

Ziqi (Astra) Zhao

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Education

Texas A&M University

Ph.D. in Computer Science and Engineering. GPA: 4.0/4.0

College Station, TX

Dec 2024

Beihang University

B.S. in Electrical and Computer Engineering. GPA: 3.8/4.0

Beijing, China

June 2018

Experience

The Linux Foundation

Mentee. Program: Linux Kernel Bug Fixing Summer 2023

Fremont, CA

May 2023 – Aug 2023

- Upstreamed a total of 6 patches into the mainline kernel as a learning experience for open-source kernel development
- Fixed bugs reported by Syzkaller on various kernel subsystems, including networking, GPU driver, filesystem, and `kselftest`
- Identified a reference leak involving Linux bridge devices by using GDB on the `vmlinux` kernel binary, and fixed it by refactoring relevant logic to avoid creating the error-prone reference in the first place
- Resolved a deadlock issue by enforcing strict topological order on 3 nested spinlocks, based on the kernel `dmesg` obtained with `CONFIG_LOCKDEP` enabled and the syscall traces provided by the `strace` command
- Created a blog to share my suggestions on working with Syzbot bugs: <https://astrajaoan.github.io/2023/08/21/syzbot.html>

Texas A&M University

Graduate Research Assistant. Supervisor: Dr. Vivek Sarin

College Station, TX

May 2022 – Present

- Leveraged PyTorch to study the scalable and efficient computation of Gaussian Process, a probabilistic supervised machine learning model that provides uncertainty measure of its predictions
- Summarized high-level concepts in this blog: <https://astrajaoan.github.io/2023/08/26/research.html>, and got sponsored by the Linux Foundation to publish this article: <https://thenewstack.io/using-gpytorch-a-researchers-experience/>

Publications

Interpretation of Time Series Deep Models: A Survey

Z. Zhao, Y. Shi (co-first author), S. Wu (co-first author), F. Yang, W. Song, N. Liu

Fremont, CA

June 2022 – Present

- Reviewed state-of-the-art post-hoc interpretation methods and inherently interpretable models on time-series deep learning

Projects

Fault-Tolerant Distributed System | C++20, Boost.Asio, gRPC, gtest, AWS, MapReduce, Raft

July 2023 – Present

- Implemented the Raft consensus protocol from scratch, including logic for leader election, log replication, and persistent state
- Developed a MapReduce system that enables user to supply custom Map and Reduce tasks to run on separated machines, using TCP sockets for worker communication and Amazon S3 for shared state object storage
- Designed an event-driven service architecture with fully asynchronous I/O operations, based on Boost.Asio, C++20 coroutines, and gRPC with its `CompletionQueue` API for non-blocking request processing
- Created 50+ unit-tests with gtest to cover any concurrent usage scenarios and ensured 100% consistency in all cases

GPU-Based Strassen Algorithm | CUDA, cuBLAS, C++

Feb 2022 – May 2022

- Implemented the Strassen matrix multiplication algorithm that recursively divides square matrices into smaller sub-matrices, and computes additions instead of multiplications to reduce the time complexity from $\mathcal{O}(n^3)$ to $\mathcal{O}(n^{\log_2 7} \approx n^{2.8})$
- Provided a GPU-based version of the algorithm that leverages CUDA and cuBLAS to parallelize workload onto GPU threads, as well as a CPU-based serial version in C++ as the baseline for performance comparison
- Achieved a 140 \times speedup when multiplying $2^{10} \times 2^{10}$ matrices on an NVIDIA RTX 6000 GPU compared to the CPU version

pastecat.io | React, Node.js, Docker, GCP, Firebase, OAuth 2.0

June 2023 – Present

- Built a web application for sharing and exporting code snippets with React as the frontend, and included a CLI tool written in Node.js for a more developer-friendly experience working with pastes in a UNIX shell environment
- Constructed the website backend with two coordinative components: a Firebase Firestore NoSQL database for high-availability queries based on paste IDs, and a Firebase Cloud Storage service for storing actual paste files
- Deployed the website with Docker containers and served traffic under a GCP external application load balancer
- Implemented Firebase Security Rules and user authentication based on OAuth 2.0 to protect access to the backend services

Skills

Languages: C++, C, Python, Bash, JavaScript, SQL, Go

Frameworks: CUDA, OpenMP, PyTorch, Tensorflow, React, Node.js, RPC, RESTful API, Git, Docker, GNU Make, AWS, GCP

Familiar with: Linux kernel, parallel computing, operating system, distributed system, asynchronous I/O, networking