Christopher Cox

Curriculum Vitæ

6201 Wean Hall
Carnegie Mellon University
Pittsburgh, PA 15213
cocox@andrew.cmu.edu
math.cmu.edu/~cocox

Research interests

Extremal combinatorics, probablilistic methods, algebraic methods, graph theory, partially-ordered sets.

Education

Doctor of Philosophy in Algorithms, Combinatorics and Optimization ..... $\mathbb{E}[\text{GRAD}] = 2020 + \varepsilon$
@ Carnegie Mellon University, Pittsburgh, PA.

- Major professor: Boris Bukh.

Master of Science in Mathematics 2015
@ Iowa State University, Ames, IA.

- Thesis: "Ordered and partially-ordered variants of Ramsey's theorem."
- Major professor: Derrick Stolee.

Bachelor of Science in Mathematics 2014
@ Iowa State University, Ames, IA.

- Thesis: "Isospectral drums and cospectral graphs."
- Thesis advisor: Steve Butler.

Academic positions

Teaching assistant 2015–Cur
@ Carnegie Mellon University, Pittsburgh, PA.

- Instructor — Concepts of mathematics (21-127)
- TA — Mathematical studies algebra I (21-237), Matrix theory (21-242), Multidimensional calculus (21-268), Calculus I (21-115), Discrete mathematics (21-228), Concepts of mathematics (21-127)

REU graduate research mentor 2015
@ Iowa State University, Ames, IA.

- Worked with four undergraduate students on problems about mathematical juggling.
- The papers "A generalization of Eulerian numbers via rook placements" and "Counting prime juggling patterns" are a result of this research workshop.

Teaching assistant 2014–2015
@ Iowa State University, Ames, IA.

- TA — Elementary differential equations (MATH 267), Calculus I (MATH 165).

Publications

Submitted

- J. Briggs, C. Cox. "The query complexity of locating monochromatic matchings and trees," arXiv:1904.00246.
- B. Bukh, C. Cox. "Nearly orthogonal vectors and small antipodal spherical codes," arXiv:1803.02949.

Published

- J. Briggs, C. Cox. "Inverting the Turán problem," *Discrete Mathematics*, vol. 342, no. 7, pp. 1865–1884, Jul. 2019.
- B. Bukh, C. Cox. "On a fractional version of Haemers' bound," *IEEE Transactions on Information Theory*, Dec. 2018 (early access).
- C. Cox, D. Stolee. "Ramsey numbers for partially-ordered sets," *Order*, vol. 35, no. 3, pp. 557–579, Nov. 2018.
- Z. Berikkyzy, C. Cox, M. Dairyko, K. Hogenson, M. Kumbhat, B. Lidický, K. Messerschmidt, K. Moss, K. Nowak, K. Palmowski, D. Stolee. "$(4, 2)$-choosability of planar graphs with forbidden substructures," *Graphs and Combinatorics*, vol. 33, no. 4, pp. 751–787, Jul. 2017.
- E. Banaian, S. Butler, C. Cox, J. Davis, J. Landgraf, S. Ponce. "A generalization of Eulderian numbers via rook placements," *Involve*, vol. 10, no. 4, pp. 691–705, Mar. 2017.
- E. Banaian, S. Butler, C. Cox, J. Davis, J. Landgraf, S. Ponce. "Counting prime juggling patterns," *Graphs and Combinatorics*, vol. 32, no. 5, pp. 1675–1688, Sep. 2016.
- C. Cox, D. Stolee. "Ordered Ramsey numbers of loose paths and matchings," *Discrete Mathematics*, vol. 339, no. 2, pp. 499–505, Feb. 2016.
- C. Cox, J. De Silva, P. DeOrsey, F. Kenter, T. Retter, R.J. Tobin. "How to make the perfect fireworks display: Two strategies for Hanabi," *Mathematics Magazine*, vol. 88, no. 5, Dec. 2015.

Presentations

Invited

- Algorithmic re-proofs of some Ramsey numbers. *Iowa State University Discrete Mathematics Seminar.* Ames, IA, Mar. 2019.
- Small antipodal spherical codes. *Carnegie Mellon University CS Theory Seminar.* Pittsburgh, PA, Oct. 2018.
- A fractional version of Haemers' bound. *AMS Special Session on Graph Theory.* Newark, DE, Sep. 2018.
- Inverting the Turán problem. *Iowa State University Discrete Mathematics Seminar.* Ames, IA, Jul. 2018.
- Nearly orthogonal vectors. *Technion Combinatorics Seminar.* Haifa, Israel, Jun. 2018.
- Nearly orthogonal vectors. *Hebrew University of Jerusalem Combinatorics Seminar.* Jerusalem, Israel, Jun. 2018.
- A fractional version of Haemers' bound. *Ben-Gurion University Combinatorics Seminar.* Be'er Sheva, Israel, Jun. 2018.
- Nearly orthogonal vectors. *Iowa State University Discrete Mathematics Seminar.* Ames, IA, Mar. 2018.
- Ramsey numbers on the Boolean lattice. *AMS Special Session on Structural and Computational Graph Theory.* Raleigh, NC, Nov. 2016.
- Ramsey numbers for partially-ordered sets. *Carnegie Mellon University ACO Seminar.* Pittsburgh, PA, Feb. 2016.

- Ramsey numbers of ordered hypergraphs. *AMS Special Session on Extremal and Stuctural Graph Theory*. Las Vegas, NV, Apr. 2015.
- Ramsey numbers of ordered hypergraphs. *University of Colorado Denver Discrete Mathematics Seminar*. Denver, CO, Mar. 2015.
- Ordered Ramsey numbers of loose paths and k-uniform matchings. *Iowa State University Discrete Mathematics Seminar*. Ames, IA, Oct. 2014.

Contributed

- Inverting the Turán problem. *ICGT*. Lyon, France, Jul. 2018.
- Nearly orthogonal vectors (poster). *Building Bridges II*. Budapest, Hungary, Jul. 2018.
- Inverting the Turán problem. *MIGHTY LIX*. Morgantown, WV, Apr. 2018.
- A degree sequence variant of Ramsey's theorem. *Connections in Discrete Mathematics*. Vancouver, Canada, Jun. 2015.
- Coupled choosability with separation. *Rocky Mountain–Great Plains Graduate Research Workshop in Combinatorics*. Ames, IA, Jun. 2015.
- Potential Ramsey numbers. *Rocky Mountain–Great Plains Graduate Research Workshop in Combinatorics*. Denver, CO, Jul. 2014.
- Normally regular digraphs resulting from Cayley graphs (poster). *SACNAS National Conference*. San Antonio, TX, Oct. 2013.
- Isospectral drums and cospectral graphs. *MAA Mathfest*. Hartford, CT, Aug. 2013.

Other

- Nearly orthogonal vectors. *CMU Graduate Student Seminar*. Pittsburgh, PA, Dec. 2018.
- When angles get into a car crash. *CMU Graduate Student Seminar*. Pittsburgh, PA, Nov. 2018.
- Poly-nom-nom-nom-ials. *CMU Graduate Student Seminar*. Pittsburgh, PA, Sep. 2018.
- High-dimensional hi-jinks. *CMU Graduate Student Seminar*. Pittsburgh, PA, Aug. 2018.
- Shannon Capacity. *CMU Graduate Student Seminar*. Pittsburgh, PA, Mar. 2018.
- Sperner's lemma and applications. *CMU Graduate Student Seminar*. Pittsburgh, PA, Feb. 2018.
- You just have to look at it from the right angle. *CMU Graduate Student Seminar*. Pittsburgh, PA, Oct. 2017.
- Triangles can cut cake. *Western PA ARML*. Pittsburgh, PA, Mar. 2017.
- 1 hat, 2 hat, red hat, blue hat. *CMU Graduate Student Seminar*. Pittsburgh, PA, Feb. 2017.
- The mathematics of juggling. *CMU Graduate Student Seminar*. Pittsburgh, PA, Sep. 2016.
- Hat guessing games and applications. *Western PA ARML*. Pittsburgh, PA, Jan. 2016.
- The mathematics of juggling. *Western PA ARML*. Pittsburgh, PA, Sep. 2015.

Awards/Grants

Buncher Graduate and Faculty Fellows Research Collaboration Fund 2018
(with Boris Bukh)

- Provides support for a faculty member and a graduate student to spend time in Israel at the Technion Institute with the intent of building long term research collaborations between the two universities. The funding provides travel support for the faculty member to spend one week in Haifa and for the graduate student to stay on for 1–2 months working in the relevant Technion laboratory.

Workshops

Informal analysis seminar ..... Feb. 2018
@ Kent State University, Kent, OH.

- Attended the lecture series: "Packing a torus with circles", "Tensegrities: why things don't fall down" and "A degenerate isoperimetric problem in the plane with applications to a bi-stable Hamiltonian system".

Summer school on random graphs and probabilistic methods ..... Jun. 2017
@ The Fields Institute, Toronto, CA.

- Attended a two week summer school comprised of four lecture series: "Ten lectures on random graphs", "Ten lectures on random graph processes", "Random spanning trees and forests" and "Randomness for and against computation".

Graduate Research Workshop in Combinatorics (GRWC) ..... Jun. 2015
@ Iowa State University, Ames, IA.

- Participated in an experimental research program for graduate students in discrete mathematics (see https://sites.google.com/site/rmgpgrwc/). The program consisted of about 35 graduate students in addition to faculty and postdocs working on problems presented by the students. Many collaborations have continued to be productive outside the workshop.

Discrete Mathematics Working Seminar 2014–2015
@ Iowa State University, Ames, IA.

- Worked with a group of graduate students, postdocs and professors on research problems in discrete mathematics. This collaboration has resulted in the paper "$(4, 2)$-choosability of planar graphs with forbidden structures."

Graduate Research Workshop in Combinatorics (GRWC) ..... Jul.–Aug. 2014
@ University of Denver and University of Colorado Denver, Denver, CO.

- Participated in an experimental research program for graduate students in discrete mathematics (see https://sites.google.com/site/rmgpgrwc/). The program consisted of about 30 graduate students in addition to faculty and postdocs working on problems presented by the students. Many collaborations have continued to be productive outside the workshop.

NSF REU ..... Jun.–Aug. 2013
@ Iowa State University, Ames, IA.

- Worked under the direction of Sung-Yell Song on projects in algebraic graph theory, focusing on the classification of Cayley graphs and the construction of normally regular digraphs.