Xiaoyu He

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Department of Mathematics
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Research Interests

Extremal, probabilistic, and algebraic combinatorics, especially in Ramsey theory, graph coloring, additive combinatorics, discrete geometry, and the combinatorics of words, with applications to computer science.

Education

Stanford University	2016–2021
Ph.D. in Mathematics, Advisor: Jacob Fox	
Harvard University	2012–2016
B.A. in Mathematics with Secondary in Computer Science	

Selected Honors and Awards

NSF Mathematical Sciences Postdoctoral Research Fellowship	2021 –2024
NSF Graduate Research Fellowship	2018–2021
Putnam Competition N1 (top 15)	2013
Google Code Jam Top 500	2014
International Math Olympiad:	
Gold Medal (x2)	2010, 2011
Silver Medal	2012

Teaching and Mentorship

Stanford University Teaching Assistant	
Math 63DM (Modern Mathematics: Discrete Methods)	Spring 2020
Math 61DM (Modern Mathematics: Discrete Methods)	Fall 2017
Stanford University Course Assistant	
Math 120 (Groups and Rings)	Spring 2018
Math 19 (Calculus 1)	Winter 2017
Math 104 (Applied Matrix Theory)	Fall 2016
Stanford University Directed Reading Program	2017–2020

Mentored 8 undergraduate students over several years
Stanford University Research Institute in Mathematics 2017 –2021
Co-authored three papers with undergraduates published in:
Discrete Math. and *Combin. Probab. Comput.*
MIT-PRIMES Research Mentor 2016
Harvard University Teaching Assistant
Math 130 (Classical Geometry) Spring 2015
Math 114 (Analysis II) Fall 2014
Math 113 (Complex Analysis) Spring 2014
MIT-PRIMES Circle Mentor 2013-2014

Other Professional Experience

Referee for: Discrete Mathematics, Electronic Journal of Combinatorics, Journal of Combinatorial Theory Series A, Journal of Combinatorial Theory Series B, SIAM Journal on Discrete Mathematics
Reviewer for Math Reviews 2019
Co-organizer for Stanford Kiddie Colloquium 2017–2018

Publications

Graduate Research

- Xiaoyu He, Jiaxi Nie, and Sam Spiro, Maximal independent sets in clique-free graphs, preprint (2021).

- Venkatesan Guruswami, Xiaoyu He, and Ray Li, The zero-rate threshold for adversarial bit-deletions is less than $1/2$, accepted for publication, FOCS (2021).

- Jacob Fox, Xiaoyu He, and Yuval Wigderson, Ramsey numbers of sparse digraphs, preprint (2021).

- Jacob Fox, Xiaoyu He, Sammy Luo, and Max Xu, Multicolor list Ramsey numbers grow exponentially, preprint (2021).

- Xiaoyu He, Yuzu Ido, and Benjamin Przybocki, Hat guessing on books and windmills, preprint (2020).

- Persi Diaconis, Ron Graham, Xiaoyu He, and Sam Spiro, Card guessing with partial feedback, in press, *Combin. Probab. Comput.* (2020).

- Xiaoyu He and Ray Li, Hat guessing numbers of degenerate graphs, *Electron. J. Combin.* **27** (2020), P3.58.

- Jacob Fox and Xiaoyu He, Independent sets in hypergraphs with a forbidden link, in press, *Proc. London Math. Soc.* (2021).

- John Engbers, Aysel Erey, Jacob Fox, and Xiaoyu He, Tomescu's graph-coloring conjecture for l-connected graphs, *SIAM J. Discrete Math.* (2021), 1478–1502.

- Jacob Fox, Xiaoyu He, and Yuval Wigderson, Ramsey, Paper, Scissors, *Random Structures Algorithms* **57** (2020), 1157–1173.

- Xiaoyu He and Matthew Kwan, Universality of random permutations, *Bull. London Math. Soc.* **52** (2020), 515–529.

- Ryan Alweiss, Chady Ben Hamida, Xiaoyu He, and Alexander Moreira, On the subgraph query problem, *Combin. Probab. Comput.* **30** (2020), 1–16.

- Xiaoyu He and Yuval Wigderson, Hedetniemi's conjecture is asymptotically false, *J. Combin. Theory Ser. B* **146** (2020), 485–494.

- Xiaoyu He and Yuval Wigderson, Multicolor Ramsey numbers via pseudorandom graphs, *Electron. J. Combin.* (2020), P1.32.

- David Gonzalez, Xiaoyu He, and Hanzhi Zheng, An upper bound for the restricted online Ramsey number, *Discrete Math.* **342** (2019), 2565–2569.

- David Conlon, Jacob Fox, Andrey Grinshpun, and Xiaoyu He, Online Ramsey numbers and the subgraph query problem, Building Bridges II, Bolyai Soc. Math. Stud. 28 (2019).

- Jacob Fox, Xiaoyu He, and Freddie Manners, A proof of Tomescu's graph-coloring conjecture, *J. Combin. Theory Ser. B* **136** (2019), 204–221.

- Jared Bitz, Sarah Griffith, and Xiaoyu He, Exponential lower bounds on the generalized Erdős-Ginzburg-Ziv constant, *Discrete Math.* **342** (2020), 112083.

- Xiaoyu He, Linear dependence between hereditary quasirandomness conditions, *Electron. J. Combin.* **25** (2018), P4.12.

High School and Undergraduate Research

- Xiaoyu He, Primes of the form $p^2 + Ny^2$, Harvard University senior thesis, manuscript (2016).

- Xiaoyu He, Geometric progression-free sequences with small gaps II, INTEGERS 16, Paper No. A31, (2016), 9pp.

- Xiaoyu He, Zero-sum subsequences of length kq over finite abelian p-groups *Discrete Math.* **339** (2016), 399–407.

- Xiaoyu He, Geometric progression-free sequences with small gaps, *J. Number Theory* **151** (2015), 197–210.

- Xiaoyu He, Cross number invariants of finite abelian groups, *J. Number Theory* **136** (2014), 100–117.

- Xiaoyu He, On the classification of universal rotor-routers, manuscript (2011).

Selected Talks

Georgia Tech Combinatorics Seminar	2020
Princeton Discrete Math Seminar	2019
Stanford Combinatorics Seminar	2019
19th International Conference on Random Structures and Algorithms (ETH Zurich)	2019
Stanford Combinatorics Seminar	2019
Stanford Combinatorics Seminar	2018
Stanford Combinatorics Reading Seminar (7 total talks)	2017–2020
Stanford Kiddie Colloquium (7 total talks)	2016–2019
MIT Student Colloquium for Undergraduates in Mathematics	2015
Dartmouth Number Theory Seminar	2015
AMS Session on Number Theory, III, Joint Math Meetings	2015
AMS Session on Combinatorics and Number Theory, Joint Math Meetings	2014

Other Experience

Google Inc. Software Engineering Intern	2015
USA Math Olympiad Grader	2015
Duluth Research Experience for Undergraduates participant	2013, 2014
Math Olympiad Summer Camp Grader	2013
Jane Street Capital Trading Intern	2013
IdeaMath Year-round Program Instructor	2012–2013