

Tristan Knoth

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Education

UC San Diego

Ph.D., Computer Science

Advisor: Nadia Polikarpova

Dissertation: "Type-directed Program Synthesis"

San Diego, CA

2017-2023

Grinnell College

B.A., Computer Science and Mathematics

Grinnell, IA

2013-2017

Professional and Research Experience

JitX

Senior Software Engineer

San Jose, CA

2023-Present

- Designed and implemented core object-oriented calculus backing JitX's domain-specific circuit description language. Doing so makes the language extensible, and facilitates design introspection via its object hierarchy.
- Lead development of engine behind interactive schematic features. The engine provides a simple API modeling electrical schematics, and implements a variety of very fast search algorithms enabling real-time user interaction. Generated schematics must be electrically correct and easily read.
- Contribute to the build system, library manager, and C runtime for the open-source lbstanza compiler. This includes a complete redesign and rewrite of the process management facilities in order to enable safe multiprocessing and IPC.

UC San Diego

Graduate Student Researcher

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 and more amenable to automation than previous approaches [2, 3].

Mathworks

Compiler Research Intern

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.

Fluxx Labs

Software Engineering Intern

San Francisco, CA

2016-2017

Led development of a native Android client for Fluxx's Grantmaker platform, culminating in its public release.

Grinnell College

Student Researcher

Grinnell, IA

2015-2016

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

Technical Skills

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

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.