Graduating summer 2025
elefthei@seas.upenn.edu
+1 (267) 968-3532

Lef Ioannidis

elefthei.me
github.com/elefthei
linkedin.com/in/elefthei

Education

Current — PhD in Computer Science, *University of Pennsylvania*, Philadelphia, PA
Research: *"Programming languages for formally verified cryptographic proof systems"* in PLClub, DSL. Advised by Sebastian Angel & Steve Zdancewic. Graduation in summer 2025.

2015, 2019 — BSc, MEng in Computer Science, *Massachusetts Institute of Technology*, Cambridge, MA
Research: *"Extracting and optimizing low-level bytecode from high-level verified Coq"* in PDOS.

Employment

Summer '22 — Research Scientist Intern, Amazon, Automated Reasoning Group, Arlington, VA
- Worked in the **formalization** of the Cedar authorization language and the Cedar validator.
- Implemented a novel **type inference** algorithm for Cedar including singleton and capability types.

2018 - 2019 — Investment Engineer, Bridgewater Associates, Westport, CT
- Created **APIs** used for **big-data** quantitative research, analytics and **visualization**.
- Implemented complex risk-controls and hedging **algorithms** used daily by Trade Generation.
- Taught the **Scala** and **SQL** programming languages to more than 100 traders and engineers.

2016 - 2018 — Principal Software Engineer, UnifyID (acquired by Prove), San Francisco, CA
- Designed and implemented a **microservice** based **back-end** on **AWS** (*20 services*).
- Implemented a real-time **Machine Learning** service, for high-throughput inference (*3000 req/sec*).
- Developed certificate management systems and implemented **end-to-end encryption**.

2015 - 2016 — Software Security Engineer, Apple, Cupertino, CA
- Contributed to the **LLVM compiler**, focus on compiler optimizations for program security.
- Implemented **cryptographic algorithms** for end-to-end encryption and DRM.

Technologies and Languages

Languages:	Rust, C/C++, Haskell, Scala, OCaml, Coq, Go, Javascript, SQL.
Software:	Linux, Docker, AWS, Azure, LLVM, Z3.
General:	Compilers, Computer Security, Language design, Performance engineering, Formal verification, Cryptography, Zero-knowledge proofs, Distributed systems, Microservices.

Patents & Publications

Oct. 2024. "Cedar: A New Language for Expressive, Fast, Safe, and Analyzable Authorization". In: *Proceedings of the ACM on Programming Languages* OOPSLA.
Dec. 2024. "Choice Trees: Representing and reasoning about nondeterministic, recursive, and impure Programs in Coq". In: *Journal of Functional Programming, Special POPL 2025 edition.*
June 2024. "Reef: Fast Succinct Non-Interactive Zero-Knowledge Regex Proofs". In: *33rd USENIX Security.*
Dec. 2024. "Structural temporal logic for mechanized program verification". In: under submission.
June 2022. "Efficient representation of numerical optimization problems for SNARKs". In: *31st USENIX Security.*
Mar. 2020. "Privacy-preserving system for machine-learning training data". US Patent 10,601,786.
Mar. 2020. "Scala DSLs for Domain-specific quantitative logic." In: *NEScala 2020.*
Nov. 2019. "Extracting and optimizing formally verified code for systems programming". In: *NASA Formal Methods: 11th International Symposium.*
Apr. 2017. "Auto-scalable microservices for Machine Learning with Docker". In: *Dockercon 2017.*