

# Tristan Knoth

436 Effey St, Santa Cruz, CA, 95062

☎ 650 200-7867 • ✉ tjknorth@gmail.com • 🌐 tjknorth.github.io  
📄 tjknorth • in tristanknoth

## Education

---

### Ph.D., Computer Science

UC San Diego

Advisor: Nadia Polikarpova

Dissertation: "Type-directed Program Synthesis"

San Diego, CA

2017-2023

### B.A., Computer Science and Mathematics

Grinnell College

Grinnell, IA

2013-2017

## Professional and Research Experience

---

### Senior Software Engineer

JitX

San Jose, CA

2023-Present

- Designed and implemented core object-oriented calculus backing JitX's domain-specific circuit description language. Provides a 10x speedup in compilation times and a foundation for novel language extensions.
- Led development of interactive schematic engine. The engine provides a set of high-performance search algorithms enabling real-time user interaction with correct-by-construction electrical schematics.
- Contributed to the build system, library manager, and C runtime for the open-source lbstanza compiler. Completely redesigned process management facilities in the runtime, enabling safe multiprocessing.
- Optimized and improved JitX language server: responsible for a 10x speed-up to the code indexer, implemented sound and efficient static analysis in the presence of syntax extensions via macros.

### Graduate Student Researcher

UC San Diego

San Diego, CA

2017-2023

Conducted research on:

- Type-directed program synthesis: built a Haskell framework for turning a typechecker into an efficient synthesizer guaranteed to produce correct programs. This drastically reduces the effort needed to implement such a tool, thus facilitating the development of provably-correct programs in a wide variety of contexts [1].
- Static resource analysis: designed and implemented an automated and expressive system for proving bounds on the resource consumption of recursive functional programs. The technique is both more flexible than previous approaches and completely automatic via reduction to SMT [2, 3].
- Supervised research assistants, resulting in co-authorship and poster presentations at top-tier conferences.

### Compiler Research Intern

Mathworks

Boston, MA

Summer 2019

- Implemented in C++ a prototype Halide backend for the Simulink compiler; the system optimizes matrix computations by generating and automatically scheduling Halide code based on hardware characteristics.

### Software Engineering Intern

Fluxx Labs

San Francisco, CA

2016-2017

- Led development of a native Android client for Fluxx's Grantmaker platform.

### Student Researcher

Grinnell College

Grinnell, IA

2015-2016

- Designed and implemented a novel algorithm using clusters of NVIDIA GPUs to efficiently and precisely select multiple order statistics from large distributed data sets.

## Programming Languages

---

Haskell, Python, Stanza, C, C++, Java, CUDA, MATLAB, LLVM, Lisp, Scheme, Javascript

## Publications

---

- [1] T. Knoth. *Type-Directed Program Synthesis*. University of California, San Diego, 2023.
- [2] Tristan Knoth, Di Wang, Nadia Polikarpova, and Jan Hoffmann. Resource-guided program synthesis. In *Programming Language Design and Implementation (PLDI)*, 2019.
- [3] Tristan Knoth, Di Wang, Adam Reynolds, Jan Hoffmann, and Nadia Polikarpova. Liquid resource types. In *International Conference on Functional Programming (ICFP)*, 2020.