Tristan Knoth

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Education

UC San Diego **San Diego, CA**
Ph.D., Computer Science (*Expected December 2022*) *2017-Present*
Advisor: Nadia Polikarpova

Grinnell College **Grinnell, IA**
B.A., Computer Science and Mathematics *2013-2017*

Research

- **ReSyn:** A tool that automatically generates recursive functional programs given a logical specification, cost model, and resource bound. ReSyn generates a program alonside a proof that it satisfies the functional specification and consumes no more resources than allotted [1].
- **Static Resource Analysis:** Liquid Resource Types are a flexible and automatic approach to verifying a variety of nontrivial resource bounds on recursive functional programs [2].
- **Type-directed Program Synthesis:** My dissertation will present a framework for type-directed synthesis of functional programs, allowing users to turn a type checker into an efficient synthesizer.

Professional Experience

Mathworks **Boston, MA**
Compiler Research Intern *Summer 2019*
- Implemented in C++ a prototype compiler backend for generating and automatically scheduling Halide code from compatible Simulink models.
- The system improves the performance of Simulink's generated code by taking into account parameters of the target hardware when scheduling the resulting Halide pipelines.
- Worked with a team of designers and engineers to design a new graphical interface allowing users to fully leverage all of the Halide language features within Simulink.

Fluxx Labs **San Francisco, CA**
Software Engineering Intern *2016-2017*
- As the lead developer on the project, designed, implemented, and shipped beta version of a native Android client for Fluxx's Grantmaker platform from scratch in the course of one summer.
- Extended Javascript API for future Fluxx mobile developers.

Grinnell College **Grinnell, IA**
Student Researcher *2015-2016*
- Designed novel parallel algorithm for selecting multiple order statistics from very large distributed data sets without relying on approximate statistical methods.
- Implemented the technique with CUDA C++ and Open MPI.

Teaching

- **Instructor**: Discrete Mathematics, UCSD
- **TA**: Programming Languages, UCSD

Publications

[1] Tristan Knoth, Di Wang, Nadia Polikarpova, and Jan Hoffmann. Resource-guided program synthesis. In *Programming Language Design and Implementation* (*PLDI*), 2019.

[2] Tristan Knoth, Di Wang, Adam Reynolds, Jan Hoffmann, and Nadia Polikarpova. Liquid resource types. In *International Conference on Functional Programming* (*ICFP*), 2020.