

# SHAOLONG LI

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## Education

**University of Michigan, Ann Arbor**  
*M.S. in Computer Science and Engineering*

Sep. 2025 – Jun. 2027 (Expected)

**Central South University (CSU)**  
*B.S. in Computer Science and Technology*

Sep. 2020 – Jun. 2024

- GPA: 93.95/100, Rank: 1/235

## Publications

(\* stands for equal contribution.)

**Mixed Sparsity Training: Achieving  $4\times$  FLOP Reduction for Transformer Pretraining**

[\[PDF\]](#)

Pihe Hu\*, Shaolong Li\*, Xun Wang, and Longbo Huang  
*In Transactions on Machine Learning Research (TMLR).*

**Value-Based Deep Multi-Agent Reinforcement Learning with Dynamic Sparse Training**

[\[PDF\]](#)

Pihe Hu\*, Shaolong Li\*, Zhuoran Li, Ling Pan, and Longbo Huang  
*In Annual Conference on Neural Information Processing Systems (NeurIPS), 2024.*

## Research Experience

**AIMING Lab at the University of North Carolina at Chapel Hill**

Aug. 2024 – Dec. 2024

*Research Assistant supervised by Prof. Huaxiu Yao*

**Research on Multimodal Alignment for Multimodal Models**

- Introduced a novel multimodal Direct Preference Optimization (DPO) that enables multimodal models to train on interleaved image-text datasets, significantly improving their capability to generate interleaved text-image outputs.
- Incorporated the concept of step reasoning into the alignment of multimodal models by segmenting interleaved image-text content into a step-level dataset for training.

**Research on Step Reasoning for Large Language Models (LLMs)**

- Improved DPO to apply it to step-level preference pair datasets, enhancing LLMs' long-chain mathematical reasoning ability.
- Constructed a step-level training dataset by sampling responses, splitting them into steps, and pairing samples based on the probability of each step leading to the correct answer.
- Leveraged a value function to evaluate context quality, enabling decisions based on the current step's response rather than the entire generated sentence.

**Decision Intelligence Lab at Tsinghua University**

Jul. 2023 – Jun. 2024

*Research Assistant supervised by Prof. Longbo Huang*

**Research on Sparse Pretraining for Large Language Models (LLMs)**

- Introduced an innovative pretraining method that cuts down about 75% of Floating Point Operations while preserving LLM performance.
- Integrated dynamic sparse training with a varying sparsity pattern to reduce the computational cost of forward and backward propagation.
- Proposed a novel topology evolution scheme, Mixed-Growing, to explore and utilize more parameters, avoiding suboptimal solution spaces.

**Research on Sparse Training for Multi-Agent Reinforcement Learning**

- Introduced a novel Multi-Agent Sparse Training Framework, reducing Floating Point Operations and model size by up to 20-fold with less than 3% performance loss.
- Capitalized on gradient-based topology evolution combined with a Hybrid TD scheme, enhancing the reliability of TD targets in sparse networks.
- Employed Dual Buffers for stable policy sampling and replaced the max operator with Soft Mellowmax to alleviate DQN overestimation and achieve more accurate value estimation.

## Skills

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- **Language:** English, Chinese.
- **Programming:** Python, Pytorch, C, C++, Java, MATLAB, HTML/CSS/Javascript, Shell, TEX, Verilog.
- **Toolsets:** Docker, Git, Linux.

## Awards and Scholarships

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|-----------------------------------|-----------|
| ◦ Outstanding Graduate, CSU       | Mar. 2024 |
| ◦ Ruiwei Scholarship              | Oct. 2023 |
| ◦ Outstanding Student, CSU        | Dec. 2022 |
| ◦ Yihao Foodstuff Scholarship     | Nov. 2022 |
| ◦ National Scholarship (Top 0.2%) | Dec. 2021 |
| ◦ First Class Scholarship, CSU    | Nov. 2021 |