Peter Bradshaw

pabradsh@sfu.ca
peter-bradshaw.com
+1-236-788-2244
Citizenship: USA

I am a graph theory researcher and PhD candidate advised by Bojan Mohar and Ladislav Stacho. My interests include graph coloring, rainbow graph structures, and games on graphs. I also take great pride in teaching math to students of all levels.

Education

PhD., Mathematics, Simon Fraser University, GPA: 4.17/4.33 — Sep 2020 — Fall 2022
- Thesis: *Graph coloring with additional restrictions*, advised by Bojan Mohar and Ladislav Stacho

MSc., Mathematics, Simon Fraser University, GPA: 4.13/4.33 — Sep 2018 — Aug 2020
- Thesis: *Cops and robbers on Cayley graphs and embedded graphs*, advised by Ladislav Stacho

B.S., Mathematics, University of Kansas, GPA: 3.82/4.00 — 2012 — 2016

Employment

Research Assistant at Simon Fraser University — **Jan 2019 — Present**
- Worked with Bojan Mohar and Ladislav Stacho carrying out graph theoretic research and writing papers

Teaching Assistant at Simon Fraser University — **Sep 2018 — Present**
- Tutored in quantitative, algebra, and applied calculus workshops, consistently receive high reviews
- Led weekly tutorials for Math 342 (Number Theory), Math 348 (Probability), and Math 343 (Discrete Mathematics)

Cambridge teacher of Math and Physics at Zhengzhou No. 47 High School — **Aug 2016 - Jun 2018**
- Led classes as a primary instructor and prepared students to take Cambridge exams in Math (IGCSE and A-Level) and Physics (IGCSE)

Selected publications and preprints

1. Bradshaw, P. Graph colorings with restricted bicolored subgraphs: II. The graph coloring game. *Published in JGT.*

   This paper proves that given graphs G and H of game coloring number at most t, the game chromatic number of the Cartesian product $G\square H$ is less than t^5, answering a question of X. Zhu. The main tool for this new result is a generalization of a method of Dinski and Zhu that shows that the game chromatic number of a graph G is at most $a(G)(a(G)+1)$, where $a(G)$ is the acyclic chromatic number of G.

2. Bradshaw, P., Hosseini, S. A., Mohar, B. & Stacho, L. Cops and robbers on graphs of high girth. *Accepted to JGT.*

   This paper shows that graphs of girth g and minimum degree δ have cop number $\Omega\left(g^{-1}(\delta-1)^{\frac{1}{4}g}\right)$, improving the classical lower bound $\Omega\left((\delta-1)^{\frac{1}{8}g}\right)$ of Frankl from 1987. Additionally, using Ramanujan graphs, spectral graph theoretic tools, and a probabilistic strategy, the paper shows that this exponential factor cannot be increased past $\frac{3}{8}$.

3. Bradshaw, P., Hosseini, S. A. & Turcotte, J. Cops and robbers on directed and undirected abelian Cayley graphs. *Published in European J. Comb.*

   This paper shows that the cop number of a Cayley graph on an abelian group of n elements is less than approximately $0.9424\sqrt{n}$, proving that Meyniel's conjecture holds for abelian Cayley graphs. Furthermore, the paper uses a construction based on finite fields to show that this upper bound is tight within a constant factor of less than 2.

4. Bradshaw, P. On the hat guessing number of a planar graph class. *Published in JCTB.*

   This paper proves that the hat guessing number of outerplanar graphs is bounded using a new partitioning lemma related to a Turán hypergraph density problem. The paper gives the first known upper bound for the hat guessing number of a large topologically defined graph class.

Refereed conference talks

- A rainbow connectivity threshold in random graph families, *Eurocomb 2021*
- Flexible list colorings in graphs with special degeneracy conditions, *ISAAC 2020*

Community activities

Seminar talks

- A small step toward bipartite list coloring *SFU Discrete Math Seminar* 2022
- Graph coloring and the Lovász Local Lemma *SSC 2022, Melbourne University* 2022
- A rainbow connectivity threshold in random graph families, *CMS Summer Meeting, SFU Discrete Math Seminar* 2021
- Flexible list colorings in graphs with special degeneracy conditions, *SFU Discrete Math Seminar* 2020
- Graphs with large cop number, *SFU Discrete Math Seminar, UBC Discrete Math Seminar* 2019
- A proof of Meyniel's conjecture for abelian Cayley graphs, *SFU Discrete Math Seminar, CanaDAM, CMS Summer Meeting* 2019

Journal and conference referee J. Graph Theory, Random Structures & Alg., Elec. J. Comb., Disc. Applied Math., SIDMA, European J. Comb, Eurocomb 2021

Awards

- Department of Mathematics graduate scholarship - $3800 2021
- Travel and research award - $700 2021
- Travel and research award - $880 2020
- Graduate fellowship - $6500 2019
- Graduate entrance scholarship - $5000 2018

Graduate level classes and grades

- Graph Theory (A+)
- Combinatorics (A)
- Topological graph theory (A)
- Topology (A+)
- Number Theory (A+)
- Cryptography (A+)
- Real Analysis (A)
- Algebraic Geometry (A)

Language skills

- English (native USA)
- Spanish (proficient, IB 7/7)
- Mandarin (proficient, HSK 6/6)
- Cantonese (proficient, use daily)
- German (can read German math papers)