

# Christopher Cox

Curriculum Vitæ

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<https://mathematicaster.org/>

## Research interests

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Extremal combinatorics, probabilistic methods, algebraic methods, discrete geometry.

## Education

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**PhD** in Algorithms, Combinatorics and Optimization.....2020

@ Carnegie Mellon University, Pittsburgh, PA

- Thesis: “Problems in coding theory and extremal combinatorics”
- Major professor: Boris Bukh

**MS** in Mathematics ..... 2015

@ Iowa State University, Ames, IA

- Thesis: “Ordered and partially-ordered variants of Ramsey’s theorem”
- Major professor: Derrick Stolee

**BS** in Mathematics ..... 2014

@ Iowa State University, Ames, IA

- Thesis: “Isospectral drums and cospectral graphs”
- Thesis advisor: Steve Butler

## Academic positions

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**RTG postdoctoral research associate**.....2020–Current

@ Iowa State University, Ames, IA

- Supported by U.S. taxpayers through NSF Research Training Grant DMS-1839918
- Instructor: Edit Distance in Graphs (MATH 595: early graduate research course)
- TA: Elementary Differential Equations (MATH 267)

**Teaching assistant** ..... 2015–2020

@ Carnegie Mellon University, Pittsburgh, PA

- Instructor: Matrices and Linear Transformations (21-241), 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 in enumerative combinatorics.

- 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

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### Submitted

- Uniquely optimal codes of low complexity are symmetric. [arXiv:2008.12871](https://arxiv.org/abs/2008.12871).  
 with E.J. King, D.G. Mixon and H. Parshall.
- Periodic words, common subsequences and frogs. [arXiv:1912.03510](https://arxiv.org/abs/1912.03510).  
 with B. Bukh.

### Published

- Restricted online Ramsey numbers of matchings and trees. *Electronic Journal of Combinatorics*, vol 27, no 3, pp 3.49, Sep 2020.  
 with J. Briggs.
- Nearly orthogonal vectors and small antipodal spherical codes. *Israel Journal of Mathematics*, vol 238, pp 359–388, Jul 2020.  
 with B. Bukh.
- Inverting the Turán problem. *Discrete Mathematics*, vol 342, no 7, pp 1865–1884, Jul 2019.  
 with J. Briggs.
- On a fractional version of Haemers’ bound. *IEEE Transactions on Information Theory*, vol 65, no 6, pp 3340–3348, Jun 2019.  
 with B. Bukh.
- Ramsey numbers for partially-ordered sets. *Order*, vol 35, no 3, pp 557–579, Nov 2018.  
 with D. Stolee.
- $(4, 2)$ -choosability of planar graphs with forbidden substructures. *Graphs and Combinatorics*, vol 33, no 4, pp 751–787, Jul 2017.  
 with Z. Berikkyzy, M. Dairyko, K. Hogenson, M. Kumbhat, B. Lidický, K. Messerschmidt, K. Moss, K. Nowak, K. Palmowski and D. Stolee.
- A generalization of Eulerian numbers via rook placements. *Involve*, vol 10, no 4, pp 691–705, Mar 2017.  
 with E. Banaian, S. Butler, J. Davis, J. Landgraf and S. Ponce.
- Counting prime juggling patterns. *Graphs and Combinatorics*, vol 32, no 5, pp 1675–1688, Sep 2016.  
 with E. Banaian, S. Butler, J. Davis, J. Landgraf and S. Ponce.
- Ordered Ramsey numbers of loose paths and matchings. *Discrete Mathematics*, vol 339, no 2, pp 499–505, Feb 2016.  
 with D. Stolee.
- How to make the perfect fireworks display: Two strategies for Hanabi. *Mathematics Magazine*, vol 88, no 5, pp 323–336, Dec 2015.  
 with J. De Silva, P. DeOrsey, F. Kenter, T. Retter and R.J. Tobin.

## Presentations

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### Invited

- Restricted online Ramsey numbers of matchings. *AMS Special Session on Advances in Graph Theory*. Online, Oct 2020.
- Periodic words, common subsequences and frogs. *ISU Discrete Math Seminar*. Online, Sep 2020.
- Nearly orthogonal vectors. *CodEx Seminar*. Online, May 2020.
- Nearly orthogonal vectors. *ISU Discrete Math Seminar*. Online, May 2020.
- Periodic words, common subsequences and frogs. *University of Virginia Probability Seminar*. Charlottesville, VA, Feb 2020.
- Periodic words, common subsequences and frogs. *UCSD Combinatorics Seminar*. La Jolla, CA, Feb 2020.
- Periodic words, common subsequences and frogs. *CMU ACO Seminar*. Pittsburgh, PA, Nov 2019.
- Periodic words, common subsequences and frogs. *MIT Combinatorics Seminar*. Cambridge, MA, Oct 2019.
- Periodic words, common subsequences and frogs. *Warwick Combinatorics Seminar*. Coventry, UK, Sep 2019.
- Algorithmic re-proofs of some Ramsey numbers. *ISU Discrete Math Seminar*. Ames, IA, Mar 2019.
- Small antipodal spherical codes. *CMU 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. *ISU Discrete Math 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 Combinatorics Seminar*. Be'er Sheva, Israel, Jun 2018.
- Nearly orthogonal vectors. *ISU Discrete Math 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. *CMU ACO Seminar*. Pittsburgh, PA, Feb 2016.
- Ramsey numbers of ordered hypergraphs. *AMS Special Session on Extremal and Structural Graph Theory*. Las Vegas, NV, Apr 2015.
- Ramsey numbers of ordered hypergraphs. *CU Denver Discrete Math Seminar*. Denver, CO, Mar 2015.
- Ordered Ramsey numbers of loose paths and  $k$ -uniform matchings. *ISU Discrete Math Seminar*. Ames, IA, Oct 2014.

### Contributed

- Nearly orthogonal vectors and small antipodal spherical codes. *European Combinatorics Conference*. Bratislava, Slovakia, Aug 2019.
- Nearly orthogonal vectors. *Finite Geometry and Extremal Combinatorics*. Newark, DE, Aug 2019.
- 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.
- 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.

## Awards/Grants ---

**Guy C. Berry Graduate Research Award** ..... 2020

- Recognizes excellence in research by graduate students in the Mellon College of Science.

**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.