Lucas Mol

Curriculum Vitae

Personal Details

Citizenship Canadian

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Education

2012–2016 Ph.D. in Mathematics, Dalhousie University, Halifax, NS

Thesis: On connectedness and graph polynomials, DalSpace

Supervisor: Jason I. Brown

2011–2012 M.Sc. in Mathematics, Dalhousie University, Halifax, NS

Thesis: On the uniformity dimension of hypergraphs, DalSpace

Supervisor: Jason I. Brown

2007–2011 B.Sc. Honours in Mathematics, Mount Allison University, Sackville, NB

Experience

- 2021–Present **Assistant Teaching Professor** (tenure-track), *Department of Mathematics and Statistics*, Thompson Rivers University, Kamloops, BC
 - 2020–2021 **Assistant Professor** (one-year term), *Department of Mathematics and Statistics*, University of Winnipeg, Winnipeg, MB
 - 2019–2020 **Senior Research Associate**, *Department of Mathematics and Statistics*, University of Winnipeg, Winnipeg, MB
 - Supervisors: James D. Currie, Ortrud R. Oellermann, and Narad Rampersad
 - 2016–2019 **Postdoctoral Fellow**, *Department of Mathematics and Statistics*, University of Winnipeg, Winnipeg, MB

Supervisors: James D. Currie, Ortrud R. Oellermann, and Narad Rampersad

Adjunct Appointments

2024–2027 **Adjunct Assistant Professor** (three-year term), *Department of Mathematics and Statistics*, University of Victoria, Victoria, BC

2020–2023 **Adjunct Professor** (three-year term), *Department of Applied Computer Science*, University of Winnipeg, Winnipeg, MB

Selected Grants, Scholarships, and Awards

- 2021–2026 **NSERC Discovery Grant**, \$90,000 (\$18,000/year)
 - Title: Repetitions in Words Branching out from Dejean's Theorem
 - 2021 NSERC Discovery Launch Supplement, \$12,500
- 2012–2015 **NSERC Alexander Graham Bell Canada Graduate Scholarship** (Doctoral), \$105,000 (\$35,000/year)
- 2012–2014 Dalhousie University President's Award, \$10,000 (\$5,000/year)
- 2011–2012 NSERC Canada Graduate Scholarship (Master's), \$17,500
 - 2011 Governor General's Silver Medal, Mount Allison University

Teaching

Summary

2021-Present Thompson Rivers University, Taught 24 sections of 12 distinct courses

Taught first-year courses in differential calculus, integral calculus, linear algebra, math for business, and discrete mathematics, a second-year course in discrete mathematics, third-year courses in probability and stochastic processes, a fourth-year course in graph theory, and directed studies courses in game theory and words/automata.

2017–2021 University of Winnipeg, Taught 14 sections of 9 distinct courses

Taught first-year courses in differential calculus, integral calculus, math for business, linear algebra, and discrete mathematics, and second-year courses in intermediate calculus and cryptography.

2013–2016 **Dalhousie University**, *Taught 6 sections of 2 distinct courses*

Taught first-year courses in integral calculus and math for business.

Wherever available, student evaluations are accessible by clicking the course number.

Thompson Rivers University

Winter 2025 MATH 2700: Discrete Mathematics 2

MATH 3030: Introduction to Stochastic Processes

MATH 4980: Directed Studies in Mathematics (Words and Automata)

Fall 2024 MATH 1300: Linear Algebra for Engineers

MATH 1240: Discrete Mathematics 1

MATH 3020: Introduction to Probability

Winter 2024 MATH 1240: Calculus 2

MATH 1240: Calculus 2

MATH 1700: Discrete Mathematics 1

Fall 2023 MATH 1170: Calculus for Business and Economics

MATH 1700: Discrete Mathematics 1

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Winter 2023 MATH 1140: Calculus 1
              MATH 1700: Discrete Mathematics 1
              MATH 3030: Introduction to Stochastic Processes
              MATH 4980: Directed Studies in Mathematics (Game Theory)
    Fall 2022 MATH 1140: Calculus 1
              MATH 1170: Calculus for Business and Economics
              MATH 3020: Introduction to Probability
 Winter 2022 MATH 1070: Mathematics for Business and Economics
              MATH 1170: Calculus for Business and Economics
              MATH 4430: Introduction to Graph Theory
    Fall 2021 MATH 1070: Mathematics for Business and Economics
              MATH 1140: Calculus 1
              MATH 1170: Calculus for Business and Economics
              University of Winnipeg
 Winter 2021 MATH-1104: Introduction to Calculus II
              MATH-1301: Applied Mathematics for Business and Administration
              MATH-2202: Cryptography and Other Applications of Algebra
    Fall 2020 MATH-1201: Linear Algebra I
              MATH-1301: Applied Mathematics for Business and Administration
              MATH-2105: Intermediate Calculus I
 Winter 2020 MATH-1103: Introduction to Calculus I
              MATH-1301: Applied Mathematics for Business and Administration (two sections)
              Note: There were no student evaluations university-wide in Winter 2020.
 Winter 2019 MATH-0042: Mathematics Access II
    Fall 2018 MATH-1102: Basic Calculus
 Winter 2018 MATH-1103: Introduction to Calculus I
    Fall 2017 MATH-1401: Discrete Mathematics
 Winter 2017 MATH-1103: Introduction to Calculus I
              Dalhousie University
Summer 2016 MATH 1010: Differential and Integral Calculus II
 Winter 2016 MATH 1115: Mathematics For Commerce
    Fall 2015 MATH 1115: Mathematics For Commerce
Summer 2015 MATH 1115: Mathematics For Commerce
Summer 2014 MATH 1010: Differential and Integral Calculus II
    Fall 2013 MATH 1115: Mathematics For Commerce
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Teaching Assistantship

Dalhousie University

- Fall 2015 MATH 1280: Engineering Mathematics I
- Winter 2014 MATH 1290: Engineering Mathematics II
 - Fall 2013 MATH 1280: Engineering Mathematics I
- Winter 2013 MATH 1290: Engineering Mathematics II
 - Fall 2012 MATH 1280: Engineering Mathematics I
- Winter 2012 MATH 1290: Engineering Mathematics II
 - Fall 2011 MATH 1280: Engineering Mathematics I

Mount Allison University

- Winter 2011 MATH 1121: Calculus II
 - Fall 2010 MATH 1111: Calculus I
 - MATH 2211: Discrete Structures
- Winter 2010 MATH 1121: Calculus II
 - Fall 2009 MATH 1111: Calculus I
- Winter 2009 MATH 1121: Calculus II
 - Fall 2008 MATH 1111: Calculus I

Student Supervision

Summary

- Supervisor One undergraduate honours project and two undergraduate summer research projects.
- Co-supervisor One master's student and four undergraduate summer research projects.

University of Victoria

2024–Present **Co-supervisor**, *Jonathan Andrade*, Master's Thesis

Project Title: Extremal power-free words

Co-supervisor: James D. Currie

Thompson Rivers University

2023–2024 Supervisor, Jonathan Andrade, Undergraduate Summer Research Project and Honours

Project

Project Title: Avoiding additive powers in words

University of Winnipeg

- 2021 **Supervisor**, *Thomas Czyzowicz*, Undergraduate Summer Research Project
 - Project Title: The average order of dominating sets in graphs
- 2019 Co-supervisor, Matthew Murphy, Undergraduate Summer Research Project

Project Title: The threshold dimension of a graph

Co-supervisor: Ortrud Oellermann

2019 **Co-supervisor**, *Vibhav Oswal*, Undergradaduate Summer Research Project supported by a MITACS Globalink Scholarship

Project Title: Average connectivity of minimally k-connected graphs

Co-supervisor: Ortrud Oellermann

- 2018 Co-supervisor, Kristaps Balodis, Undergraduate Summer Research Project Project Title: The mean connected induced subgraph order of block graphs Co-supervisor: Ortrud Oellermann
- 2017 **Co-supervisor**, *Matthew Kroeker*, Undergraduate Summer Research Project supported by an NSERC USRA

Project Title: The mean connected induced subgraph order of cographs

Co-supervisor: Ortrud Oellermann

Publications

Names of students appear in orange.

- 29. J. D. Currie, L. Mol, N. Rampersad, and J. Shallit, Extending Dekking's construction of an infinite binary word avoiding abelian 4-powers, vSIAM Journal on Discrete Mathematics 38(4), 2913–2925 (2024). DOI arXiv
- 28. L. Mol, N. Rampersad, and J. Shallit, Dyck Words, Pattern Avoidance, and Automatic Sequences, *Communications in Mathematics* **33**(2) (2024), article no. 5. DOI arXiv
- 27. A. Baranwal, J. D. Currie, L. Mol, P. Ochem, N. Rampersad, and J. Shallit, Antisquares and critical exponents, *Discrete Mathematics and Theoretical Computer Science* **25**(2) (2023), article no. 11. DOI arXiv
- 26. L. Mol, M. J. H. Murphy, and O. R. Oellermann, The threshold dimension and irreducible graphs, *Discussiones Mathematicae Graph Theory* **43**(1) (2023), 195–210. DOI arXiv
- 25. R. M. Casablanca, P. Dankelmann, W. Goddard, L. Mol, and O. R. Oellermann, The maximum average connectivity among all orientations of a graph, *Journal of Combinatorial Optimization* **43** (2022), 543–570. DOI arXiv
- 24. L. Mol, O. R. Oellermann, and V. Oswal, On the average (edge-)connectivity of minimally k-(edge-)connected graphs, *Bulletin of the ICA* **94** (2022), 95–110. DOI arXiv
- 23. L. Mol and N. Rampersad, Lengths of extremal square-free ternary words, *Contributions to Discrete Mathematics* **16**(1) (2021), 8–19. DOI arXiv
- 22. J. D. Currie and L. Mol, The undirected repetition threshold and undirected pattern avoidance, *Theoretical Computer Science* **866** (2021), 56–69. DOI arXiv
- 21. B. Cameron and L. Mol, On the mean subtree order of graphs under edge addition, *Journal of Graph Theory* **96**(3) (2021), 403–413. DOI arXiv

- R. M. Casablanca, L. Mol, and O. R. Oellermann, Average connectivity of minimally 2-connected graphs and average edge-connectivity of minimally 2-edge-connected graphs, Discrete Applied Mathematics 289 (2021), 233–247. DOI arXiv
- 19. J. I. Brown, C. J. Colbourn, D. Cox, C. Graves, and L. Mol, Network reliability: Heading out on the highway, *Networks* **77**(1) (2021), 146–160. DOI
- 18. L. Mol, N. Rampersad, and J. Shallit, Extremal overlap-free words and extremal β -free words, *Electronic Journal of Combinatorics* **27**(4) (2020), article no. P4.42. DOI arXiv
- 17. L. Mol and N. Rampersad, The weak circular repetition threshold over large alphabets, RAIRO Theoretical Informatics and Applications **54** (2020), article no. 6. DOI arXiv
- L. Mol, M. J. H. Murphy, and O. R. Oellermann, The threshold dimension of a graph, Discrete Applied Mathematics 287 (2020), 118–133. DOI arXiv
- 15. J. I. Brown and L. Mol, On the roots of the subtree polynomial, *European Journal of Combinatorics* **89** (2020), article no. 103181. DOI arXiv
- J. D. Currie, L. Mol, and N. Rampersad, The repetition threshold for binary rich words, Discrete Mathematics and Theoretical Computer Science 22(1) (2020), article no. 6. DOI arXiv
- 13. J. D. Currie, L. Mol, and N. Rampersad, The number of threshold words on n letters grows exponentially for every $n \geq 27$, Journal of Integer Sequences 23(3) (2020), article no. 20.3.1. DOI arXiv
- 12. K. J. Balodis, M. E. Kroeker, L. Mol, and O. R. Oellermann, On the mean order of connected induced subgraphs of block graphs, *Australasian Journal of Combinatorics* **76**(1) (2020), 128–148. DOI arXiv
- 11. L. Mol, N. Rampersad, J. Shallit, and M. Stipulanti, Cobham's theorem and automaticity, *International Journal of Foundations of Computer Science* **30**(8) (2019), 1363–1379. DOI arXiv
- 10. L. Mol and O. R. Oellermann, Maximizing the mean subtree order, *Journal of Graph Theory*, **91**(4) (2019), 326–352. DOI arXiv
- 9. J. D. Currie, L. Mol, and N. Rampersad, Circular repetition thresholds on some small alphabets: Last cases of Gorbunova's conjecture, *Electronic Journal of Combinatorics* **26**(2) (2019), article no. P2.31. DOI arXiv
- 8. J. I. Brown, L. Mol, and O. R. Oellermann, On the roots of Wiener polynomials of graphs, *Discrete Mathematics* **341**(9) (2018), 2398–2408. DOI arXiv
- 7. J. D. Currie, L. Mol, and N. Rampersad, Avoidance bases for formulas with reversal, Theoretical Computer Science **738** (2018), 25–41. DOI arXiv

- M. E. Kroeker, L. Mol, and O. R. Oellermann, On the mean connected induced subgraph order of cographs, *Australasian Journal of Combinatorics* 71(1) (2018), 161–183. DOI arXiv
- 5. J. D. Currie, L. Mol, and N. Rampersad, On avoidability of formulas with reversal, *RAIRO Theoretical Informatics and Applications* **51** (2018), 181–189. DOI arXiv
- 4. J. I. Brown and L. Mol, The shape of node reliability, *Discrete Applied Mathematics* **238** (2018), 41–55. DOI arXiv
- 3. J. D. Currie, L. Mol, and N. Rampersad, A family of formulas with reversal of high avoidability index, *International Journal of Algebra and Computation* **27**(5) (2017), 477–494. DOI arXiv
- 2. J. I. Brown and L. Mol, On the roots of all-terminal reliability polynomials, *Discrete Mathematics* **340**(6) (2017), 1287–1299. DOI arXiv
- 1. J. I. Brown and L. Mol, On the roots of the node reliability polynomial, *Networks* **68**(3) (2016), 238–246. DOI arXiv

Conference Proceedings

- L. Mol, N. Rampersad, and J. Shallit, Dyck words, pattern avoidance, and automatic sequences, WORDS 2023: Proceedings of the 14th International Conference on Words, Lecture Notes in Computer Science 13899 (2023), 220–232. DOI arXiv
- 1. J. D. Currie and L. Mol, The undirected repetition threshold, WORDS 2019: Proceedings of the 12th International Conference on Words, Lecture Notes in Computer Science 11682 (2019), 145–158. DOI arXiv

Preprints Submitted for Publication

- 2. J. D. Currie, L. Mol, and J. Peltomäki The repetition threshold for ternary rich words, arXiv preprint, September 2024. arXiv
- 1. J. Andrade and L. Mol, Avoiding abelian and additive powers in rich words, arXiv preprint, August 2024. arXiv

Conference Talks

- 2023 **WORDS 2023**, *Dyck words, pattern avoidance, and automatic sequences*, Umeå Universitet, Umeå, Sweden, Slides
 - CanaDAM 2023, Avoiding additive powers in words, University of Winnipeg, Slides Coast Combinatorics Conference, Avoiding additive powers in words, Simon Fraser University, Slides
- 2022 **CMS Summer Meeting** (Graph Theory Session), *On connectivity of orientations of graphs*, Memorial University of Newfoundland, Slides

- 2021 CanaDAM 2021 (Average Graph Parameters Minisymposium), The mean subtree order of graphs under edge addition, online, Slides
- 2020 **CMS Winter Meeting** (Graph Theory Session), *The threshold dimension of a graph*, online, Slides
 - **Joint Mathematics Meetings** (AMS Special Session on Sequences, Words, and Automata), *The repetition threshold for binary rich words*, Denver, CO, Slides
- 2019 **WORDS 2019**, *The undirected repetition threshold*, Loughborough University, Loughborough, UK, Slides
 - **East Coast Combinatorics Conference**, *The threshold dimension of a graph*, St. Francis Xavier University, Slides
 - CanaDAM 2019 (Average Graph Parameters Minisymposium), The mean subtree order and the mean connected induced subgraph order, Simon Fraser University, Slides
 - **CanaDAM 2019** (Graph Polynomials Minisymposium), *The subtree polynomial*, Simon Fraser University, Slides
- 2018 Prairie Discrete Math Workshop, The circular repetition threshold for small alphabets, Brandon University, Slides
 - **SIAM Conference on Discrete Mathematics**, *Circular repetition thresholds for small alphabets*, University of Colorado, Denver, CO, Slides
 - **SIAM Conference on Discrete Mathematics** (Graph Polynomials Minisymposium), *On the roots of Wiener polynomials of graphs*, University of Colorado, Denver, CO, Slides
- 2017 CanaDAM 2017 (Average Graph Parameters Minisymposium), *Maximizing mean subtree order for classes of trees*, Ryerson University, Slides
 - **CanaDAM 2017** (Graph Polynomials Minisymposium), *Roots of all-terminal reliability and node reliability polynomials*, Ryerson University, Slides
- 2015 **East Coast Combinatorics Conference**, *Shape of the node reliability polynomial*, Mount Allison University
 - **CMS Summer Meeting**, Shape and roots of the node reliability polynomial, University of Prince Edward Island
- 2013 **CanaDAM 2013**, On the uniformity dimension of hypergraphs, Memorial University of Newfoundland

Seminar Talks

- 2024 **TRU Mathematics and Statistics Seminar**, *The repetition threshold for ternary rich words*, Thompson Rivers University, Slides
- 2023 **TRU Mathematics and Statistics Seminar**, *Dyck words, pattern avoidance, and automatic sequences*, Thompson Rivers University, Slides
 - **UTU Mathmematics Seminar**, *The repetition threshold for binary rich words*, University of Turku, Turku, Finland, Slides

TRU Mathematics and Statistics Seminar, *Avoiding additive powers in words*, Thompson Rivers University, Slides

Atlantic Graph Theory Seminar, *Avoiding additive powers in words*, Dalhousie University (online), Slides

- 2022 **CBU Mathematics Seminar**, *Square-free words: Theme and variations*, Cape Breton University, Slides
- 2021 **TRU Mathematics and Statistics Seminar**, *Square-free words: Theme and variations*, Thompson Rivers University, Slides
- 2020 **One World Combinatorics on Words Seminar**, Extremal square-free words and variations, online, Slides, Video
- 2019 **UWinnipeg Mathematics and Statistics Seminar**, *The repetition threshold for binary rich words*, University of Winnipeg, Slides
- 2017 **Atlantic Graph Theory Seminar**, *Maximizing the mean subtree order*, Dalhousie University
 - **UWinnipeg Mathematics and Statistics Seminar**, *Maximizing the mean subtree order*, University of Winnipeg
- 2016 **UWinnipeg Mathematics and Statistics Seminar**, *A family of patterns with reversal with interesting avoidance properties*, University of Winnipeg
- 2015 **Atlantic Graph Theory Seminar**, *The shape of the node reliability polynomial*, Dalhousie University
- 2014 **Atlantic Graph Theory Seminar**, *On independence polynomials of Cartesian product graphs*, Dalhousie University

Minisymposium Organization

2019 **CanaDAM 2019**, Average Graph Parameters Minisymposium (Parts I and II), Simon Fraser University

Co-organizer: Ortrud Oellermann

2017 **CanaDAM 2017**, Average Graph Parameters Minisymposium, Ryerson University Co-organizer: Ortrud Oellermann

Journal Review Activities

The number of articles reviewed for each journal/conference below is indicated in parentheses.

Advances in Applied Mathematics (1)

Ars Combinatoria (2)

Combinatorial Theory (1)

Computability (1)

Discrete Applied Mathematics (2)

Discrete Mathematics (3)

Discrete Mathematics and Theoretical Computer Science (2)

Electronic Journal of Combinatorics (1)

European Journal of Combinatorics (1)

Graphs and Combinatorics (2)

IEEE Transactions on Information Theory (1)

Journal of Combinatorial Theory, Series B (1)

Journal of Combinatorics (1)

Journal of Graph Theory (4)

Journal of Integer Sequences (1)

Networks (6)

Theoretical Computer Science (1)

WORDS 2019 Conference (2)

Other Review Activities

Informal reviewer for the book *The Logical Approach to Automatic Sequences: Exploring Combinatorics on Words with Walnut* by Jeffrey Shallit

Mathematical Reviews (4)

External Reviewer for NSERC Discovery Grant (2)

Committee Memberships

Thompson Rivers University

2023-Present Science Social and Culture Committee, Faculty of Science

2022-Present Recruitment and Retention Committee, Department of Mathematics and Statistics

2021-Present Curriculum Committee, Department of Mathematics and Statistics

University of Winnipeg

2020–2021 **Seminar Committee**, Department of Mathematics and Statistics

2020–2021 **Curriculum Committee**, Department of Mathematics and Statistics

Dalhousie University

2016 First Year Calculus Committee, Department of Mathematics and Statistics

Volunteer and Mathematical Outreach Activities

2022–2024 **Co-organizer**, *BC Secondary School Math Contest*, Thompson Rivers University Co-organizers: Shirin Boroushaki and Suzanne Feldberg

2021–2023 **Volunteer Tutor**, *Math Help Centre*, Thompson Rivers University Volunteered 1–2 hours per week.

- 2018–2020 **Supervisor**, *Archimedes Math Schools*, Winnipeg, MB Supervised a team of 8–10 teachers at an after-school math program for children in grades 4–9 (approximately 100 students per year).
- 2014–2016 Workshop facilitator and member of presentation team, Nova Scotia Math Circles, Dalhousie University

 Gave enrichment presentations to students in grades 1–12 in schools across Nova Scotia (approximately 10 high school visits per year).

Outreach Talks

- 2023, 2024 Day of Arts and Sciences, Mathematical Party Problems, Thompson Rivers University
 - 2020 **Archimedes Math Schools Enrichment Talk**, *Graph Theory for Kids!*, Archimedes Math Schools
 - 2019 **UWinnipeg Retirement Lecture Series**, *The Monty Hall Problem: How to be as smart as a pigeon and win a car*, Portsmouth Retirement Residence
- 2015, 2016 **CMS Summer Camp**, Party in Königsberg BYOG (Bring Your Own Graphs), Dalhousie University

Professional Development

Workshops

- June 2024 **Participant**, Canadian Consortium of Science Equity Scholars (CCSES) Retreat, University of British Columbia (online)

 Attended sessions about equity, diversity, and inclusion in university science education
- June 2022 **Participant**, *CMS Summer Meeting*, Memorial University of Newfoundland Attended sessions on OERs and authentic applications in mathematics courses
- May 2019 **Participant**, First Year University Mathematics Across Canada: Time to Rethink our Curriculum? (FYMSiC Workshop), University of Alberta
- August 2018 Participant, Measuring the Connectedness of Graphs and Digraphs, Focussed Research Group at Banff International Research Station
 Other participants: Peter Dankelmann, Wayne Goddard, Rocio Moreno Casablanca, Ortrud Oellermann
 - June 2018 Participant, WestGrid Research Computing Summer School, University of Manitoba
 - April 2018 Participant, First Year University Mathematics Across Canada: Facts, Community and Vision (FYMSiC Workshop), Fields Institute

Seminars

- May 2024 **Co-organizer**, Authentic Applications and Common Misconceptions, Teachers' Session at the BC Secondary School Mathematics Contest, Thompson Rivers University Co-organizer: Shirin Boroushaki
- May 2023 **Co-organizer**, Al Squared: Artificial Intelligence and Academic Integrity, Teachers' Session at the BC Secondary School Mathematics Contest, Thompson Rivers University Co-organizer: Shirin Boroushaki

- 2022–2023 **Participant**, *Mathematics and Statistics Department Teaching Seminar*, Thompson Rivers University

 Attended all meetings of the seminar, and actively participated in discussions.
- May 2022 **Participant**, *Race and Inequality in Schools Systems*, University of British Columbia (online)
- May 2022 **Participant**, *Indigenous Math Education Symposium*, University of British Columbia (online)