Ishaan Gandhi

ishaangandhi@gmail.com | github.com/ishaangandhi | [US Citizen]

Education

Harvey Mudd College — Claremont, CA

Bachelor of Science in Computer Science & Mathematics — *2017 – 2021*

Graduated with departmental honors in 3.5 years as a *Harvey S. Mudd scholar*. Selected coursework: Computer Systems, Databases, Operating Systems, Programming Languages, Software Verification, Advanced Algorithms, Algorithmic Game Theory, Model Theory.

Experience

Facebook — Summer 2019

Software Engineering Intern - Place Visit Detection — *New York, NY*

- Implemented 2-pass scoring in Facebook's machine learning model for place visit detection, increasing model AUC by 0.74pp.
- Worked on prediction service and training workflow in C++ and Python respectively.

Facebook — Summer 2018

Software Engineering Intern - Real time Infrastructure — *Seattle, WA*

- Worked on Facebook's pub-sub system on the real-time infrastructure team. Improved the security of infrastructure by using cryptographic authentication tokens to authenticate subscribe requests to certain topics.

Capital One — Summer 2017

Software Engineering Intern - Commercial Bank — *Tysons Corner, VA*

- Worked on full stack development for an IOT sensor network.
- Built a real-time dashboard and wrote a REST API.

Open Source Contributions

- Wrote, tested, and submitted an implementation of RFC 5837 (Extending ICMP for Interface and Next-Hop Identification) for **Linux 5.12**.
- Enhanced the **tracepath** and **traceroute6** applications in the widely used iputils package to identify arrival and next-hop interfaces when such information is present in ICMP replies.
- Added support for the IPv6 compact routing header (CRH), and IPv6 tunnel payload forwarding (TPF) in **Wireshark**. Also fixed six bugs related to ICMP extensions.
- Added a new dissector for the RFC 5837 protocol in **TCPDump**.
- Fixed bugs and added interactive parsing mode to the POSIX compliant shell parsing libraries **Morbig** and **Morsmall**.

Publications

- **Ishaan Gandhi**, Anshula Gandhi. Lightening the Cognitive Load of Shell Programming. 11th Annual Workshop on Evaluation and Usability of Programming Languages and Tools (PLATEAU 2020.)

Research

Harvey Mudd College | *Parallel Symbolic Execution Research* — Spring 2021

- Analyzing novel matrix-based approach to symbolic execution. Wrote tool to generate control-flow-graphs for a proprietary language and convert these CFGs into matrices.

Pomona College | *Formalization of the POSIX shell standard* — Fall 2020

- Worked on integrating the Morbig parser to the SMOOSH shell in OCaml.

- Found and fixed bugs in the **Morbig** and **Morsmall** parser libraries, and extended them to support interactive parsing.

ETH Zürich | *Advanced Software Technology Lab* Feb 2020 – July 2020

- Built coverage-guided fuzzers for SMT solvers and profiled symbolic executors using C++ and Python.

NASA | *Stellar Astrophysics* Jun 2016 – Jun 2017

- Wrote Monte Carlo simulator to study the performance of various data compression algorithms on space telescopes.
- Sped up image data processing for my research group 600x from Hubble Space Telescope using scripts.

Projects

TCP/IP Stack | *C++*

- Wrote an implementation of a networking stack in using modern C++ (C++17). Included the transmission control protocol (TCP), address resolution protocol (ARP), and IP router.
- Profiled with Gprof and improved throughput of implementation 0.05 Gbit/s to 0.78 Gbit/s.
- Used this stack to talk to real internet survers in a command line application similar to cURL.

LLVM Interpolation Pass | *C++*

- Wrote a compiler optimization for LLVM to make arrays easier to understand for software verification tools.
- The optimization converted lookups into arrays whose contents were known at compile time into function calls that could be more easily understood by verification tools.

Shell Notebook | *Node.js, React*

- Built a full-featured terminal replacement for Mac, Linux, and Windows based on the notebook computing paradigm. Includes native SSH support and native file navigation.
- Sold to paying users, and ranked #2 on Product Hunt the day of its release. Check it out at shellnotebook.com

Symbolic Executor | *Python*

- Hired by Harvey Mudd's CS department to design a project for the *Applied Logic* course. Wrote a symbolic executor for a subset of Python.

iOS App Development | *Swift, Objective-C*

- Built and published games and utilities for iPhone and iPad.
- Received over 50,000 downloads and made about $2k in sales.

Golang transpiler | *Golang, Python*

- Wrote a basic transpiler to turn Python code into Go. Wrote own lexer and parser. Included VSCode extension and iPad companion app to choose between translations when multiple were available.
- Won 1st place and around $1k in prizes at CU Hacks.

Python Static Analysis Tool | *Python*

- Wrote a static analysis tool to find bugs in Python scripts.
- Won 1st place and around $700 in prizes at 5C Hacks.

Technical Skills

C, C++ (up to standards in C++17), OCaml, Coq, Haskell, Java, Go, Swift, SQL, Bash, Git, Flask, JS, React, AWS, Kafka, Mongo

Test Scores

ACT: (99.9 percentile)

Math:	36/36
English:	36/36
Reading:	36/36
Science:	36/36