2024 - Apr 2025
Research Collaborator, Supervisor: Prof. Yaoqing Yang Dartmouth College

- Developed ***FARMS***, a novel subsampling method grounded in **Random Matrix Theory** (RMT), to normalize weight matrices to a fixed aspect ratio, enabling an unbiased, size-invariant evaluation of layer training quality.
- Validated the method's effectiveness across diverse domains (**LLM Pruning, CV, SciML**), consistently **outperforming state-of-the-art** layer-wise optimization methods.
- First-authored a research paper accepted to the **ICML** 2025.

Layer-wise Optimization for Low-Resource SFT of LLM [2] Jun 2023 - Jun 2024
Research Collaborator, Supervisors: Dr. Pu Ren and Prof. Yaoqing Yang Dartmouth College

- Developed a dynamic **layer-wise learning rate** scheduling algorithm to rebalance training quality across layers, overcoming limitations of prior optimizers in LLM SFT scenarios.
- Validated the method's effectiveness through extensive experiments on diverse models and benchmarks, improving LLM test accuracy **by 2-10%** in low-data SFT and leading to a **co-first** authored publication at EMNLP 2024 **(Oral Presentation)**.

COMPETITION AWARDS / SERVICE

Reviewer for ICLR 2026, ARR 2025 (July / Oct.), and Workshops.
Volunteer for ICML 2025

TECHNICAL SKILLS

Programming Languages	Python, C/C++, SQL, Bash, Matlab
Machine Learning Tools	PyTorch, Hugging Face Transformers, LLaMA Factory, Verl