

Devon Loehr

PhD Student (final year) at Princeton University

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EDUCATION

Princeton University — *Masters & PhD in Computer Science*

August 2018 - January 2021 (Masters)

August 2018 - December 2023 (PhD)

- Relevant Grad Courses: Networks, Automated Reasoning, Programming Languages, Network Verification
- Currently building a programming language for network switches with David Walker and John Sonchack.

Swarthmore College — *BA in Computer Science, Mathematics*

September 2014 - May 2018

- Relevant Courses: Data Structures & Algorithms, Algorithms, Programming Languages, Compilers, Theory of Computation
- Graduated with High Honors

INDUSTRY EXPERIENCE

Google, Sunnyvale, CA — *Research Intern*

June 2023 - August 2023

- Developed the CAIRN hardware model and compiler for programmable packet parsers.
- Formally defined a practical, hardware-friendly parser architecture.
- Designed compiler passes for translating P4 parsers into programs for the model, which automatically handle many common and complicated compilation challenges.

Amazon, Seattle, WA — *Applied Scientist Intern*

June 2020 - September 2020

- Integrated a new tool into AWS Security's automatic org-wide static analysis program, extending coverage over Python and JS..
- Researched and developed 8 configurations to detect previously undetected issues with a false positive rate below 10%

GrammaTech, Ithaca, NY — *Software Engineering Intern*

June 2015 - August 2015, June 2016 - August 2016

- Increased performance by manually translating over 10 legacy Scheme programs to equivalent C++ code.
- Redesigned 1 nonfunctional legacy program during translation to

SKILLS

Languages

OCaml, Python, C++

Tools/Frameworks

LaTeX, Git, Opam, OUnit

Mathematics

Discrete Math, Algebra, proof-based reasoning

Other Skills

Technical communication, Language Design, Unit Testing

AWARDS

Princeton SEAS Award for Excellence (2021)

Awarded to 16 advanced graduate students who have performed at the highest level as scholars and researchers.

Phi Beta Kappa (2018)

Awarded to top 50-60 seniors by GPA in a class of ~400.

work with modern architecture.

PROJECTS

Lucid — *A Language for Control in the Data Plane*

- Designed and implemented language constructs and grammar for an efficient and easy-to-use dataplane programming language
- Developed a novel type system for automatically enforcing ordering constraints, which are not even expressible in other languages
- Demonstrated that novices can implement nontrivial programs in the language in mere hours, while experts might take days or weeks to implement equivalent programs in another language.

NV — *An Intermediate Language for Network Verification*

- Reduced redundant code by writing a template for program transformations, subsuming 80% of existing transformations.
- Extended NV language with 5 new datatypes and 2 new analyses
- Ensured completeness of SMT analysis by writing a novel program transformation to eliminate dictionaries.

CoPylot — *Static Type Analysis of Python*

- Designed grammar and semantics to describe behavior of Python
- Simplified Python to a pure-functional intermediate language using three successive program transformations.
- Applied Demand-Driven Program Analysis to deduce typing information statically.

PUBLICATIONS

- *SwitchLog: A Logic Programming Language for Network Switches*. Vaibhav Mehta, Devon Loehr, John Sonchack, David Walker. PADL 2023
- *Safe, Modular Packet Pipeline Programming*. Devon Loehr, David Walker. POPL 2022
- *Lucid: A Language for Control in the Data Plane*. John Sonchack, Devon Loehr, Jennifer Rexford, David Walker. SIGCOMM 2021
- *NV: An Intermediate Language for Network Verification*. Ryan Beckett, Nick Giannarakis, Devon Loehr, David Walker. PLDI 2020