

Krish Singal

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EDUCATION

Columbia University

B.S. in Computer Science

Cumulative GPA: 4.02/4.0

*Expected
2024*

Computer Science Coursework: Algorithms for Massive Data, Property Testing, Computational Complexity Theory, Advanced Algorithms, Quantum Computing, Analysis of Boolean Functions, Cryptography, Learning Theory, Operating Systems, Distributed Systems

Mathematics Coursework: Real Analysis I + II, Abstract Algebra I + II, Topology, Measure Theory and Probability Theory

RESEARCH EXPERIENCE

- Parallel Algorithms for High-Dimensional Geometric Single Linkage Clustering. Senior thesis advised by Prof. Alexandr Andoni *2023 - Present*
 - Constructed near-linear time approximation algorithm with subquadratic runtime for $c > 1$
 - Researching algorithms for the MPC model
- Computational Complexity of Chip-Firing Games on Graphs. [SMALL REU](#) at Williams College. Advised by Prof. Ralph Morrison. *Summer 2023*
 - Proved the Brill-Noether Conjecture for generalized path graphs and that computing disjoint scramble number is fixed parameter linear
 - Implemented and optimized fast gonality computation on the [Chip Firing Interface](#)
- Distribution-Free k -Junta Testing. Independent research advised by Prof. Xi Chen. *2023 - Present*
 - Trying to close the gap between one-sided testing $\tilde{O}_\epsilon(k^2)$ and two-sided testers $\tilde{\Theta}_\epsilon(k)$
- Directed Grey Box Fuzzing. Independent research advised by Prof. Suman Jana *2021 -2022*
 - Implemented benchmark setting bug-finding fuzzer using monte carlo counting in C
 - Proved fuzzer's optimal query complexity by formalizing algorithm as noisy counting oracle

PUBLICATIONS/PREPRINTS

1. [MC²: Rigorous and Efficient Directed Greybox Fuzzing](#).
Honorable Mention Best Paper Award. ACM CCS, 2022.
with Peter Coffman, Suman Jana, Samanway Sadhu, Abhishek Shah, and Dongdong She.
2. On the Size and Complexity of Scrambles.
arXiv preprint, 2023.
with Seamus Connor, Steven DiSilvio, Sasha Kononova, and Ralph Morrison.
3. [In Preparation] The Gonality of Chess Graphs.
with Marchelle Beougher, Nila Cibu, Steven DiSilvio, Sasha Kononova, Chan Lee, and Ralph Morrison.
4. [In Preparation] Chip Firing Games on Banana Graphs.
with Marchelle Beougher, Nila Cibu, Steven DiSilvio, Sasha Kononova, Chan Lee, and Ralph Morrison.

TEACHING EXPERIENCE

- Mentor for [Columbia Undergraduate TCS Learning Seminar](#) (Analysis of Boolean Functions) *Fall 2023*
- Teaching Assistant for COMS 4236 (Computational Complexity Theory) *Fall 2023*
- Teaching Assistant for CSOR 4231 (Analysis of Algorithms I) *Spring 2023*
- Teaching Assistant for CSOR 4231 (Analysis of Algorithms I) *Fall 2022*

TALKS/PRESENTATIONS

- [On the Size and Complexity of Scrambles](#). Young Mathematicians Conference (YMC) 2023
- [On the Size and Complexity of Scrambles](#). (Accepted to) Joint Mathematics Meetings (JMM) 2024
- [Bananas, Eggs, and Chips: A Recipe for Graph Gonality](#). (Accepted to) Joint Mathematics Meetings (JMM) 2024

PROFESSIONAL EXPERIENCE

- Software Engineering Intern at Apple. Advised by Gabrielle Belzberg and Evan Kriminger Summer 2022
 - [Apple CoreMotion] Memory constrained machine learning for human gesture detection
- Software Engineering Intern at Amazon Web Services. Advised by Harsh Mohan Summer 2021
 - [AWS Config] Multi-tenant library for real-time resource management metrics

PROJECTS

- [Solution Manual](#) to chapters 1-4 of *Analysis of Boolean Functions* by Ryan O'Donnell Spring 2023
- [Survey Paper](#) on Dynamic Graph Sketching: AGM Sketch and its Optimality Spring 2023

HONORS/AWARDS

- Honorable Mention Best Paper Award *ACM CCS* 2022 2022
- Putnam Exam Score of 10 (Top 900) 2022
- Tau Beta Pi Engineering Honor Society 2023
- Upsilon Pi Epsilon Computer Science Honor Society 2023
- Columbia University Dean's List 2021 - 2024
- American Invitational Mathematics Exam (AIME) Qualifier 2020
- USA Computing Olympiad (USACO) Gold Division 2017-2020
- US National Chemistry Olympiad (USNCO) Honors Recognition 2020