

Justin “JD” Nir

Curriculum Vitae

Research Interests

Combinatorics and Graph Theory:

I work on problems concerning maximal parameter values and typical properties of large networks with specified characteristics. My work draws motivation and techniques from extremal and random graph theory.

Education

- 2020 **Doctor of Philosophy**, University of Nebraska–Lincoln, Lincoln, NE.
Dissertation Title: *Two Questions About Properties of Large Graphs: On Generalized Turán Numbers and the Chromatic Number of Random Lifts*
Advised by Dr. Jamie Radcliffe
- 2017 **Master of Arts in Mathematics**, University of Nebraska–Lincoln, Lincoln, NE.
- 2013 **Bachelor of Science in Mathematics**, Carnegie Mellon University, Pittsburgh, PA.
- 2013 **Bachelor of Science in Computer Science**, Carnegie Mellon University, Pittsburgh, PA.

Experience

- July 2020 – **Post-Doctoral Fellow**, University of Manitoba, Winnipeg, MB.
present Producing research in extremal and random graph theory. Teaching classes as instructor of record.
- Aug 2015 – **Graduate Teaching Assistant**, University of Nebraska–Lincoln, Lincoln, NE.
May 2020 Teach classes as instructor of record. Lead recitation sections. Grade graduate-level assignments.
- Aug 2018 **Instructor**, Johns Hopkins Center for Talented Youth, Easton, PA.
Design and teach a three-week course in discrete mathematics and logic for gifted middle-school students.
- Jun 2016 – **Summer Intern**, MIT Lincoln Laboratory, Lexington, MA.
Aug 2016 Develop software to parse logical expressions and convert them to disjunctive normal form. Aid in integrating this functionality into a secure database prototype.
- Jan 2015 – **Research Engineer**, Fast Orientation, Washington, D.C.
Jul 2015 Research, design, and prototype product features. Provide analysis for security evaluations.
- July 2013 – **Security Analyst**, Independent Security Evaluators, Baltimore, MD.
Dec 2014 Evaluate applications and document vulnerabilities. Develop and present security-oriented training sessions.

Publications

4. Karen Gunderson and **JD Nir**. *The oriented chromatic number of random graphs of bounded degree*. arXiv e-prints, page arXiv:2202.12323, Feb 2022. 49 pages.
3. **JD Nir** and Xavier Pérez Giménez. *Chromatic Number of Random Lifts of Complete Graphs*. arXiv e-prints, page arXiv:2109.13347, Sep 2021. 62 pages.
2. Jonathan Cutler, **JD Nir**, and A. J. Radcliffe. *Supersaturation for subgraph counts*, *Graphs and Combinatorics* **38** (2022), no. 3, 65. 20 pages.
1. Kyle Murphy and **JD Nir**. *Paths of Length Three are K_{r+1} -Turán-Good*, *Electron. J. Combin.* **28** (2021), no. 4, Paper No. 4.34. 28 pages.

Invited and Contributed Talks

- June 2022 **A New Direction: The Oriented Chromatic Number of Random Graphs of Bounded Degree**, BIRS Cross-community collaborations in combinatorics, Banff, AB, 20 minutes, invited.
- May 2022 **Close Enough! How to (Probably) Calculate the Chromatic Number**, University of Montana Mathematics Colloquium, Missoula, MT, 50 minutes, invited.
- Apr 2022 **Paths of Length Three are K_{r+1} -Turán-Good**, Joint Mathematics Meetings, online, 20 minutes, invited.
- Oct 2020 **The Chromatic Number of Random Lifts of Regular Graphs**, AMS Fall Southeastern Sectional Meeting, online, 20 minutes.
- Jan 2020 **The Chromatic Number of Random Lifts of Regular Graphs**, Joint Mathematics Meetings, Denver, CO, 20 minutes, invited.
- Sept 2019 **Turán-Type Questions about Cliques and Stars**, Erdős Lecture Series, Memphis, TN, 20 minutes.
- Apr 2019 **The Chromatic Number of Random Lifts of Complete Graphs**, CU Denver Discrete Math Seminar, Denver, CO, 50 minutes, invited.
- Mar 2019 **Turán-Type Questions about Cliques and Stars**, CombinaTexas 2019, College Station, TX, 20 minutes.
- Sept 2018 **Popularity vs. Fame: Alon-Shikhelman Results for Cliques and Stars**, Mostly Manitoba, Michigan and Minnesota Combinatorics Graduate Student Workshop, Ames, IA, 30 minutes.
- Mar 2018 **This Title is False: Hilbert, Gödel, Turing and the Beautiful Futility of Mathematics**, Great Plains Alliance Talk Series at University of Nebraska–Kearney, Kearney, NE, 50 minutes, invited.
- Oct 2017 **Triangular and Pixel Ramsey Numbers**, CU Denver Discrete Math Seminar, Denver, CO, 50 minutes, invited.
- July 2014 **Phishing and Spear Phishing: Detection and Prevention**, Independent Security Evaluators Security Training for Enterprise Series, Baltimore, MD, 60 minutes.
- Nov 2013 **Industry-wide Misunderstandings of HTTPS**, International Conference on Information Security and Cryptology, Seoul, South Korea, 25 minutes.

Other Conferences

- July 2019 **MSRI Summer School on the Polynomial Method**, Mathematical Sciences Research Institute, Berkeley, CA.
Two-week intensive course on applications of the polynomial method to incidence geometry and other problems.
- Oct 2018 **AMS Sectional Meeting**, University of Michigan, Ann Arbor, MI.
- July 2018 **Building Bridges II**, Budapest, Hungary.
- June 2018 **Graduate Research Workshop in Combinatorics**, Iowa State University, Ames, IA.
Two-week workshop on open problems in combinatorics.
- Apr 2018 **AMS Sectional Meeting**, Vanderbilt University, Nashville, TN.
- Jan 2018 **Joint Mathematics Meetings**, San Diego, CA.
- June 2017 **Graduate Research Workshop in Combinatorics**, Denver University and CU Denver, Denver, CO.
Two-week workshop on open problems in combinatorics.
- Apr 2017 **Graduate Students Combinatorics Conference**, University of Kansas, Lawrence, KS.
- May 2016 **Great Plains Combinatorics Conference**, University of Kansas, Lawrence, KS.

Student Research Supervision

- Summer 22 **Ruiyang Chen**, University of Manitoba.
Summer 22 **Hritik Punj**, University of Manitoba.
Summer 21 **William Kellough**, *Infect Everyone: Modelling infection spreading via bootstrap percolation*, University of Manitoba.
21, 22 3 Minute Thesis winner (Mathematical, Computational & Statistical Sciences Division)
Summer 21 **Laura Funk**, *Domination in Networks*, University of Manitoba.

Teaching and Pedagogical Training

As Instructor of Record

- S22 Math 1240: Discrete Mathematics, University of Manitoba. 126 students.
F21 Math 3360: Combinatorics II, University of Manitoba. 6 students.
S21 Math 1700: Calculus II, University of Manitoba. 222 students.
S19 Math 107: Calculus II, University of Nebraska–Lincoln. 14 students.
F18, S20 Math 208: Calculus III, University of Nebraska–Lincoln. 30, 30 students.
Summer 18 Paradoxes and Infinities, Johns Hopkins Center for Talented Youth. 18 students.
Three-week course in logic and reasoning for gifted middle-school students
S18 Math 103: Algebra & Trigonometry, University of Nebraska–Lincoln. 32 students.
F16, S17, F17 Math 101: College Algebra, University of Nebraska–Lincoln. 40, 38, 39 students.

As Recitation Leader

- F19 Math 106: Calculus I, University of Nebraska–Lincoln. 93 students.
S15, F15 Math 107: Calculus II, University of Nebraska–Lincoln. 41, 38 students.
S13 21-484: Graph Theory, Carnegie Mellon University. 50 students.
S12 15-251: Great Theoretical Ideas in Computer Science, Carnegie Mellon University. 25 students.
Survey course of topics in mathematics and computer science theory
F11, S11 21-127: Concepts of Mathematics, Carnegie Mellon University. 25, 25 students.
Introductory proof-based mathematics course
F10 21-112: Calculus II, Carnegie Mellon University. 25 students.

As Grader

- F18, S18 Math 850/852: Graduate Discrete Mathematics, University of Nebraska–Lincoln

Training

- F16-S17 University of Nebraska–Lincoln Pedagogy Course

Service

- F 21 – S22 **UM Combinatorics Seminar Co-organizer**
Organize local and visiting speakers for a weekly seminar
Apr 2021 **AMS Sectional Special Session Co-organizer**
Invite and moderate speakers presenting work on graph theory and its applications
2020 – **Journal referee**
present Review and give feedback on manuscripts submitted for publication to journals including *Discrete Mathematics*, *Graphs and Combinatorics*, and *Australasian Journal of Combinatorics*
S19 – S20 **UNL New Graduate Mentor Program coordinator**
Assign and oversee 18 pairs of graduate mentors and first-year students, facilitating productive relationships
F18 – S19 **UNL New Graduate Mentor Program mentor**
Peer resource and support for a first-year graduate student