Peiran Qin

Software Systems Engineer

MangoBoost, Inc.

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Areas of Expertise

Areas: Systems for LLM Inference and Training. Operating Systems, Storage Systems, and Distributed Systems.

Focus: Building more performant systems in the context of:

1) High Resouce Efficiency (e.g. prefetch and cache eviction co-design for higher cache efficiency)
2) Low Latency (e.g. mitigating tail latencies in cloud storage systems)
3) Workload Awared (e.g. workload characterization and prediction for distributed ML clusters)

Education

University of Chicago

Pre-Doctoral M.S. in Computer Science; GPA: 3.86/4.00 — Sep, 2023 - Dec, 2024

- Advisor: Haryadi S. Gunawi
- Recipient of a $38,000 Merit-based Scholarship (4 students, CS class of 2024)

Chinese University of Hong Kong, Shenzhen

B.Eng. in Computer Engineering; First-Class Honours — Sep, 2019 - Jul, 2023

- Advisor: Yeh-Ching Chung

Publications

EuroSys'25 [Acceptance Rate: 8.2%]	Daniar H. Kurniawan, Rani Ayu Putri, Peiran Qin, Kahfi S. Zulkifli, Ray AO Sinurat, Janki Bhimani, Sandeep Madireddy, Achmad Imam Kistijantoro, and Haryadi S. Gunawi. **Heimdall: Accurate and Efficient I/O Admission Policy with Extensive Machine Learning Pipeline.**
In Submission '25	Anonymous Author(s). **Storage Prefetching Needs Feedback: An Efficient Prefetching/Eviction Co-Design with Small Cache Footprints.** *Manuscript is available upon request*

Work Experience

MangoBoost, Inc. (Series-A Startup) — Bellevue, WA

Software Enigneer, LLM Inference Systems — Jan, 2025 - Present

Systems for LLM Inference [Product Link]

- Optimized LLM inference engine on 32x AMD MI300X GPUs for MLPerf Inference v5.0 submission. Delivered the highest Llama-70B results in MLPerf, with 103,182 tokens per second.
- Optimized network stack and delivered the first multi-node MLPerf submission on AMD GPUs, achieving linear scaling, with 24% better throughput than 32x H100 GPUs.
- Developed key features of MangoBoost's Inference Engine, including load balancing, TTFT and TPOT sensitive scheduling, and auto-config tuning. Delivered up to 7.1x higher throughput on Llama4-Scout.

(Media Mentions: [Forbes], [Yahoo], [IEEE])

Systems for LLM Training

- Optimized on the NCCL and Megatron optimization. Offered near-linear throughtput scaling from 8x MI300X GPUs to 32x MI300X GPUs.
- Optimized on the context parallelism for Llama2-70B-Lora Fine-Tuning, achieved 11% lower lantency than previous optimal parallelism strategy.
- Delivered the first-ever multi-node (16x & 32x) AMD GPUs result in MLPerf, competitive to H200 cluster.

(Media Mentions: [AMD], [Forbes], [IEEE], [ZDNET])

University of Chicago; Advisor: Haryadi S. Gunawi — Chicago, IL

Research Assistant, UCARE Group — Apr, 2023 - Jan, 2025

Cache Prefetching & Eviction Co-Design

- Developed a co-designed policy for cache prefetching and eviction, achieving a 62% reduction in backend load compared to the state-of-the-art.
- Implemented the system on multiple platforms including CacheLib, Linux kernel, Ceph.
- Implemented and characterized SOTA prefetchers (e.g. Pythia) and eviction policies (e.g. SIEVE, S3FIFO).
- Majorly contribute to structure, organize, and conduct the evaluation experiments.

(Paper in submission '25)

I/O Admission Policy
- Built an efficient I/O admission policy by innovatively combining storage domain knowledge with the extensive ML pipeline. Our system surpasses the SOTA by 15%-35% in terms of average I/O latency.
- Implemented the joint-inference which can maintain the scalability under 8x heavier workload.
- Hacked the deployment of our system on Linux kernel level and C client level.
- Implemented a SSD wear-leveling emulator which is cheap, scalable and extensible, based on FEMU.

(Paper accepted at EuroSys'25)

Microsoft Research, Asia; Mentor: Lei Qu   Beijing, China
Intern, Networking Research Group   May, 2022 - Dec, 2022

Workload Characterization & Prediction for ML Clusters Design
- One of the major contributors to the AISim project, supported MLsys design by workloads analysis.
- Completed the design, implementation, and validation to extract the general workload characteristic from first-part clusters and proposed a pipeline to predict the workload's distribution.
- Created a workload prediction model with high goodness-of-fit (p-value=0.3) and generalizability.

(Research report delivered to Microsoft Engineering Group '22)

Workload Profiling in ML Clusters
- One of the major contributors to DMLProfiling project, focusing on ML distributed systems profiling.
- Characterized the resource patterns of various large ML models running in Microsoft Azure clusters.
- Devised a high-precision solution for inferring the job types and model types (ResNet, BERT, ViT, etc) of jobs run on clusters by analyzing the key resources usage, with the accuracy reaching over 99%.

(Research report delivered to Microsoft Engineering Group '22)

Alibaba Group; Advisor: Yeh-Ching Chung   Hangzhou, China
Student Research Assistant   Dec, 2021 - May, 2022

Graph Computing Sytems Optimization
- Worked on the large-scale sub-graph matching systems, focusing on reducing memory footprint.
- Optimized the design by replacing the stale tabular-based catalog with graph-based representation equipped with dynamic programming, which reduces the memory usage and improves the efficiency.
- Proposed a solution for encoding and decoding sub-graphs with reduced memory footprint.

(Paper accepted at ATC '23)

Technical Skills

Systems for LLM:	vLLM, SGLang, Megatron, Mango LLMBoost
Linux Kernel:	Experience of block layer, vfs, and syscalls hacking in Linux-6.0
Programming Language:	C, C++, Python, Rust, Java, C#, Verilog HDL, SQL
Distributed Systems:	RocksDB, Ceph
ML Framework:	PyTorch, TensorFlow
Containerization:	Docker

References

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