Zeyu Zheng

My Homepage

zeyuzheng19@fudan.edu.cn or zeyu.zheng@rutgers.edu

EDUCATION

Rutgers University, B.S. expected in Aug 2023 — New Brunswick, New Jersey, USA
major in Pure Math, with a minor in Computer Science — *May 2022 - present*

Fudan University, B.S. expected in Jul 2023 — Shanghai, Mainland China
major in Computational Math, Buqing Su Top-notch Talent Program in Mathematics — *Sep 2019 - present*

Budapest Semesters in Mathematics — Budapest, Hungary, EU
with Highest Honors (for top students, based on professor recommendations) — *Jan 2022 - Aug 2022*

Alfréd Rényi Institute of Mathematics — Budapest, Hungary, EU
Semester on Large Networks and their Limits — *May 2022 - Jun 2022*

University of Illinois at Urbana-Champaign — Urbana, Illinois, USA
Summer School on Flag Algebras, online — *Jun 2021 - Jul 2021*

GRE Mathematics: 94% ; **TOEFL:** 109/120 in total, 28/30 in speaking

Coursework:
Combinatorics I (A+) , Advanced Combinatorics (A) , Combinatorial Optimization (A-) , Graph Theory (A), Number Theory (A+) , Calculus (A) , Complex Analysis (A-) , Real Analysis (A-) , Fourier Analysis (A+), Linear Algebra (A) , Abstract Algebra (B+) , Galois Theory (A+) , Analytic Geometry (A) , Discrete and Convex Geometry (A+) , Topology (A) , Algebraic Topology (B+) , Mathematical Modeling (A) , Mathematical Modeling and Practice (A), Theory of Computing (A+), Conjecture and Proof (A), Research Opportunities (A+), Research Opportunities II (A)

RESEARCH WORKS

1. Chaoliang Tang, Hehui Wu, Shengtong Zhang, and Zeyu Zheng, "On the Turán number of the linear 3−graph C_{13}", *Electronic Journal of Combinatorics* Volume 29, Issue 3 (2022), P3.46. arXiv Journal version
2. Logan Post and Zeyu Zheng, "Common kings of a chain of cycles in a strong tournament", *under review.* arXiv
3. Robin Huang, Tibor Jordán, Henry Simmons, Kaylee Weatherspoon and Zeyu Zheng, "Regular graphs with extremal rigidity properties", *submitted.* PDF
4. Ervin Győri, Xianzhi Wang and Zeyu Zheng, "Extremal planar graphs with no cycles of particular lengths", *under review.* arXiv
5. Yaobin Chen, Hehui Wu and Zeyu Zheng, Progress on the small quasi-kernel conjecture, *in preparation.*
6. Bhargav Narayanan and Zeyu Zheng, Maximum number of independent sets in 3-graphs, *in preparation.*

RESEARCH EXPERIENCE

Turán Number of Linear 3-graphs Dec 2020 - Oct 2021

Advisor: Hehui Wu *Shanghai Center for Mathematical Sciences, Fudan University*

- We introduced a new approach to this kind of problems. By this new method, we proved and strengthened a conjecture of András Gyárfás about the Turán number of a linear 3-graph.

Planar Turán Number Jan 2022 - Aug 2022

Advisor: Ervin Győri *Alfréd Rényi Institute of Mathematics & Budapest Semesters in Mathematics*

- We found a new approach to find the planar Turán number of C_5, i.e. to partition the graph into triangular blocks and do local calculations. We've also found a better extremal construction.
- We proved tight bounds for the maximum number of edges in a C_6/C_8-free planar bipartite/triangle-free planar graph with some restrictions of small degree vertices.

Rigidity Properties of Graphs Jan 2022 - Aug 2022

Advisor: Tibor Jordán *Eötvös Loránd University & Budapest Semesters in Mathematics*

- We fully characterized the the minimal 2-vertex globally rigid graphs. We proved some properties of 2-vertex globally rigid graphs and established some equivalences of 2-edge globally rigid graphs under different conditions.
- We extended a classic result about 2-vertex rigid graphs. Using our new result, we found a recursive construction showing sharpness of a lower bound for the minimum number of edges in 3-vertex rigid graphs.

Small Quasi-kernel Conjecture May 2022 - present

Advisor: Hehui Wu *Shanghai Center for Mathematical Sciences, Fudan University*

- We found an equivalent proposition to a recent result of Alexandr Kostochka, and we have generalized his result.
- We are studying the weighted version of the conjecture, trying to establish some more results.

Maximum Number of Independent Sets in 3-graphs Sep 2022 - present

Advisor: Bhargav Narayanan *Rutgers University - New Brunswick*

- We are trying to use entropy method to study the maximal number of independent sets of 3-graphs.

RESEARCH EXPERIENCE

Fudan SCMS Combinatorics Research Group Shanghai, China

Shanghai Center for Mathematical Sciences, Fudan University *Sep 2019 - Present*

- We introduced a new approach to this kind of problems. By this new method, we proved and strengthened a conjecture of András Gyárfás about the Turán number of a linear 3-graph.
- We are now working on the small quasi-kernel conjecture. Currently we have generalized a result of Alexandr Kostochka.

BSM Undergraduate Research Opportunity Budapest, Hungary

Budapest Semesters in Mathematics *Jan 2022 - Aug 2022*

- With Professor Ervin Győri, we studied planar Turán number. We found a new proof to the planar Turán number of C_5, and determined some other planar Turán numbers.
- With Professor Tibor Jordán, we studied graph rigidity properties and established some combinatorial characterizations of redundantly rigid graphs.

Rutgers Discrete Mathematics Research Group New Jersey, USA

Rutgers University - New Brunswick *Sep 2022 - present*

- We are trying to use entropy method to study the maximal number of independent sets of 3-graphs.

RESEARCH EXPERIENCE

- Fudan SCMS Combinatorics Research Group, Dec 2020 - present
- Budapest Semesters in Mathematics Spring REU, Jan 2022 - May 2022
- Budapest Semesters in Mathematics Summer REU, Jun 2022 - Aug 2022
- Rutgers Discrete Math Research Group, Sep 2022 - present

TEACHING EXPERIENCE

- Fall 2021: TA for Linear Algebra at FDU

HONORS AND AWARDS

- Hungarian BME Mathematical Contest for university students, second place 2022
- Scholarship for Outstanding Students, FDU 2020-2021 & 2019-2020
- East China Cup Mathematical Modeling Contest, outstanding winner 2021
- The Chinese Mathematics Competition for college students, first prize 2020
- National High School Mathematical Contest, first prize 2018

TALKS

1. 11th Cross-strait Conference on Graph Theory and Combinatorics Aug 2021
2. Graduate Student Seminar, Fudan University Sep 2022
3. (poster) Undergraduate Mathematics Symposium, University of Illinois at Chicago Nov 2022