

Andrew Krapivin

andrew@krapivin.net

Pittsburgh, PA
andrewkrapivin.net

Education

Carnegie Mellon University

Jul 2025–Present

Ph.D. in Computer Science (in progress), advised by William Kuszmaul and Elaine Shi

University of Cambridge, Churchill College

Oct 2024–Jul 2025

Churchill Scholar, Master of Philosophy in Advanced Computer Science

Pass with Distinction

Rutgers University, School of Arts and Sciences

Sep 2020–May 2024

Honors College, Bachelor of Science in Mathematics and Computer Science

GPA: 4.0 out of 4.0

Awards and Scholarships

Hertz Fellowship Finalist (2026): One of 54 finalists for the Hertz Fellowship, one of the most competitive doctoral fellowships in the US.

ARCS Scholar (2025–2028): Recipient of the Jeanne B. and Richard F. Berdik ARCS Pittsburgh Endowed Scholar Award, \$5000 annually for three years.

Churchill Scholar (2024–2025): One of 18 in the US awarded full tuition and living costs for study at University of Cambridge.

Goldwater Scholar (2023): Winner of a national scholarship for sophomores and juniors for exceptional promise in research.

Research Interests

I develop algorithms and data structures that connect theoretical computer science with practical applications, including space-efficient hashing, oblivious data structures, and SAT solving. I created PointSAT and used it to resolve an open problem in discrete geometry. My work on compact SAT encodings and hypergraph decompositions supports faster SAT solving and preprocessing, with potential applications to theorem proving and software verification. My master's thesis studied theoretical differences between transformer encoders and reasoning decoders.

Publications and Manuscripts

- **Andrew Krapivin**, William Kuszmaul and Yixuan Wang. “Interlinear Probing: Linear Probing with Non-Greedy Insertions,” 18th Innovations in Theoretical Computer Science Conference (ITCS). 2027. (*under review*)
- **Andrew Krapivin** and William Kuszmaul. “Optimal Worst-Case Open Addressing: Braided Cuckoo Hashing,” ACM-SIAM Symposium on Discrete Algorithms (SODA). 2027.
- **Andrew Krapivin**, Benjamin Przybocki, Bernardo Subercaseaux. “The CNF Encoding Complexity of Boolean Functions and Non-Uniform Computation.” 2026. *Manuscript in preparation*.
- **Andrew Krapivin** and Elaine Shi. “Optimal Statistical Oblivious RAM I,” 46th Annual International Conference on the Theory and Applications of Cryptographic Techniques (EUROCRYPT). 2027. (*under review*)
- **Andrew Krapivin**, Benjamin Przybocki, Bernardo Subercaseaux. “Near-Optimal Encodings of Cardinality Constraints,” Conference on Theory and Applications of Satisfiability Testing (SAT'26). 2026.

- **Andrew Krapivin**, Benjamin Przybocki, Marijn J.H. Heule. “Toward Satisfiability Modulo Realizability,” 19th Conference on Intelligent Computer Mathematics (CICM’26). 2026.
- **Andrew Krapivin**, Benjamin Przybocki, Nicolás Sanhueza-Matamala and Bernardo Subercaseaux. “Optimal and Efficient Partite Decompositions of Hypergraphs,” ACM Symposium on Theory of Computing (STOC). 2026.
- Martín Farach-Colton, **Andrew Krapivin** and William Kuszmaul. “Greedy Open Addressing Revisited: How to Bypass Yao’s Lower Bound,” ACM Symposium on Theory of Computing (STOC). 2026.
- **Andrew Krapivin**, Aaditya Ranga Rajan, Alex Conway, Martin Farach-Colton, Rob Johnson, Prashant Pandey. “Breadcrumb Filters: Fast Fully Featured Filters.” Proceedings of the 2026 International Conference on Management of Data (SIGMOD). 2026.
- **Andrew Krapivin**. “On Encoders, LLMs, and Reasoning.” Master’s thesis, University of Cambridge, Churchill College. 2025. Supervisor: Soumya Banerjee.
- Martín Farach-Colton, **Andrew Krapivin**, William Kuszmaul. “Optimal Bounds for Open Addressing Without Reordering.” 65th Symposium on Foundations of Computer Science (FOCS), 2024.

Selected Press Coverage

Hash-table research featured in *Quanta Magazine*’s Biggest Breakthroughs in Computer Science (2025) and its article “Undergraduate Upends a 40-Year-Old Data Science Conjecture”, also published in *Wired*.

Work Experience

Software Developer Intern (OCaml; Jane Street)

May–Aug 2024

- Built library to help refactor proprietary financial application. Made heavy use of the type system and advanced language concepts such as monads and applicatives to eliminate potential bugs and simplify transferring code to the library, including building a custom applicative to streamline the creation of a computational pipeline.
- Added features to a web application for email filtering. Managed the technical complexity of multiple apps created at different times with different frameworks. Worked with applications built on transaction logs with stable types for forwards and backwards compatibility. Worked fullstack across the backend and frontend.

Software Developer Intern—Low Latency (C++; Akuna Capital)

Jun–Aug 2023

- Consolidated and streamlined the codebase using C++ variadic template metaprogramming. Generalized similar code across several different services to improve maintainability and reduce technical debt.
- Implemented a low latency packet sniffer utilizing a specialized network card that bypasses operating system calls to reduce latency. Added logging, heartbeating, and performance monitoring to provide visibility into the operation of the service.

Projects:

- Cocreated a collaborative game using Kafka and nginx.
- Created a program to benchmark memory level parallelism (bandwidth versus latency) on modern computers.
- Implemented neural network in C++ with backpropagation.
- Implemented a version of Kyber-Crystals, a quantum resistant cryptography algorithm.