

Joshua Goldberg

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Education

Northeastern University - Boston, MA | Khoury College of Computer Sciences

Sept 2023 - Present

Candidate for a B.S. in Computer Science, Minor in Mathematics

Expected Apr 2027

Honors: GPA 4.0/4.0 | Dean's List (4 semesters) | Honors Scholarship

Relevant Courses: Software Engineering, Programming Languages, Algorithms (Graduate), [CS7470](#) Influential Ideas in Programming Languages (Audit), Object Oriented Design, Distributed Systems

Knowledge/Expertise

Programming Languages: Lean, Java, Python, Javascript/Typescript, HTML/CSS, Rocq, OCaml, Racket, C

Applications/Systems: Git, Docker, Node.js, React, Postman, VSCode, Prisma, Qt, IntelliJ, PyCharm, n8n, DrRacket

Projects

Categorical Mode

Jan 2026 - Present

- Implementing a DSL compiler in **Lean 4** with parsing and elaboration for reasoning about categorical structures
- Designing categorical definitions and formally verifying properties across distinct representations

OwlLean [\[source\]](#)

Aug 2025 - Mar 2026

- Developed a typechecker in Lean 4 for Owl, integrating subtyping and label corruption across 14,000+ lines of code to guarantee safety of secret data from outside adversaries
- Implemented bidirectional typing inference and automated 10+ tactics for proof generation, ensuring proper typechecking of information flow constraints
- Constructed 5+ example cryptographic programs to emulate and typecheck concurrency using state machines
- Devised performance optimizations, allowing runtimes to be 3x faster compared to unoptimized tests

Cybersecurity TA Discord Bot [\[source\]](#)

Jun 2025 - Nov 2025

- Led the development of a **Retrieval-Augmented Generation (RAG)** integrated discord bot leveraging **Python**, **GPT-4 API**, and **n8n** workflow automation to assist 200+ students with cybersecurity coursework
- Authored and presented research at [CISSE](#), demonstrating system design with an over 80% student helpfulness rating

Osu!mania Replay Renderer [\[source\]](#)

Aug 2024 - Mar 2025

- Implemented a MVC **Java** application that parses **LZMA** compressed game data and converts resulting data to MP4 format by recreating the game environment, using **7Zip** and **FFmpeg**
- Optimized object-oriented programming (OOP) design patterns within the replay renderer, decreasing average render times by over 50% and enabling smoother playback for a higher volume of user-created content

Experience

Research Assistant - Northeastern [Programming Research Laboratory](#) - Boston, MA

Jul 2025 - Present

- Building automated tools in **Lean 4** and **Rocq** to verify security properties of cryptographic programming languages (e.g. [Owl](#)), enabling alternatives to manual proof goals
- Spearheaded the formal verification of 4+ critical security properties, including non-interference and operational correctness, across 3 distinct language representations

Technical Lead - Northeastern University Electric Racing - Boston, MA

Apr 2025 - Present

Software Team Member - Northeastern University Electric Racing - Boston, MA

Sept 2024 - Mar 2025

- Guiding a team of 5+ developers using **React** and **Typescript**, assigning tickets and reviewing pull requests weekly
- Built full-stack improvements for the Finance and Calendar pages integrating **Prisma** and **SQL filtering**, cutting management overhead and improving load times by over 50% for 200+ members across sub teams

Logic and Computation Teaching Assistant - Northeastern University - Boston, MA

Jan 2025 - Present

- Mentoring and prepared 70+ students weekly for proof-based exams in formal logic and property-based testing
- Maintaining autograder infrastructure in **Racket** and **OCaml**, designing systems to handle 100+ submissions weekly

Interests : Piano | Theorem Provers | American Numismatics | Programming Languages