

# Alexander J. Root

PHD STUDENT · STANFORD

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## Education

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### Stanford University

PHD COMPUTER SCIENCE

Advisor: Prof. Fredrik Kjolstad

09/2022 - Present

### Massachusetts Institute of Technology

MENG ELECTRICAL ENGINEERING & COMPUTER SCIENCE

Advisors: Prof. Jonathan Ragan-Kelley & Dr. Andrew Adams

Thesis: Optimizing Vector Instruction Selection for Digital Signal Processing

06/2021 - 06/2022

GPA: 5.0 / 5.0

### Massachusetts Institute of Technology

SB COMPUTER SCIENCE & ENGINEERING

Advisors: Prof. Frédo Durand & Prof. Jonathan Ragan-Kelley

Bachelor's Project: High Performance Image Processing with Fixed-Point Types

09/2017 - 06/2021

GPA: 5.0 / 5.0

## Publications

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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>

## Experience

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### Stanford Compilers Group

RESEARCH ASSISTANT

Researching sparse data reorganization theory and sparse compilers for visual computing.

09/2022 - Present

### Adobe Research

RESEARCH INTERN (COMPILERS)

Developing a language and system for improving fixed-point vector instruction selection within Halide.

06/2022 - 11/2022

### MIT Visual Computing Languages & Systems Group

RESEARCH ASSISTANT

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

05/2019 - 08/2022

### Adobe Research

RESEARCH INTERN (COMPILERS)

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

06/2021 - 12/2021

### Intel

RESEARCH INTERN (COMPILERS)

Designed and implemented a new autoscheduler for Halide.

01/2021 - 05/2021

### Microsoft

SOFTWARE ENGINEERING INTERN

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

06/2020 - 09/2020

### Lawrence Livermore National Lab

COMPUTATION INTERN

Developed distributed numerical optimization methods.

06/2019 - 09/2019

## Iterative Scopes

02/2018 - 08/2018

### ASSOCIATE SOFTWARE ENGINEER

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

## Redding Electric Utility

06/2017 - 08/2017

### ENGINEERING INTERN

Implemented query and reporting systems in C++ for financial data sets.

## Awards, Fellowships, & Grants

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2022-2025 **Graduate Research Fellowship**, NSF

2022 **School of Engineering Fellowship**, Stanford

2020 **Engineering Honor Society Member**, Tau Beta Pi

2019 **National Honors Society Member**, Eta Kappa Nu

2019 **Keel Foundation Undergraduate Research and Innovation Scholar**, MIT

## Teaching Experience

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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 (Middle East)**, Computer Science Instructor

MIT MEET

## Mentoring

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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 Google Summer of Code Intern, *Rewrite Rules Evaluation*

GSoC