Alexander J. Root

PhD Student · Stanford

ajroot@stanford.edu | rootjalex.github.io | rootjalex

Education

Stanford University *09/2022 - Present*

PhD Computer Science

- Concentration: Compilers

Massachusetts Institute of Technology *06/2021 - 06/2022*

MEng Electrical Engineering & Computer Science *GPA: 5.0 / 5.0*

- Advisors: Prof. Jonathan Ragan-Kelley & Dr. Andrew Adams
- Thesis: Optimizing Vector Instruction Selection for Digital Signal Processing

Massachusetts Institute of Technology *09/2017 - 06/2021*

SB Computer Science & Engineering *GPA: 5.0 / 5.0*

- Advisors: Prof. Frédo Durand & Prof. Jonathan Ragan-Kelley
- Bachelor's Project: High Performance Image Processing with Fixed Point Types

Experience

Adobe Research *Summer 2022*

Research Intern (Compilers)

- Developing a language and system for improving vector instruction selection for DSP with Halide.

MIT Visual Computing Languages & Systems Group *05/2019 - 08/2022*

Research Assistant

- Researched multiple projects related to high-performance digital signal processing, including automatic quantization, bounds inference, and vector instruction selection.

Adobe Research *06/2021 - 12/2021*

Research Intern (Compilers)

- Developed techniques for constant bounds approximations for use in Halide's compiler.

Intel *01/2021 - 05/2021*

Research Intern (Compilers)

- Designed and implemented a new autoscheduler for Halide.

Microsoft *06/2020 - 09/2020*

Software Engineering Intern

- Contributed to verification infrastructure for access of control of virtual machines.

Lawrence Livermore National Lab *06/2019 - 09/2019*

Computation Intern

- Developed distributed numerical optimization methods.

Iterative Scopes *02/2018 - 08/2018*

Associate Software Engineer

- Automated and tested large scale image processing and machine vision systems using AWS.

Publications

Maaz Bin Safeer Ahmad, **Alexander J. Root**, Andrew Adams, Shoaib Kamil, and Alvin Cheung. *Vector Instruction Selection for Digital Signal Processors Using Program Synthesis*. ASPLOS 2022. https://doi.org/10.1145/3503222.3507714

Awards, Fellowships, & Grants

2022 **NSF Graduate Research Fellowship**,
2022 **School of Engineering Fellowship**, Stanford
2020 **Tau Beta Pi Engineering Honor Society Member**, Tau Beta Pi
2019 **HKN National Honors Society Member**, Eta Kappa Nu
2019 **Keel Foundation Undergraduate Research and Innovation Scholar**, MIT

Teaching Experience

Fall 2021	**6.818: Dynamic Computer Language Engineering**, Teaching Assistant	*EECS, MIT*
Spring 2020	**6.006: Introduction to Algorithms**, Teaching Assistant	*EECS, MIT*
Spring 2019	**6.006: Introduction to Algorithms**, Teaching Assistant	*EECS, MIT*
January 2019	**MIT Global Teaching Labs**, Computer Science Instructor	*Jerusalem*

Mentoring

Spring 2022	**Mario Leyva**, UG Intern, *Fast Porter-Duff Image Compositing*	*MIT CSAIL*
2021-2022	**Katherine Mohr**, UG Intern, *Compiling Fast Term-Rewriting Systems*	*MIT CSAIL*
Summer 2021	**Evan Lee**, Halide GSoC Intern, *Rewrite Rules Evaluation*	*GSoC*