David J. Lee

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Education

2017– Present **Williams College**, *Williamstown, MA*.
B.A. Computer Science; Mathematics. Expected June 2021.
GPA: 4.0. GRE: 170vb/170qt

2012–2016 **Asia Pacific International School**, *Seoul, Korea*.
Valedictorian.

Experience

Summer 2020– Present **Undergraduate Thesis Student, Data Structures**, *Williams College*.
Mentors: Sam McCauley and Shikha Singh.
- Designed and implemented a novel adaptive quotient filter (AQF) in C.
- Implemented the rank-and-select quotient filter in C, augmented with a theoretically optimal compressed representation for adaptivity.
- The AQF is competitive with other state-of-the-art adaptive filters.

Summer 2019 **Undergraduate Research Student, Programming Languages**, *Williams College*.
Mentor: Stephen Freund. Part of Synchronicity (NSF Grant #1812951).
- Developed an algorithm using counterexample-guided inductive synthesis to synthesize synchronization disciplines for concurrent programs, leveraging Lipton's theory of reduction.
- Algorithm successfully generated valid synchronization disciplines for medium-sized concurrent test programs.
- Poster: Inferring Synchronization Disciplines to Verify Atomicity of Concurrent Code.

Spring 2019 **Research Assistant, Knot Theory**, *Williams College*.
- Wrote a combinatorial algorithm in Python to conjecture an upper bound on the number of distinct virtual multi-crossings for a virtual n-crossing, ignoring symmetries.

Spring 2018– Present **Teaching Assistant**, *Williams College*.
Held office/lab hours and graded assignments, 10 hours/week.
- Software Methods (Spring 2020)
- Principles of Programming Languages (Spring 2019, Fall 2019, Fall 2020)
- Introduction to Computer Science (Fall 2018)
- Data Structures and Advanced Programming (Spring 2018)

Spring 2019 **Tutor**, *Williams College Center for Learning in Action*.
Taught a high school student at Mount Greylock Regional School the fundamentals of computer science. 2 hours/week.

Personal Projects

2020 **A Peer-to-Peer Privacy-Preserving Location-Based Digital Contact Tracing Protocol**.
- Designed a digital contact tracing protocol that uses GPS data from cellular devices to alert users of potential virus transmission events without compromising user anonymity.
- Simulated in Go using Apache Cassandra.

2019 **Functional Hearthstone in Lisp**.

- Rewrote the Hearthstone game engine in Clojure following functional programming best practices.
- Engine core consists entirely of pure functions that are rigorously tested: mutation is limited to the namespace handling the engine's interface with a web view.

2018 **Augmented Reality Drawing for iOS**.

- Wrote an iOS application that lets users draw curves in 3D space by moving their devices.
- Used ARKit to determine device position from camera data and SceneKit to generate 3D geometries.

Awards

2020 Computing Research Association (CRA) Outstanding Researcher Award (Nominated).

2020 Phi Beta Kappa (Junior Year). Awarded to top 5% of graduating class by GPA.

2020 Ward Prize (Runner-up). Awarded annually to the best student project in the Williams College CS Department.

2018 James Jenkins Lowe Scholarship.

Relevant Coursework

Computer Science	Machine Learning, Distributed Systems, Functional Programming, Software Methods, Programming Languages, Algorithms, Computer Organization, Data Structures
Mathematics	Real Analysis, Abstract Algebra, Knot Theory, Cops and Robbers[1], Probability, Linear Algebra, Differential Equations, Multivariable Calculus

Skills

Programming Languages	Python, C, Java, Scala, Go, Clojure/ClojureScript, Standard ML
Natural Languages	English (Native), Korean (Proficient), Chinese (Intermediate)

[1] A senior seminar on graph theory, with a focus on the game of cops and robbers on graphs.