

Krish Singal

krish.singal@columbia.edu | krishsingal.github.io

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 testing $\tilde{\Theta}_\epsilon(k)$
- Directed Grey Box Fuzzing. Independent research advised by Prof. Suman Jana *2021 -2022*
 - Implemented benchmark setting bug-finding fuzzer using monte carlo tree search 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
- International Physics Bowl 1st place Team and Top 50 Individual 2019
- National Science Bowl 2nd, 7th, 16th Place 2018-2020