

Arnav Dandu

Research Interests

Formal verification, proof assistants, programming languages, type theory, mathematical logic.

Education

2026 – **University of Massachusetts Amherst** Amherst, MA
Ph.D. Computer Science

Advisor: Prof. Yuriy Brun

2022 – 2026 **University of California San Diego** La Jolla, CA
B.S. Computer Science

B.S. Mathematics

(Attended Budapest Semesters in Mathematics, fall 2025)

Experience

Feb. 2025 – **Undergraduate Researcher**

Jun. 2026 *Programming Systems Group, UC San Diego*

Advisor: Prof. Loris D'Antoni.

Formalized an efficient algorithm for grammar-constrained decoding using the Lean proof assistant.

Sep. 2024 – **Undergraduate Researcher**

Dec. 2025 *Department of Mathematics, UC San Diego*

Advisor: Jack J. Garzella.

Contributed to the formalization of commutative algebra using the Lean proof assistant.

Jan. 2025 – **Computer Graphics Tutor**

Mar. 2025 *Department of Computer Science, UC San Diego*

Held weekly office hours to assist 180+ students with core concepts in graphics programming, including linear algebra, projective geometry, lighting, and ray tracing.

Oct. 2023 – **Machine Learning Engineer Intern**

Mar. 2024 *Aesthetic*

Developed retrieval-augmented generation (RAG) based interface for fashion curation.

Fine-tuned CLIP embedding models to improve domain-specific vector search accuracy.

Projects

2025 – 2026 **Grammar-Constrained Decoding (GCD) Formalization**

Formal verification, automata theory.

Formalized a GCD algorithm in Lean, enforcing context-free grammar rules on LLMs.

Formalized finite-state transducers (FSTs) and proved the correctness of the standard FST composition algorithm.

Developed a Lean formalization of depth-first search (DFS) and proved the correctness of DFS-based FST reachability.

2024 – 2025 Commutative Algebra Formalization

Formal verification, commutative algebra.

Partially formalized results in commutative algebra in Lean.

Transferred Lean formalizations of statements about exterior algebras into the current version of mathlib.

Designed an LLM-assisted automated proof repair workflow to speed up migration.

Fall 2024 Linear Dependent Type Theory for Quantum Computation

Quantum computing, logic, type theory, category theory.

Survey on no-cloning compatible type systems for quantum programming languages.

Graduate class project for CSE 291: Quantum Complexity. With Ryan Batubara.

Winter 2024 Ray Tracer

Computer graphics, C++.

Ray tracer with custom matrix multiplication library and optimized with bounded volume hierarchy to accelerate scene rendering.

Honors

2023 ServiceNow Scholarship. Awarded for academic merit and potential to contribute to diversity, equity, and inclusion.

Skills

Formalization Lean, Rocq/Coq, Agda

Languages Python, Haskell, \LaTeX , Java, C/C++

ML/AI Deep learning with TensorFlow and PyTorch

Systems Parallel computing with NVIDIA CUDA; graphics with OpenGL; quantum computing with Qiskit

Service

Winter 2024 **Volunteer Teacher, UC San Diego CSE Outreach**

Created and taught lessons on important computer science topics such as cryptography to students in underprivileged elementary, middle, and high schools in the San Diego area.