Kevin A. Zhou
Curriculum Vitae

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Education

University of Illinois Urbana-Champaign 2024-
Ph.D. Mathematics, expected May 2029

Carnegie Mellon University 2019-2023
M.S. Mathematics, May 2023
B.S. Discrete Math and Logic, May 2023
Honors Math Degree Program (top 12), University Honors

Achievements

- CMU Senior Leadership Recognition Award 2023
- Mellon College of Science Research Honors 2023
- World Puzzle Championship, 13th place (out of 175) 2023
- Putnam Math Competition, placed in top 100 and top 200 (out of 4000+) 2019-2022
- Harvard-MIT Math Tournament, 9th place in Combinatorics (out of 600+) 2018

Publications and Preprints

- **Realizing convex codes with axis-parallel boxes** 2023
with Dr. Amzi Jeffs (advisor), Miguel Benitez, Siran Chen, Tiffany Han, and Kinapal Paguyo. *Involve, a Journal of Mathematics* (accepted). Available at `https://arxiv.org/abs/2209.02486`
- **Embedding Dimensions of Box-Convex Codes** 2023
Available at `https://kevinazhou150.github.io/pdfs/convex%20codes%20thesis%208-9.pdf`
- **Complete graphs are rainbow-uncommon** 2021
with Dr. Zhanar Berikkyzy (advisor), Gabriel Elvin (grad advisor), Blake Bates, Pablo Blanco, Nick Chiem, Risa Fines, Sarvagya Jain, Maja Lie, Hanna Mikulás, and Isaac Reiter. *Involve, a Journal of Mathematics* (accepted).
- **Hat Problems on Bipartite Graphs and the Generalized Line of Sages Problem** 2019
with Dr. William Gasarch (advisor), Reynald Oliveria, William Bass, Tyler Huang.
Available at `https://kevinazhou150.github.io/pdfs/HatProblems.pdf`

Research Experience

Master's Degree Research, Carnegie Mellon University, Advisor: Amzi Jeffs 2022-2023
Thesis project: Studied box-convex codes, which are combinatorial codes that record how a collection of axis-parallel boxes intersect and cover one another in Euclidean space. Discovered an explicit algorithm for classifying all box-convex codes on any number of indices. Proved that box-convex codes can in general have embedding dimension at least $\binom{n}{\lfloor n/2 \rfloor}/2$.

- Published master's thesis that communicates the algorithms used, results, and proofs
- Developed algorithms and programmed them to find patterns on 4 neurons
- Collaborated with four undergraduates to discover theorems in combinatorial geometry

- Presented results at the 2023 Joint Mathematics Meetings conference in Boston

Anti-Ramsey Multiplicities Research, Polymath Jr., Advisor: Zhanar Berikkyzy 2021

- Studied graph theory using programming and proofs
- Proved a result about rainbow cycles of length 6 appearing in large complete graphs

Communication Complexity Research, Carnegie Mellon University, Advisor: Kaave Hosseini 2020

- Studied the log-rank conjecture for AND functions, and found a bound between fractional hitting set and hitting set of a family of sets
- Presented results at a symposium held at CMU

Hat Problems Research, University of Maryland, Advisor: William Gasarch 2018-2019

- Proved results about hat problems on bipartite sight graphs, and solved cases of the Line of Sages problem using Steiner systems and Java programming
- Presented findings in a poster session at Montgomery Blair High School

Presentations and Conferences

Meeting of the Minds Undergraduate Research Symposium, Carnegie Mellon University 2023

- Presented with my research group (Miguel Benitez, Siran Chen, Tiffany Han, and Kinapal Paguyo)
- Runner-up prize for best poster

Joint Mathematics Meetings, Poster Session 2023

- Presented convex codes research with my research group to experts in the field

Work and Teaching Experience

Art of Problem Solving, Instructor 2024-

- Taught contest math to 16 students in-person, supporting students one-on-one by explaining concepts and guiding them through challenging problems
- Tutored 10+ students over Zoom

Puzzle Designer at Lunarch Studios 2024

- Designed 74 logic grids for the puzzle video game Islands of Insight

Principles of Functional Programming, TA (Head TA for Spring 2022) 2020-2023

- Developed homework assignments and wrote autograders for coding problems
- Taught weekly recitations and review sessions for 8 semesters
- Helped 1000+ students during office hours with conceptual and debugging questions
- Organized logistics for 45+ TA's, as head TA

Logic Puzzle Student-Taught Course, Instructor 2023

- Created a class about logic puzzles from scratch
- Developed handouts for weekly classes, including dozens of puzzles and thorough notes
- Taught 35 students about advanced mathematical techniques

Coursework

Graduate-level classes are marked with ⋆

- Discrete math⋆
- Extremal combinatorics⋆
- Probabilistic combinatorics⋆
- Measure and integration⋆
- Complex analysis⋆
- Functional analysis⋆
- Topology⋆
- Honors real analysis
- Honors abstract algebra
- Probability in computing
- Reasoning with Data (Statistics)

- Computer systems
- Imperative programming
- Functional programming
- Theoretical computer science
- Parallel/sequential algorithms
- Constructive logic
- Complexity theory
- Programming Languages theory

Projects

Puzzlehunt Club Staff, Carnegie Mellon University 2020-2023

Every semester the club hosts a puzzlehunt, where teams of 4-6 people work together to solve logic and word puzzles. About 300 teams from around the world participate. The club also organizes solving sessions for other puzzlehunts.

- Wrote 52+ puzzles in HTML and Javascript, collaborating with other members to provide feedback and ideas
- Solved puzzles using MS Excel functions, such as regex and database operations
- Contributed to a 4th place team at the MIT Mystery Hunt, the most prestigious annual puzzle event

Montgomery Blair Math Tournament, Problem writing 2018-2019

- Wrote 30 competition math problems in algebra, geometry, combinatorics, and number theory

Level designer at JUMP Team 2016-

JUMP Team is a renowned, culturally diverse group of Mario game creators, putting creativity and design above all else. I wrote assembly language to create custom gimmicks and sprites.

- Designed 25+ levels for video games created by JUMP Team
- Achieved 2nd best level award in a level design contest with 70 participants

Skills

Programming

4+ years: Java, HTML, SML, LaTeX
1+ years: Python, C, OCaml, Javascript

Technology

Git/github, Windows and Unix operating systems, Vim, VS code, MS Excel, MS Powerpoint