Github: https://github.com/fqzz2000

Quanzhi (Frank) Fu

(+86)189-1005-1971
Quanzhi.fu@duke.edu

EDUCATION

Virginia Tech Aug 2024 – present
Ph.D. in Computer Science
Advisor: Dr. Dan Williams
Research Interest: Operating System, Cloud System

Duke University Aug 2022 – May 2024
M. Eng. in Electrical and Computer Engineering *– Software Development GPA 4.0/4.0 (ranked 1/26)*
- **Coursework**: Enterprise Storage System, Compiler, Computer and Information security, Computer Architecture

The Chinese University of Hong Kong, Shenzhen Aug 2018- May 2022
B.Sc. in Statistics - Data Science, *Graduate with First Class Honors, GPA 3.84/4.0 (ranked 6/199)*
- **Coursework:** Programming Paradigms(A), Database Management(A), Machine Learning(A), Deep Learning(A)
- **Awards:** Undergraduate Research Award (2 times), Dean's List (6 semesters), Academic Performance Scholarship (2 times)

INTERNSHIP EXPERIENCE

AlibabaCloud-Container Service Team-System and Infrastructure Develop Intern May 2023 – Aug 2023
Key Technology: Kubernetes, Docker, Container, OpenKruise, Golang
Development and Support of AlibabaCloud Network Service Mesh (NSM)
- Implemented hot-update capability for NSM's Sidecar access component using OpenKruise and Unix Domain Socket
  - Achieved seamless migration of services during updates, ensuring uninterrupted service and continuity of existing long-lived connections
  - Designed a custom communication protocol for state synchronization during hot updates
  - Developed Python scripts for automated end-to-end testing within the cluster
- Daily Support and Solutions
  - Customized Socks5 forwarding solution for tailored business needs, enabling controlled flow of north-south traffic
  - Utilized iptables rules for seamless traffic redirection, ensuring transparent forwarding.
  - Upgraded containerd image pull proxy, deploying the proxy within an isolated net namespace to reduce reliance on host kernel parameters
  - Actively participated in NSM's daily development, operational tasks, and troubleshooting efforts
  - Engaged in NSM code reviews, contributing to the codebase with multiple fixes for production incidents

PROJECT EXPERIENCE

Tiger Compiler Jan 2024 – May 2024
- Developed a MIPS compiler for a Pascal like language “Tiger” using SML in a functional programming paradigm, which is a Turing complete language with strong type system and a runtime library
- Implemented lexical analysis, parsing, semantic analysis, intermedia representation generation, code generation and register allocation.
- Applied optimizations to the compiler including common sub-expression elimination and constant propagation
- Designed and documented an automatic test pipeline with python which tested the compiler on 128 different test programs

Dropbox Client in Linux FUSE filesystem Feb 2024 – May 2024
- Developed a Dropbox Client using Python SDK of Dropbox API and Linux Filesystem in Userspace (FUSE)
- Implemented SmartSync Feature using Linux FUSE to hijacking filesystem call to enhance efficient synchronization by only downloading files when accessed to saving disk space and network bandwidth
- Designed an asynchronous synchronization mechanism to manage local and remote file updates to achieve both low-latency and no race-condition
- Developed a Python-Nemo extension for displaying file sync statuses in Linux Mint’s file explorer.
- Developed tests using pytest and set up Github CI pipeline to automate unit tests and integrated tests

Gomoku Online Mar 2024 – May 2024
- Developed an online multi-player Gomoku game website using TypeScript, utilized Vue3 as frontend and Express, SocketIO, MongoDB as backend
- Applied design patterns and principles developed functionality including OIDC authentication, join/leave room, gameplay, update profile, ranking etc.

- Enabled scale-out by using Kubernetes as load-balancer and set up a CI/CD pipeline to deploy the project
- Deployed the project with Nginx as reverse proxy and automated Playwright E2E tests on the CI pipeline
- Used github to manage the project progress and collaboration

Tiny-TikTok Back-end Development Jan 2023 – Feb 2023
- Developed services including Video Feed, Registration and Login, Video Upload, etc. for a Simplified TikTok application based on **Golang**
- Built Web Service based on **Gin**, designed and implemented **MySQL** tables, used **Gorm** to operate the database
- Conducted version control and collaboration using **Git** and **Github**, finished documentation of the project

Malloc: Implementation of Dynamic Memory Allocation in C Jan 2023 -Feb 2023
- Implemented malloc & free function with FILO explicit free list in C using sbrk() system call
- Realized efficient memory usage by aligning the data by double words and using hidden pointers in free block
- Benchmarked the malloc & free performance for different allocation policies including best-fit and first-fit policy

Gitlet Version Control System Nov 2022 – Dec 2022
- Built a Git-like version control system using **Java**, support commands including add, commit, checkout, merge, etc.
- Realized version control and comparison by creating an index for files using the **SHA-1** function; Boosted query performance by storing files in a **tree structure**
- Conducted unit and integration tests using **JUnit** and **Python** Script respectively, and designed test cases for them

GateToTetris: Implementation of a Single Cycle Processor and its Application Oct 2022-Nov 2022
- Implemented a **single-cycle processor** supporting 16 MIPS-like instructions using **Verilog** gate level circuits on the **FPGA** platform and ran the Tetris game on it
- Utilized PS2 keyboard and VGA monitor as input and output device designed a **VGA buffer** based on memory layout for data transfer between the processor and VGA monitor
- Developed assembly for Tetris based on the instruction set of the processor and converted assembly to binary instructions by building an assembler in **Python**

RESEARCH EXPERIENCE

Probabilistic Safe Reinforcement Learning for Autonomous Vehicle Ramp Merging Control Jun 2021-Aug 2021
Research Assistant; Adviser: Prof John M. Dolan Carnegie Mellon University
- Eliminated the Avoid Constraint Violation by introducing the **Control Barrier Function** to the optimization process and successfully developing a **safety-assured Reinforcement Learning** algorithm for ramp merging
- **Paper published on RISS Journal (2021)** [Link]

Adaptive Network Routing based on Reinforcement Learning Jul 2020-Jul 2021
Research Assistant; Advisor: Prof. Yi Chen Chinese University of Hong Kong
- Conducted extensive research and designed a **multi-agent deep reinforcement learning**-based solution for the network routing problem
- **Paper published on IEEE Globecom (2021)** [Link]

LEADERSHIP

Reinforcement Learning Seminar Chinese University of Hong Kong
Leader & Instructor of Markov Decision Process Parts Oct 2020-Dec 2020
- Organized and instructed sessions for 7 faculties and 5 PhD students to learn Reinforcement Learning Theory

SKILLS

Programming Language: Golang, C/C++, Java, Python (Pytorch, Skitlearn, Pandas, MatplotlibWeb Development (JavaScript, HTML, CSS), MySQL
Development Tool: Unix, Git, Vim, Valgrind