

## EDUCATION

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| PhD in Mathematics, University of Vermont (UVM), Burlington, VT, USA | May 2025 |
| Dissertation: <i>Odd Covers and Graph Saturation</i>                 |          |
| Advisor: Dr. Puck Rombach  |          |
| MSc in Mathematical Sciences, UVM                                    | May 2022 |
| BA in Mathematics and English, UVM                                   | Dec 2017 |

## RESEARCH

### Fields of interest

Combinatorics; Graph theory

### Publications & Preprints

*On odd covers of cliques and disjoint unions*, with A. Clifton, E. Culver, P. Frankl, J. Nie, K. Ozeki, P. Rombach, and M. Yin; *arXiv:2408.08598*, 2024.

*Tropical geometry of Rado matroids*, with R. Danner; *Discrete Math. Lett.*, 14:27–30, 2024.

*Trail Trap: a variant of Partizan Edge Geography*, with M. Carr, A. Clifton, S. G. Hartke, V. Iršič, N. Sieger, and R. Whitman; *arXiv:2405.05195*, 2024.

*A lower bound on the saturation number and a strengthening for triangle-free graphs*, with P. Rombach; *arXiv:2402.11387*, 2024.

*Node placement to maximize reliability of a communication network with application to satellite swarms*, with J. Bagrow, P. Rombach, and H. Ossareh; in 2023 IEEE SMC Conference Proceedings.

*Toughness of recursively partitionable graphs*, with B. Du Preez, K. E. Perry, and P. Rombach; *Theory Appl. Graphs*, 10(2), Article 4, 2023.

*Path odd-covers of graphs*, with S. Borgwardt, E. Culver, B. Frederickson, P. Rombach, and Y. Yoo; *arXiv:2306.06487*, 2023.

*Odd covers of graphs*, with A. Clifton, E. Culver, J. Nie, J. O'Neill, P. Rombach, and M. Yin; *J. Graph Theory*, 104:420–439, 2023.

*On the last new vertex visited by a random walk in a directed graph*, with P. Horn and P. Rombach; *Discrete Math. Lett.*, 11:96–98, 2023.

*Subgraph complementation and minimum rank*, with C. Purcell and P. Rombach; *Electr. J. Comb.*, 29(1), 2022.

### Technical reports

*One Algorithm to Rule Them All*, with N. Brown, N. Chicoine, B. Emerick, A. Emmanuel, C. Hammond, K. Oluwasegun, O. Pomerenk, L. Schneegans, and H. Taboe. *Mathematics in Industry Reports* (submitted April 2025).

## Manuscripts in progress

*A lower bound on rainbow saturation*, with N. Bushaw, D. P. Johnston, and P. Rombach.

*Fixing and distinguishing numbers for trees*, with P. Dankelmann, I. Harris, P. Horn, K. E. Perry, and E. Rivett-Carnac.

*Saturation numbers for caterpillars and other trees*, CB.

*Vertex addition to a ball graph with application to reliability and area coverage for autonomous swarms*, with J. Bagrow, P. Rombach, and H. Ossareh.

## RESEARCH ASSISTANTSHIPS & FELLOWSHIPS

Vermont Space Grant Consortium Graduate Fellowship, UVM Jul 2024 – Jun 2025

Graduate Research Assistant, UVM Aug 2022 – Jan 2024

NASA EPSCoR Award

Supervisor: Dr. Hamid Ossareh

## TEACHING

Graduate Primary Instructor, UVM

Math1212: Fundamentals of Calculus I Fall 2019, 2020, 2021

Math1077: Exploring Modern Mathematics Spring 2020, 2021, 2024

Teaching Assistant 2017, 2018

Johns Hopkins Center for Talented Youth, Bristol, RI

Course: Paradoxes and Infinities

Instructor of Conversational English 2018 – 2019

Collèges Le Grand Beauregard and La Coutancière, La Chapelle sur Erdre, France

Tutor 2016 – 2018

UVM Tutoring Center, Burlington, VT

## MENTORING

Graduate Mentor, Polymath Jr. REU 2024

Project group leader, Graduate Research Workshop in Combinatorics

Path odd-covers of graphs 2022

Odd covers of graphs 2021

## AWARDS

Nam Sang Kil Scholarship in Mathematics, UVM 2023

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| Graduate Teaching Assistant of the Year, Lecture Instruction Category, UVM | 2021       |
| John F. Kenney Award, Excellence in mathematics, UVM                       | 2021       |
| AMS Joint Mathematics Meetings Graduate Student Travel Grant               | 2021, 2024 |
| AMS Graduate Student Sectional Travel Grant                                | 2023       |
| UVM Graduate College Mini-Grant  | 2022, 2023 |
| The Phi Beta Kappa Society, Alpha of Vermont                               | 2017       |

## SERVICE

|   |                |
|---|----------------|
| Graduate Student Council  | 2022 – present |
| College of Engineering and Mathematical Sciences, UVM                                       |                |
| Math Outreach   |                |
| Lectured at Governor’s Institutes of Vermont and MathCounts NW VT Chapter Competition       | 2023           |
| Prepared lessons on combinatorics for high school students (materials available on website) |                |

## ORGANIZING

|  |      |
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| Joint Mathematics Meetings, Seattle, WA  | 2025 |
| <i>AMS Special Session on Graphs, Hypergraphs, and Extremal Combinatorics (Co-organizer)</i> |      |
| AMS Spring Central Sectional Meeting, Cincinnati, OH   | 2023 |
| <i>Special Session on Extremal Graph Theory (Co-organizer)</i>                               |      |
| UVM Combinatorics Seminar, Burlington, VT (Co-organizer)                                     | 2023 |

## WORKSHOPS

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|---|------------------|
| 15th Emléktábla Workshop – Extremal combinatorics group         | 2024             |
| SIAM Mathematical Problems in Industry Workshop                 | 2024             |
| Graduate Research Workshop in Combinatorics                     | 2021, 2022       |
| Masamu Advanced Study Institute and Workshops                   | 2020, 2021, 2023 |
| of the <i>Southern Africa Mathematical Sciences Association</i> |                  |

## SELECTED TALKS\*

|  |      |
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| Joint Mathematics Meetings (invited), Seattle, WA  | 2025 |
| in AMS Special Sessions on <i>Coloring Problems in Combinatorics and Random Walks on Graphs and Related Parameters</i> |      |

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\*A full list of talks is available at <https://www.uvm.edu/~cjbuchan/TalksList.pdf>

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| Summit280, Budapest, Hungary  | 2024 |
| NY Combinatorics Seminar (invited), CUNY Graduate Center, New York, NY  | 2024 |
| Joint Mathematics Meetings (invited), San Francisco, CA<br>in AMS Special Session on <i>Recent Trends in Graph Theory</i> | 2024 |
| IEEE Int. Conf. on Systems, Man, and Cybernetics, Honolulu, HI  | 2023 |
| Dartmouth Combinatorics Seminar (invited), Dartmouth College, NH  | 2022 |

## GRADUATE COURSES

|  |             |
|--|-------------|
| Mathematical Sciences Research Institute (MSRI), Berkeley, CA<br>Random Graphs summer graduate school  | 2022        |
| Department of Mathematics & Statistics, UVM<br>Spectral graph theory, extremal graph theory, probabilistic combinatorics, matroids and polytopes, symmetric functions, analysis (functional, complex, measure), algebraic geometry, algebraic topology, abstract algebra | 2019 – 2023 |

## RELEVANT SKILLS

Coding: Python,  $\text{\LaTeX}$  and TikZ, HTML, SageMath

Languages: English (native), French (advanced)