

# Xiaoyu He

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## Employment

**Princeton University** 2021–Present  
NSF Postdoctoral Research Fellow

## 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

## Research Interests

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

## Teaching and Mentorship

**Princeton University Instructor**  
MAT 104 (Calculus II) Fall 2022  
**Princeton University Summer REU Mentor** Summer 2022  
**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	
<b>Stanford University Research Institute in Mathematics</b>	2017 –2021
Co-authored four papers with undergraduates published in: <i>Combin. Probab. Comput., Discrete Math., and Electronic J. Combin.</i>	
<b>MIT-PRIMES Research Mentor</b>	2016
<b>Harvard University Teaching Assistant</b>	
Math 130 (Classical Geometry)	Spring 2015
Math 114 (Analysis II)	Fall 2014
Math 113 (Complex Analysis)	Spring 2014
<b>MIT-PRIMES Circle Mentor</b>	2013-2014

## Other Professional Experience

<b>Referee for:</b> Discrete Mathematics, Electronic Journal of Combinatorics, Journal of Combinatorial Theory Series A, Journal of Combinatorial Theory Series B, SIAM Journal on Discrete Mathematics, Random Structures and Algorithms, Combinatorica, Discrete Applied Mathematics	
<b>Reviewer for Math Reviews</b>	2019
<b>Co-organizer for Stanford Kiddie Colloquium</b>	2017–2018

## Papers

32. David Conlon, Jacob Fox, Xiaoyu He, Dhruv Mubayi, Andrew Suk, Jacques Verstraëte  
*Hypergraph Ramsey numbers of stars versus cliques*  
preprint (2022)
31. Noga Alon, Gabriela Bourla, Ben Graham, Xiaoyu He, Noah Kravitz  
*Logarithmically larger deletion codes of all distances*  
preprint (2022)
30. David Conlon, Jacob Fox, Xiaoyu He, Dhruv Mubayi, Andrew Suk, Jacques Verstraëte  
*Set-coloring Ramsey numbers via codes*  
preprint (2022)
29. Noga Alon, Benjamin Gunby, Xiaoyu He, Eran Shmaya, Eilon Solan  
*Identifying the Deviator*  
preprint (2022)
28. Benjamin Gunby, Xiaoyu He, Bhargav Narayanan  
*Down-set Thresholds*  
preprint (2021)
27. Xiaoyu He, Emily Huang, Ihyun Nam, Rishubh Thaper  
*Shuffle squares and reverse shuffle squares*  
preprint (2021)

26. Jacob Fox, Xiaoyu He, Yuval Wigderson  
*Ramsey goodness of books revisited*  
preprint (2021)
25. Xiaoyu He, Jiaxi Nie, Sam Spiro  
*Maximal independent sets in clique-free graphs*  
European J. Combin. 106 (2022), 103575
24. Venkatesan Guruswami, Xiaoyu He, Ray Li  
*The zero-rate threshold for adversarial bit-deletions is less than  $1/2$*   
FOCS (2021)
23. Jacob Fox, Xiaoyu He, Yuval Wigderson  
*Ramsey numbers of sparse digraphs*  
Israel J. Math. (2021), accepted for publication
22. Jacob Fox, Xiaoyu He, Sammy Luo, Max Xu  
*Multicolor list Ramsey numbers grow exponentially*  
J. Graph Theory (2022), early view
21. Xiaoyu He, Yuzu Ido, Benjamin Przybocki  
*Hat guessing on books and windmills*  
Electron. J. Combin. 29 (2022), P1.12
20. Persi Diaconis, Ron Graham, Xiaoyu He, Sam Spiro  
*Card guessing with partial feedback*  
Combin. Probab. Comput. 31 (2021), 1–20
19. Xiaoyu He, Ray Li  
*Hat guessing numbers of degenerate graphs*  
Electron. J. Combin. 27 (2020), P3.58
18. Jacob Fox, Xiaoyu He  
*Independent sets in hypergraphs with a forbidden link*  
Proc. London Math. Soc. (2021)
17. John Engbers, Aysel Erey, Jacob Fox, Xiaoyu He  
*Tomescu’s graph-coloring conjecture for  $l$ -connected graphs*  
SIAM J. Discrete Math. (2021), 1478–1502
16. Jacob Fox, Xiaoyu He, Yuval Wigderson  
*Ramsey, Paper, Scissors*  
Random Structures Algorithms 57 (2020), 1157–1173
15. Xiaoyu He, Matthew Kwan  
*Universality of random permutations*  
Bull. London Math. Soc. 52 (2020), 515–529
14. Ryan Alweiss, Chady Ben Hamida, Xiaoyu He, Alexander Moreira  
*On the subgraph query problem*  
Combin. Probab. Comput. 30 (2020), 1–16

13. Xiaoyu He, Yuval Wigderson  
*Hedetniemi's conjecture is asymptotically false*  
J. Combin. Theory Ser. B 146 (2020), 485–494
12. Xiaoyu He, Yuval Wigderson  
*Multicolor Ramsey numbers via pseudorandom graphs*  
Electron. J. Combin. (2020), P1.32
11. David Gonzalez, Xiaoyu He, Hanzhi Zheng  
*An upper bound for the restricted online Ramsey number*  
Discrete Math. 342 (2019), 2565–2569
10. David Conlon, Jacob Fox, Andrey Grinshpun, Xiaoyu He  
*Online Ramsey numbers and the subgraph query problem*  
Building Bridges II, Bolyai Soc. Math. Stud. 28 (2019)
9. Jacob Fox, Xiaoyu He, Freddie Manners  
*A proof of Tomescu's graph-coloring conjecture*  
J. Combin. Theory Ser. B 136 (2019), 204–221
8. Jared Bitz, Sarah Griffith, Xiaoyu He  
*Exponential lower bounds on the generalized Erdős-Ginzburg-Ziv constant*  
Discrete Math. 342 (2020), 112083
7. Xiaoyu He  
*Linear dependence between hereditary quasirandomness conditions*  
Electron. J. Combin. 25 (2018), P4.12
6. Xiaoyu He  
*Primes of the form  $p^2 + Ny^2$*   
Harvard University senior thesis, manuscript (2016)
5. Xiaoyu He  
*Geometric progression-free sequences with small gaps II*  
INTEGERS 16, Paper No. A31, (2016), 9pp
4. Xiaoyu He  
*Zero-sum subsequences of length  $kq$  over finite abelian  $p$ -groups*  
Discrete Math. 339 (2016), 399–407
3. Xiaoyu He  
*Geometric progression-free sequences with small gaps*  
J. Number Theory 151 (2015), 197–210
2. Xiaoyu He  
*Cross number invariants of finite abelian groups*  
J. Number Theory 136 (2014), 100–117
1. Xiaoyu He  
*On the classification of universal rotor-routers*  
manuscript (2011)

## Selected Talks

BIRS Workshop on Extremal Combinatorics and Geometry	2022
Princeton PACM Colloquium	2022
Princeton Discrete Math Seminar	2021
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