Aneesh Durg

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EDUCATION

BS in Computer Science & Mathematics Aug 2015 - May 2019

University of Illinois at Urbana-Champaign

- GPA: 3.57/4.00
- Graduated with High Distinction
- Was included in the Dean's List in Fall '15 and Fall '16

WORK EXPERIENCE

Senior Software Engineer Jul 2023-Present

Bodo.ai — remote

- Developing the core engine which consists of an optimizing compiler and scalable runtime for **SQL** and python/pandas workflows.
- Identified optimizations that reduced compile time by 60% in some benchmarks

Senior Software Engineer/Team Lead Feb 2021-Present

KatanaGraph Inc. — Austin, TX

- Worked on building a distributed graph compute engine that provides AI, analytics, and a database.
- Lead a team of **5** to implement and support graph database querying and ingest.
  - Guided design discussions, identified organizational blockers, and coordinated with product to set priorities and generate new technical requirements.
- Implemented compiler and runtime support for the **Cypher** query language.
- Designed and implemented novel high performance algorithms for distributed subgraph pattern matching (tested on ∼**20B** nodes, **44B** edges)
  - Improved performance by **100x** in queries against the **LDBC-SNB** datasets and reduced memory usage by over **95%** on benchmarks simulating specific client workloads.
- Proposed and implemented AST transformations to optimize query performance
- Designed syntax extensions to **Cypher** to allow users to tune query performance
- Built a hotswap mechanism to allow devs to replace only salient parts of a katana deployment on **kubernetes**, reducing org-wide feedback cycles by up to **30x**
- Built infrastructure for benchmarking the query engine in isolation from the rest of the product using **slurm**

Member of Technical Staff Aug 2019-Feb 2021

Qumulo Inc. — Seattle, WA

- Extended platform support for two new hardware configurations
- Designed a solution for eliminating server downtime during upgrades from 5 minutes to under 30 seconds in a team of four
  - Used containerization to avoid potentially slow boot times
  - Used a **dbus**-based mechanism to allow processes to break out of the container and control the host
- Implemented **SMB** server-side copy and **SMB**'s encryption protocol
- Refactored the **SMB** implementation to reduce memory usage and make object lifetimes more explicit.
- Helped lead migration of **python2** code to **python3**
  - Modernized python code by adding types via **mypy**
  - Proposed and implemented a python dependency verification tool for customer and cloud deployments

Software Engineering Intern May 2018-Aug 2018

Qumulo Inc. — Seattle, WA

- Worked on migrating an on-prem filesystem to work in AWS
- Helped implement a new hardware abstraction layer to interact with AWS resources
- Designed and developed an IP failover solution in **AWS**.
- Used **linux namespaces** to speed up testing time by up to 5x.

Machine Learning Intern May 2017-Aug 2017
Intel Corporation — Austin, TX

- Evaluated performance of **Intel Movidius Neural Compute stick (NCS)**.
- Proposed and built a tool to split large networks across multiple **NCS** devices
- Developed a browser plugin to demonstrate real-time image recognition on Raspberry PIs using **NCS**.
- Developed a benchmarking suite to demonstrate a 1.5x speedup on **CNNs** (**GoogLeNet**, **AlexNet**, **Age-Gender Net**) by using **NCS**. Compared against CPU/GPU using **Caffe**.
- Improved performance of **libSVM** on intel CPUs by using **OpenMP** for parallelism and **MKL** BLAS libraries to use intel CPU specific BLAS instructions. Achieved a 4x speed on the "Up squared" development board (Apollo Lake SoC).

Software Developer May 2016-Dec 2016
Hacklab Innovations — Bangalore, India

- Built AAMI - a wearable reading assistant for the blind and visually impaired.
- Developed and optimized a real-time imaging solution to find text in images and synthesize audio using **OpenCV**, **tesseract-ocr**, and **Caffe**.
- Designed and built a tactile feedback mechanism to help visually impaired users navigate lines of text.

TEACHING EXPERIENCE/PROJECTS

rainbow python/Cypher
https://github.com/aneeshdurg/rainbow

- Arbitrary compile-time function coloring and callgraph rejection tool powered by **clang** and **Cypher**
- Provides an ergonomic way for users to labels functions and lambdas, and then define relationships between those labels that should be considered invalid. Some example usecases are:
  - label functions that assume locks are held to verify that they are never called without a lock
  - label routines using collective MPI operations to ensure that other collective operations aren't called during execution
  - prototype new language features such as async/constexpr without writing custom compiler passes/extensions

spycy python/WASM
https://github.com/aneeshdurg/spycy

- An in-process graph database library for python that implements a **openCypher** frontend
- Provides implementable interfaces for data sources to enable querying real world graphs.
  - Wrote a demo that uses **spycy** and **WASM** to filter HTML nodes using **openCypher**

What Is a Filesystem?
http://aneeshdurg.me/what_is_a_filesystem

- An interactive book/vizualization for students learning filesystem concepts.
- Implements a ext2-esque filesystem with animations to illustrate how a disk accesses occur.
- Features a terminal simulator which implements some standard `GNU/Linux` utilities and interactively visualizes how they interact with filesystems and disk IO.

Visual Malloc
https://aneeshdurg.me/visual-malloc/

- An interactive vizualization for students implementing a memory allocator to visualize how various memory allocation schemes might work

Systems Programming Course Lead Jan 2017-May 2019
CS241 @ UIUC — Urbana, IL

- Development lead for assignments, Lab/Office hours assistant, Honors mentor.
- Designed and created assignments (and associated infrastructure) to allow students to implement and explore concepts such as filesystems, containers, and cooperative scheduling.
- Mentored honors students to complete projects exploring areas such as distributed systems, compilers and linux kernel development.
- Wrote and gave lectures on additional topics such as containerization, and kernel developement for the honors section
- Held review sessions for assignments with low average score by creating slides and handouts that demonstrated concepts through hands-on guided exploration of topics

Illinois-CS241 Coursebook
https://github.com/illinois-cs241/coursebook

- Helped write and review portions of the free coursebook, which covers a superset of all content from UIUC's CS241
- Contributed chapters on filesystems, containers, and basic kernel developement.

Research Game Developer May 2016-May 2017
Project 415x @ UIUC with Prof. Cary Malkiewich & Prof. Jenya Sapir

- `https://github.com/project415x/project415x.github.io`
- Developed an open source game to kinesthetically teach linear algebra concepts.
- Held experimental trials to evaluate effectiveness of the game, but the results were inconclusive.

PROJECTS

Bash Raytracer bash
https://github.com/aneeshdurg/bash-raytracer

- An implementation of a raytracer in bash
- Inspired by the CMake raytracer, this project aims to use bash implement a raytracer that uses fixed point arithmetic. The purpose was to test my bash skills and learn about raytracing.

Video Synthesizer Javascript/GLSL
https://aneeshdurg.me/video-synth

- A GPU accelerated interface to build complex generative visual effects that achieve real-time manipulation of audio and video input.
- Features modules that can be chained and combined with various operators

SignalApps Rust/Python
https://github.com/aneeshdurg/signalapps

- A platform to build secure and anonymized chatbot based applications on top of the **Signal** protocol

Ephemeral Typescript/React
http://aneeshdurg.me/ephemeral

- A distributed, peer-to-peer, twitter-inspired social media platform
- Uses **RSA** encryption and signing to prove identity

CameraTheremin JavaScript/GLSL
https://aneeshdurg.me/CameraTheremin

- In-browser webcam gesture-based theremin (a musical instrument)
- Implemented all image processing functions required in Javascript and again in **WebGL** to compare performance.