Jacob Root

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Education

University of California - San Diego San Diego, CA
Bachelor of Science in Computer Science; **GPA: 3.97** *September 2022 – June 2026*
Coursework: Graduate Networked Systems, Cloud Computing and Virtualization, Parallel Computing, Operating Systems, Databases, Software Engineering, Graphics

Technical Skills

Languages: Python, Golang, Javascript, Rust, C++, C, ARM Assembly, Java, Protobuf, Bash
Frameworks and Libraries: Pytest, OpenCV, gRPC, Connect-go, JUnit, Next.js
Developer Tools: Git, Docker, Kubernetes, Systemd, Linux

Experience

Incoming Linux System Software Intern September 2024 - December 2024
NVIDIA *Santa Clara, CA*

Intern Member of Techincal Staff June 2024 – Present
Nutanix *San Jose, CA*

- Built an internal tool using **Next.js** designed to derisk and automate DevOps tasks on Nutanix Cloud Clusters
- Reduced time to fetch data by 97% to 200ms by rewriting database queries, leading to reduced service load
- Shortened CI time by 86% (50m to 7m) by removing redundant steps, splitting tests, scheduling tests optimally, and exploiting parallelism, saving 500+ hours per year for the team

Cloud Networking Developer October 2023 – Present
CAIDA *San Diego, CA*

- Designed and implemented a **DPDK** app to inject in-band probe packets to measure per-hop latency
- Identified consistency issues and deadlocks in 2 implementations of a concurrent hash table using packet traces and rewrote using a mutex and atomics to guarantee correctness while preserving throughput
- Automated end to end setup and running of tests on Fabric Testbed in Python Jupyter notebook

Cloud Software Engineering-Robotics Application Intern June 2023 – September 2023
Braincorp *San Diego, CA*

- Implemented and upgraded end to end (cloud to robot) communication layer using **Python**, **gRPC**, and **Golang** to perform actions from the cloud previous possible only in person, saving up to 5 minutes per use for customers
- Revamped Python handling of concurrent threads to increase performance for test suite by over 10 times
- Identified multiple race conditions leading to flaky tests, reduced flake rate from above 33% to under 0.01%

Software Engineer Intern July 2022 – August 2022
Torpago *San Francisco, CA*

- Built **Slack** bot for Torpago, with features estimated to streamline spend management for 90% of Torpago users
- Developed **Golang** bindings of Torpago REST API and wrote automated tests for the binding with 80% coverage

Linux Development Intern June 2021 – August 2021
IBM *Hillsboro, OR*

- Contributed changes in **IBM vnic** driver to **Linux Kernel**

Projects

Live Container Migration | *Python, Iptables/Netfilter, Wireguard, Podman, CRIU*
- Tool to migrate **Podman** containers with active network connections while not disrupting them
- Used **wireguard** tunnels, **IPtables** rules, and connection table rewriting to migrate network connections
- Debugged several packet transit and tcp connection issues using tcpdump, iptables TRACE, and conntrack
- Minimized network and container downtime using **CRIU** pre-snapshots and peer to peer file transfer

SurfStore | *Golang*
- Scalable and fault-tolerant folder sync app similar to Dropbox written with **Golang** and **Sqlite**
- Made the app scalable by storing blocks in a distributed hash table, enabling horizontal scaling
- Implemented the Raft consensus algorithm to make the app's metadata store fault tolerant

Numerical Computing | *CUDA, ARM SVE*
- Implemented Convolution in CUDA that placed 1st in class of 100+ by optimizing data movement
- Implemented high performance Matrix Multiplication kernel using ARM SVE Intrinsics and blocking
- Implemented Matrix Multiplication in CUDA using hyperparameter optimization, __shfl_sync, and blocking