

Rutger Campbell

Department of Combinatorics and Optimization
University of Waterloo, Canada

+1-(226)-606-3837
rtrcampb@uwaterloo.ca

Basic Information

Citizen of Canada and the Netherlands.

Employment

Research Associate, Department of Combinatorics and Optimization, **University of Waterloo**, Canada, Jan 2026–Present.

Postdoctoral Researcher, School of Computing, **KAIST**, Daejeon, South Korea, Sep–Dec 2025.

Senior Researcher, Discrete Mathematics Group, **Institute for Basic Science**, Daejeon, South Korea, Aug 2020–Aug 2025.

Postdoctoral Fellow, Department of Combinatorics and Optimization, **University of Waterloo**, Canada, May–Aug 2020.

Education

Ph.D. in Combinatorics and Optimization, University of Waterloo, May 2015–May 2020.

Disasters in Abstracting Combinatorial Properties of Linear Dependence, Advisor: Jim Geelen

Bachelor of Mathematics, University of Waterloo, Sep 2011–Apr 2015.

Pure Mathematics, Honours

Combinatorics and Optimization, Honours

Supervision

Jemin Hwang (Undergraduate Research Assistant), June 2025–present (co-supervising).

Benjamin Duhamel (Undergraduate Research Assistant), April–Aug 2024 (co-supervised).

Hector Buffière (Undergraduate Research Assistant), April–Aug 2023 (co-supervised).

Timothy Wahyudi (Undergraduate Research Assistant), May–Aug 2020 (co-supervised).

David Jiang (Undergraduate Research Assistant), May–Aug 2018 (sub-supervised).

Publications

Journal articles

(with J. Geelen, M. E. Kroeker) **Average plane-size in complex-representable matroids**, 21 pages, *Combinatorica* 45, 53 (2025).

(with J. P. Gollin, K. Hendrey, R. Steiner) **Optimal bounds for zero-sum cycles. I. Odd order**, 8 pages, *J. Combin. Theory Ser. B* 173 (2025), 246–256.

(with J. P. Gollin, K. Hendrey, T. Lesgourgues, B. Mohar, Y. Tamitegama, J. Tan, D. Wood) **Clustered Colouring of Graph Products**, 22 pages, *Electron. J. Combin.* 32 (2025).

(with F. Hörsch, and B. Moore) **Decompositions into two linear forests of bounded lengths**, *Discrete Math.* 347 (2024), 113962.

(with K. Clinch, M. Distel, J. P. Gollin, K. Hendrey, R. Hickingbotham, T. Huynh, F. Illingworth, Y. Tamitegama, J. Tan, and D. Wood) **Product structure of graph classes with bounded treewidth**, *Combin., Prob. and Comp.* 33 (2023), 351–376.

(with M. Distel, J. P. Gollin, D. Harvey, K. Hendrey, R. Hickingbotham, B. Mohar, and D. Wood) **Graphs of linear growth have bounded treewidth**, *Electron. J. Combin.* 30 (2023), Paper 3.1, 12pp.

(with J. Geelen) **On the complex-representable excluded minors for real-representability**, *J. Combin. Theory Ser. B* 143 (2020), 16–28.

(with K. Grace, J. Oxley, and G. Whittle) **On density-critical matroids**, *Electron. J. Combin.* 27 (2020), Paper 2.35, 16pp.

(with N. Brettell, D. Chun, K. Grace, and G. Whittle) **On a generalisation of spikes**, SIAM J. on Discrete Math. 33 (2019), 358–372.

Conference articles

(with J. P. Gollin, M. Hatzel, O. Kwon, R. McCarty, S. Oum, S. Wiederrecht) **The Erdős-Pósa property for circle graphs as vertex-minors**, 31 pages, ACM-SIAM Symposium On Discrete Algorithms (SODA26), arxiv: 2506.03973.

(with B. Guillon, M. Kanté, E. Kim, and S. Oum) **Recognisability equals definability for matroids of bounded path-width representable over a finite field**, 30 pages, Fortieth Annual ACM/IEEE Symposium on Logic in Computer Science (LICS).

(with B. Guillon, M. M. Kanté, E. J. Kim, N. Köhler) **CMSO-transducing tree-like graph decompositions**, 28 pages, 42nd International Symposium on Theoretical Aspects of Computer Science (STACS 2025).

Preprints

(with N. Köhler) **The role of counting quantifiers in laminar set systems**, 19 pages, arxiv: 2512.02617.

(with H. Buffière, K. Hendrey, S. Oum) **Blind cop-width and balanced minors of graphs**, 28 pages, arxiv: 2511.22278.

(with D. Kim, J. van der Pol) **Turán’s theorem for Dowling geometries**, 18 pages, arxiv: 2508.20843.

(with J. Davies, R. Hickingbotham) **Binary matroids and degree-boundedness for pivot-minors**, 11 pages, arxiv: 2507.23182.

(with K. Hendrey, B. Lund, C. Tompkins) **Metric graphs of negative type**, 5 pages, arxiv: 2501.07098.

(with J. Davies, M. Distel, B. Frederickson, J. P. Gollin, K. Hendrey, R. Hickingbotham, S. Wiederrecht, D. Wood, L. Yepremyan) **Treewidth, hadwiger number, and induced minors**, 26 pages, arxiv: 2410.19295.

(with M. E. Kroeker, B. Lund) **Characterizing real-representable matroids with large average hyperplane-size**, 17 pages, arxiv: 2410.05513.

Dense $PG(n - 1, 2)$ -free binary matroids, 11 pages, arxiv: 1605.06546.

External Talks

CMSO-transducing tree-like graph decompositions, Workshop on Logic, Graphs, and Algorithms; Vienna, Austria, June 2025.

MSO-transducing tree-like graph decompositions, Bertinoro Workshop on Algorithms and Graphs, Italy, October 2025.

Recognizability equals definability for finitely representable matroids with bounded path-width, Logic in Computer Science, Singapore, June 2025.

Recognizability and definability for set systems, Canadian Discrete and Algorithmic Mathematics Conference, Ottawa, May 2025.

Counting well-quasi-ordered down-sets, International Workshop on Discrete Mathematics and Algorithms, Okinawa, Japan, March 2025.

Well-quasi-ordered down-sets in combinatorial posets, Canadian Discrete and Algorithmic Mathematics Conference, University of Winnipeg, June 2023.

Counting wqo down-sets; 8th Czech-Slovak International Symposium on Graph Theory, Combinatorics, Algorithms and Applications; Prague, July 2022.

Representability of orientable matroids, American Mathematical Society Sectional Meeting, Binghamton University, New York State, Oct 2019.

Hajós construction for digraphs, Waterloo Coloring Conference, University of Waterloo, Sep 2019.

Representability of orientable matroids, Oxley65, Louisiana State University, Baton Rouge, July 2019.

Complexity of matroid representability, Canadian Discrete and Algorithmic Mathematics Conference, Simon Fraser University, Vancouver, May 2019.

Representable orientable matroids that are not real-representable; Combinatorial Geometries: matroids, oriented matroids, and applications; Centre International de Recontres Mathématiques, Marseille, Sep 2018.

On excluded minors for real-representability, International Workshop on Structure in Graphs and Matroids, University of Waterloo, July 2017.

On excluded minors for real-representability, Canadian Discrete and Algorithmic Mathematics Conference, Toronto Metropolitan University, June 2017.

Dense $PG(t - 1, 2)$ -free binary matroids, International Workshop on Structure in Graphs and Matroids, Eindhoven University of Technology, Netherlands, July 2016.

Dense triangle-free binary matroids, La Vacquerie Matroid Workshop, La Vacquerie, France, July 2015.

Denser triangle-free binary matroids, International Workshop on Structure in Graphs and Matroids, Princeton University, New Jersey, July 2014.

Teaching

Courses

Instructor and Course Coordinator, **CO 331 (Coding Theory)**, University of Waterloo, Jan–Apr 2019.

Teaching assistant, **CO 331 (Coding Theory)**, University of Waterloo, Jan–Apr 2017.

Teaching assistant, **CO 331 (Coding Theory)**, University of Waterloo, Jan–Apr 2016.

Internal Talks and Lectures

Well-quasi-ordered downwards-closed subsets, Matroid Union Seminar, online, Dec 2021.

Oriented matroids, Discrete Math Seminar, Institute for Basic Science, Daejeon, April 2021.

Disasters in Abstracting Combinatorial Properties of Linear Dependence, Discrete Math Seminar, Institute for Basic Science, Daejeon, Sep 2020.

Matroids doing algebra, Matroid Union Seminar, online, June 2020.

Axiomatization of matroids, Graduate Student Research Seminar, University of Waterloo, Nov 2019.

Schrijver–Seymour conjecture, Arithmetic and Geometric Combinatorics (Course), University of Waterloo, Feb 2019.

Representable oriented matroids that are not real-representable, Graph and Matroid Seminar, University of Waterloo, Oct 2018.

Representability of matroids, Graph and Matroid Seminar, University of Waterloo, May 2018.

Introduction to gammoids, Graph and Matroid Seminar, University of Waterloo, Feb 2018.

Fair representation by independent sets, Topological Methods (Course), University of Waterloo, Mar 2017.

On excluded minors for real-representability, Graph and Matroid Seminar, University of Waterloo, Dec 2016.

Dense $PG(t - 1, 2)$ -free binary matroids, Graph and Matroid Seminar, University of Waterloo, Apr 2016.

Factors of automorphy and Inoue surfaces, Geometry Working Seminar, University of Waterloo, Dec 2014.

Dense triangle-free binary geometries, Combinatorics and Optimization Undergraduate Research Assistant Seminar, University of Waterloo, Jul 2014.

T-Linked matchings, Combinatorics and Optimization Undergraduate Research Assistant Seminar, University of Waterloo, Aug 2013.

Professional Development

Seminars

Graduate Teaching Seminar, Faculty of Mathematics, University of Waterloo, Jan–Apr 2019.

Workshops

Teaching Methods, Centre for Teaching Excellence, University of Waterloo, Dec 2018.

Interactive Lectures, Centre for Teaching Excellence, University of Waterloo, Dec 2018.

Effective Lesson Plans, Centre for Teaching Excellence, University of Waterloo, Dec 2018.

Professional Service

Co-organizer, Colourings and decompositions minisymposium, CanaDAM, 2025.

Co-organizer, Workshop on (Mostly) Matroids, 2024.

Co-organizer, Matroid (Post)Graduate (Pre)Meeting, 2024.

Co-organizer, Vertex-minor workshop, 2023.

Co-organizer, DIMAG Internal Workshop 2021.

Editor, Matroid Union.

Awards

NSERC Alexander Graham Bell Canada Graduate Scholarship – Doctoral, Natural Sciences and Engineering Research Council of Canada, 2016–2019.

NSERC Alexander Graham Bell Canada Graduate Scholarship – Master’s, Natural Sciences and Engineering Research Council of Canada, 2015–2016.

President’s Graduate Scholarship, University of Waterloo, 2015–2019.

Jessie W. H. Zou Award, Faculty of Mathematics, University of Waterloo, 2015.

Combinatorics and Optimization Book Prize, Department of Combinatorics and Optimization, University of Waterloo, 2015.

NSERC Undergraduate Student Research Award, Natural Sciences and Engineering Research Council of Canada, 2014–2015.

Ronald G. Scoins National Scholarship, Faculty of Mathematics, University of Waterloo, 2011–2015.

Other Research Experience

Undergraduate Researcher, Department of Pure Mathematics, University of Waterloo, Sep–Dec 2014. *Research in complex geometry with Ruxandra Moraru.*

Undergraduate Researcher, Department of Combinatorics and Optimization, University of Waterloo, May–Aug 2014. *Research in matroid theory with Jim Geelen and Peter Nelson.*

Undergraduate Researcher, Department of Combinatorics and Optimization, University of Waterloo, May–Aug 2013. *Research in finite geometry with Jim Geelen and Peter Nelson.*

References

Jim Geelen Professor, University of Waterloo, Canada
Email: Jim.Geelen@uwaterloo.ca
Website: <https://www.math.uwaterloo.ca/~jfgeelen/>

Dillon Mayhew Email: D.Mayhew@leeds.ac.uk
Website: <https://dillon128.github.io/index.html>

Peter Nelson Professor, University of Waterloo, Canada
Email: apnelson@uwaterloo.ca
Website: <https://www.math.uwaterloo.ca/~apnelson/>

Sang-il Oum Chief Investigator, Institute for Basic Science, South Korea
Email: sangil@ibs.re.kr
Phone: +82-42-878-9200
Website: <https://dimag.ibs.re.kr/home/sangil/>

James Oxley Professor, Louisiana State University, USA
Email: oxley@math.LSU.edu
Website: <https://www.math.lsu.edu/~oxley/>