

Ziming Liu (刘子铭)

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National University of Singapore / Peking University

Education

National University of Singapore, School of Computing

➤ Ph.D. in Computer Science Jan. 2023 – Present

National University of Singapore, School of Computing

➤ Master's degree in computer science (Artificial Intelligence) Aug. 2021 – Jan. 2023

Peking University, School of Electronics Engineering and Computer Science

➤ B.S. in Computer Science and Technology Sep. 2016 – Jul. 2020

Award

ByteDance Scholarship Award 2025

➤ 20 among all CS Ph.D. students and candidates in China and Singapore.

National University of Singapore SoC Teaching Fellowship

➤ Reward for excellence in tutoring, 3 among all CS Ph.D. in NUS.

Industry Experience

Qiji Zhifeng (Startup)

Jan. 2025 – Nov. 2025

Research Intern

Large-scale MoE Serving.

Microsoft Research Asia.

May. 2024 – Nov. 2024

Research Intern, System Group

Rewarded "Star of Tomorrow" certificate (Top 10% intern)

HPC-AI Tech.

May. 2022 – Dec. 2022

Research Intern

ByteDance Inc.

Aug. 2020 – Jul. 2021

Machine Learning Engineer, Lark

Research Interests

Machine Learning System and High Performance Computing.

Including distributed model training (parallelism schemes) / inference and serving systems. Also working on efficient training/inference with sparsity.

Highlight Research Experience

StarTrail:

Concentric Ring Parallelism for Efficient Near-Infinite-Context Transformer Model Training

Advisor: Presidential Young Prof. You Yang, Prof. James Demmel

Dec. 2023 – June.2024

Objective: We develop a multi-dimensional sequence parallel system to reduce the communication volume and improve overall efficiency for long-sequence Transformer model training.

- This paper is accepted by NeurIPS2025.
- We conceptualize Attention computation as a novel instance of the traditional n-body problem, providing fresh insights into optimizing and parallelizing Attention computation.
- We introduce a near-infinite-context training system for Transformer models, featuring a groundbreaking multi-ring sequence parallelism scheme.
- Preliminary results indicate that our **StarTrail** system outperforms Ring Attention by up to 77.12%, showcasing its efficacy and scalability.

Hanayo: Harnessing Wave-like Pipeline Parallelism for Enhanced Large Model Training Efficiency

Advisor: Presidential Young Prof. You Yang

Dec. 2022 – Apr. 2023

Objective: We develop a new pipeline parallel technique to solve the problem the bubbles in existing pipeline model training techniques and achieve SOTA results in multiple tasks.

- This paper has been accepted by SC '23(The International Conference for High Performance Computing, Networking, Storage, and Analysis).
- We introduce a wave-like pipeline scheme that achieves a low bubble ratio and high performance in large model training.
- Experimental results demonstrate that Hanayo achieves up to a 30.4% performance improvement over the current state-of-the-art pipeline parallelism implementation.

WeiPipe: Weight Pipeline Parallelism for Communication-Effective Long-Context Large Model Training

Advisor: Presidential Young Prof. You Yang and Prof. Rong Zhao

Apr. 2024 – Nov. 2024

Objective: We introduce weight-pipeline parallelism (WeiPipe) that transitions from an activation-passing pipeline to a weight-passing pipeline in long-context scenarios to reduce the communication volume and enhance efficiency.

- This paper has been accepted by PPOPP '25(ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming).
- We propose WeiPipe, WeiPipe-Interleave, and WeiPipe-Zero-Bubble that reduces the bubble ratio and relieve the communication requirements
- Experimental results demonstrate that WeiPipe can improve training efficiency by about 30%-80% compared to state-of-the-art PP and maintain weak and strong scalability under long-context scenarios.

Expert-as-a-Service: Towards Efficient, Scalable, and Robust Large-scale MoE Serving

May. 2024 – Dec. 2024

Objective: Efficient, scalable, and robust MoE Serving System.

- Our system disaggregates MoE modules into independent, stateless services. This design enables fine-grained resource scaling and provides inherent fault tolerance by decoupling compute units.
- The architecture is powered by a high-performance, CPU-free peer-to-peer communication library that ensures minimal overhead and high throughput.
- EaaS incurs less than a 2% throughput reduction under simulated hardware failures that would otherwise halt monolithic architectures. It further saves up to 37.5% of computing resources through dynamic fine-grained adaptation to serving traffic, demonstrating strong resilience for large-scale MoE deployment in production.

Region-Adaptive Sampling for Diffusion Transformers

Advisor: Dr. Yuqing Yang

May. 2024 – Dec. 2024

Objective: *Efficient Diffusion Transformer Inference.*

- We introduce RAS, a novel, training-free sampling strategy that dynamically assigns different sampling ratios to regions within an image based on the focus of the DiT model.
- We evaluate RAS on Stable Diffusion 3 and Lumina-NextT2I, achieving speedups up to 2.36x and 2.51x, respectively, with minimal degradation in generation quality.

Publication

Hanayo: Harnessing Wave-like Pipeline Parallelism for Enhanced Large Model Training Efficiency

Ziming Liu*, Shenggan Cheng*, Haotian Zhou, and Yang You

SC '23, *In Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis*, 2023

*: Equal Contribution.

StarTrail:

Concentric Ring Parallelism for Efficient Near-Infinite-Context Transformer Model Training

Ziming Liu, Shaoyu Wang, Shenggan Cheng, Zhongkai Zhao, Yang Bai, Xuanlei Zhao, James Demmel, Yang You

NeurIPS2025, *In Proceedings of The Thirty-Ninth Annual Conference on Neural Information Processing Systems*.

WeiPipe: Weight Pipeline Parallelism for Communication-Effective Long-Context Large Model Training

Junfeng Lin*, **Ziming Liu***, Yang You, Jun Wang, Weihao Zhang, Rong Zhao

PPoPP '25, *ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming*

*: Equal Contribution.

Concerto: Automatic Communication Optimization and Scheduling for Large-Scale Deep Learning

Shenggan Cheng, Shengjie Lin, Lansong Diao, Hao Wu, Siyu Wang, Chang Si, **Ziming Liu**, Xuanlei Zhao, Jiangsu Du, Wei Lin, Yang You

ASPLOS 2025, *ACM International Conference on Architectural Support for Programming Languages and Operating Systems*

DSP: Dynamic Sequence Parallelism for Multi-Dimensional Transformers

Xuanlei Zhao, Shenggan Cheng, Zangwei Zheng, Zheming Yang, **Ziming Liu**, and Yang You

ICML2025, *In Proceedings of International Conference on Machine Learning 2025*

HeteGen: Efficient Heterogeneous Parallel Inference for Large Language Models on Resource-Constrained Devices

Xuanlei Zhao, Bin Jia, Haotian Zhou, **Ziming Liu**, Shenggan Cheng, and Yang You

MLSys 2024, *In Proceedings of Machine Learning and Systems 2024*

Preprints

Expert-as-a-Service: Towards Efficient, Scalable, and Robust Large-scale MoE Serving

Ziming Liu, Boyu Tian, Guoteng Wang, Zhen Jiang, Peng Sun, Zhenhua Han, Tian Tang, Xiaohe Hu, Yanmin Jia, Yan Zhang, He Liu, Mingjun Zhang, Yiqi Zhang, Qiaoling Chen, Shenggan Cheng, Mingyu Gao, Yang You, Siyuan Feng

Under Review, Arxiv:2509.17863, 2025

Region-Adaptive Sampling for Diffusion Transformers

Ziming Liu, Yifan Yang, Chengruidong Zhang, Yiqi Zhang, Lili Qiu, Yang You, Yuqing Yang

Under Review, Arxiv:2502.10389, 2024

EnergonAI: An Inference System for 10-100 Billion Parameter Transformer Models

Jiangsu Du, **Ziming Liu**, Jiarui Fang, Shenggui Li, and Yongbin Li, Yutong Lu, Yang You

Arxiv: 2301.08658, 2022

ATP: Adaptive Tensor Parallelism for Foundation Models

Shenggan Cheng, **Ziming Liu**, Jiangsu Du, and Yang You

Arxiv: 2209.02341, 2023

Skills

Languages: Python, C, C++, Latex

Frameworks: Pytorch, Huggingface, Megatron, Deepspeed, SGLang.