

# Noah Singer

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## Education

2022– **Ph.D. in Computer Science**, *Carnegie Mellon University*, Computer Science Department, School of Computer Science, Pittsburgh, PA  
Supported by NSF GRFP fellowship.

2018–2022 **A.B. in Computer Science and Mathematics**, *Harvard University*, Harvard College, Cambridge, MA  
*Magna cum laude* with highest honors in field, GPA 3.97.

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## Research Interests

Broadly, complexity, cryptography, combinatorics, and algorithms, and applications of mathematical techniques towards answering questions in these areas.

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## Papers

### Publications

- [1] Joanna Boyland, Michael Hwang, Tarun Prasad, Noah Singer, and Santhoshini Velusamy. “On Sketching Approximations for Symmetric Boolean CSPs”. In: *Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques*. APPROX 2022 (Sept. 19–21, 2022). LIPIcs. Schloss Dagstuhl — Leibniz-Zentrum für Informatik, July 2022.
- [4] Noah Singer and Madhu Sudan. “Point-Hyperplane Incidence Geometry and the Log-Rank Conjecture”. In: *ACM Transactions on Computation Theory* 14.2 (June 2022). Early version appeared in the National Collegiate Research Conference in January 2021.
- [5] Noah Singer, Madhu Sudan, and Santhoshini Velusamy. “Streaming Approximation Resistance of Every Ordering CSP”. In: *Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques*. APPROX 2021 (Aug. 16–18, 2021). Ed. by Mary Wootters and Laura Sanità. Vol. 207. LIPIcs. Schloss Dagstuhl — Leibniz-Zentrum für Informatik, July 2021, 17:1–17:19. DOI: [10.4230/LIPIcs.APPROX/RANDOM.2021.17](https://doi.org/10.4230/LIPIcs.APPROX/RANDOM.2021.17).

### Manuscripts

- [2] Raghuvansh R. Saxena, Noah Singer, Madhu Sudan, and Santhoshini Velusamy. “Streaming Complexity of CSPs with Randomly Ordered Constraints”. In submission. July 2022. arXiv: [2207.07158](https://arxiv.org/abs/2207.07158) [cs.DS].

### Thesis

- [3] Noah Singer. “On Streaming Approximation Algorithms for Constraint Satisfaction Problems”. BA thesis. Cambridge, MA: Harvard University, Mar. 2022. 140 pp. URL: <https://nrs.harvard.edu/URN-3:HUL.INSTREPOS:37371750>.

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## Awards

- Spring 2022 **Hoopers Prize**  
Award from Harvard College for “outstanding scholarly work” on bachelor’s thesis [3].
- Spring 2022 **NSF GRFP Fellowship**
- Spring 2022 **CRA Outstanding Undergraduate Researcher Award**, Honorable Mention
- Fall 2021 **Harvard College Research Program Grant**  
\$800 grant supporting work on sketching complexity of constraint satisfaction, and eventual publication in APPROX [1] and bachelor’s thesis [3].

Spring 2021 **Phi Beta Kappa, Alpha Iota of Massachusetts**  
Elected in group of 24 juniors from the Harvard College Class of 2022.

2019–2021 **Certificate of Distinction in Teaching**  
Awarded by Harvard Office of Undergraduate Education on basis of instructor ratings in student evaluations. Overall scores were: CS 121 Fall 2019, 4.83/5; CS 121 Fall 2020, 4.88/5; CS 124 Spring 2021, 4.82/5.

Summer 2020 **Herchel Smith-Harvard Undergraduate Research Fellow**  
\$5K grant supporting research on log-rank conjecture and incidence geometry, leading to work published in *ACM Transactions on Computation Theory* [4].

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## Teaching

Graded and hosted office hours and recitation sections for the following courses in the Harvard CS department:

- *CS 121: Introduction to Theoretical Computer Science* (Fall 2021, Fall 2020, Fall 2019)
- *CS 124: Data Structures and Algorithms* (Spring 2021)
- *CS 161: Operating Systems* (Spring 2020)

In CS 121 and 124, organized advanced sections with weekly guest lectures.

Served as a teaching assistant for the *New Horizons in TCS* program at TTIC over Summer 2022.

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## Internships

Summer 2021 **Research Intern, DIMACS REU @ Rutgers University**, remote  
Worked with Prof. Eric Allender on complexity of circuit minimization and related problems. Supported by NSF grant CCF-1852215.

Summer 2020–Spring 2022 **Research Intern, Harvard University**, Cambridge, MA  
Worked with Prof. Madhu Sudan on communication and streaming complexity, supported by Herchel-Smith Fellowship and Harvard College Research Program.

Summer 2019 **Software Engineering Intern, Airbnb**, San Francisco, CA  
Built a production data pipeline to discover and manage large quantities of search advertising keywords targeting Airbnb hosts, efficiently scaling up listing creation due to search ads by over 20% and generating tens of thousands of dollars in weekly revenue.

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## Service

2020–2022 **Peer Concentration Adviser, Harvard University**, Department of Computer Science

2020–2022 **WiCS Mentor, Harvard Women in Computer Science**

Spring 2019 **Volunteer, Digital Literacy Project**  
Taught basic programming in Scratch and Processing.js to middle school students in Allston.

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## Skills

*Programming languages:* Python, Java, C/C++, JavaScript, x86 assembly, and OCaml.  
*Tools and frameworks:* L<sup>A</sup>T<sub>E</sub>X, Django, PyTorch, Mathematica, SQL, and Git.