

# THIAGO HOLLEBEN

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## EDUCATION

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**Dalhousie University, Canada**

*September 2022 - current*

PhD in Mathematics

Thesis title: The failure of Lefschetz properties from a combinatorial perspective.

Advisor: Sara Faridi

**Universidade Federal do Rio de Janeiro, Brazil**

*August 2019 - December 2021*

Master's degree in Mathematics

Dissertation title: [The log-concavity of chromatic polynomials](#).

Advisor: Seyed Hamid Hassanzadeh

**Universidade Federal do Rio de Janeiro, Brazil**

*July 2017 - 2020*

Bachelor in Applied Mathematics

**Universidade Federal do Rio de Janeiro, Brazil**

*March 2016 - July 2017 (interrupted)*

Major in Mathematics

## PAPERS ACCEPTED/PUBLISHED

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1. *Coinvariant stresses, Lefschetz properties and random complexes*. *Advances in Applied Mathematics*. [doi.org/10.1016/j.aam.2026.103097](https://doi.org/10.1016/j.aam.2026.103097). [arxiv:2501.12108](https://arxiv.org/abs/2501.12108)
2. *Roller Coaster Gorenstein algebras and Koszul Gorenstein algebras failing the weak Lefschetz property*. *Journal of Pure and Applied Algebra*. [doi.org/10.1016/j.jpaa.2026.108238](https://doi.org/10.1016/j.jpaa.2026.108238). With Lisa Nicklasson. [arxiv:2502.00155](https://arxiv.org/abs/2502.00155) (2026)
3. *Realizing resolutions of powers of extremal ideals*. *Combinatorial Theory*, to appear. With Trung Chau, Art Duval, Sara Faridi, Susan Morey, Liana Şega. [arxiv:2502.09585](https://arxiv.org/abs/2502.09585) (2026)
4. *Spheres and balls as independence complexes*. *Illinois Journal of Mathematics*, to appear. [arXiv:2503.18490](https://arxiv.org/abs/2503.18490). With Susan M. Cooper, Sara Faridi, Lisa Nicklasson, Adam Van Tuyl. (2025)
5. *Lefschetz properties of squarefree monomial ideals via Rees algebras*. *Journal of Algebra* 668, 572-599. [doi.org/10.1016/j.jalgebra.2024.12.030](https://doi.org/10.1016/j.jalgebra.2024.12.030) [arxiv:2404.12471](https://arxiv.org/abs/2404.12471). (2025)
6. *The weak Lefschetz property and mixed multiplicities of monomial ideals*. *J Algebr Comb* 60, 295-317. [doi.org/10.1007/s10801-024-01337-8](https://doi.org/10.1007/s10801-024-01337-8). [arxiv:2306.13274](https://arxiv.org/abs/2306.13274). (2024)
7. *The weak Lefschetz property of whiskered graphs*. *Lefschetz Properties*. SLP-WLP 2022. Springer INdAM Series, vol 59. Springer, Singapore. [doi.org/10.1007/978-981-97-3886-1\\_5](https://doi.org/10.1007/978-981-97-3886-1_5). With Susan M. Cooper, Sara Faridi, Lisa Nicklasson, Adam Van Tuyl. [arxiv:2306.04393](https://arxiv.org/abs/2306.04393) (2023)

## PREPRINTS

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1. *Weighted Veronese Rings via Convex Semigroups*. With Bek Chase, Luca Fiorindo, Emanuela Marangone, Thái Thành Nguyễn, Alexandra Seceleanu, Srishti Singh. [arXiv:2603.12441](https://arxiv.org/abs/2603.12441) (Submitted, 2026)
2. *Symmetric (co)homology polytopes*. With Torben Donzelmann, Martina Juhnke. [arXiv:2602.17253](https://arxiv.org/abs/2602.17253) (Submitted, 2026)

3. *Symbolic powers and integral closures via extremal ideals*. With Trung Chau, Art Duval, Sara Faridi, Susan Morey, Liana Şega. [arXiv:2602.05076](https://arxiv.org/abs/2602.05076) (Submitted, 2026)
4. *From points to complexes: a concept of unexpectedness for simplicial complexes*. [arXiv:2510.10884](https://arxiv.org/abs/2510.10884) (Submitted, 2025)
5. *Planar ternary graphs, flag spheres and Delannoy numbers*. With Margaret Bayer, Rick Danner, Marie Kramer, Yirong Yang. [arXiv:2509.21705](https://arxiv.org/abs/2509.21705) (Submitted, 2025)
6. *When are Morse resolutions polyhedral?*. With Louis Bu, Sara Faridi, Iresha Madduwe Hewalage, Hasan Mahmood, Dharm Veer, Kyle Wang and Scott Wesley. [arXiv:2505.08580](https://arxiv.org/abs/2505.08580) (Submitted, 2025)
7. *A probabilistic parking process and labeled IDLA*. With Pamela E. Harris, J. Carlos Martínez Mori, Amanda Priestley, Keith Sullivan and Per Wagenius [arxiv:2501.11718](https://arxiv.org/abs/2501.11718) (Submitted, 2025)
8. *Spherical complexes*. With Sara Faridi. [arXiv:2311.07727](https://arxiv.org/abs/2311.07727) (Submitted, 2025)

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## ACADEMIC ACHIEVEMENTS

### **Science Atlantic, Graduate Research Award 2025. Second place**

Award winners are selected based on the best presentations at Science Atlantic

### **Glendon McCormick Scholarship (2024)**

Dalhousie University scholarship aimed at general graduate students

### **AARMS Graduate Scholarship (2024,2025)**

Scholarship winners are selected on the basis of academic excellence, research potential, and regional representation within Atlantic Canada.

### **Jane Street Graduate Research Fellowship Award Honorable mention (2024)**

### **Professor Michael Edelstein Memorial Graduate Prize (2023)**

Annual prize awarded to a graduate student in shows great promise in the mathematical sciences.

### **Honours undergraduate research project (2018)**

Award for best undergraduate research project on the algebraic and combinatorial properties of Edge Ideals. Advisor: Seyed Hamid Hassanzadeh

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## INVITED TALKS

*The failure of Lefschetz properties from a combinatorial perspective*. Iowa State University, Discrete Mathematics seminar. April 2026.

*Graphs, spheres and graphs of spheres*. Iowa State University, Discrete Mathematics seminar. April 2026.

*The failure of Lefschetz properties from a combinatorial perspective*. North Carolina State University, Algebra and Combinatorics seminar. April 2026.

*From points to complexes: a concept of unexpectedness for simplicial complexes*. AMS Sectional meeting, New Orleans. October 2025

*Lefschetz properties and coinvariant stresses*. Mathematical Congress of the Americas Special session: Influences of Combinatorics and Topology in Commutative Algebra. Miami. July 2025

*Coinvariant stresses, Lefschetz properties and random complexes*. Oberseminar Algebra/diskr. Mathematik und angew. Algebra/Datenanalyse 2025, Osnabrück University. April 2025

*Positivity via commutative algebra*. Working ALgebra Knowledge Seminar (WALKS), Syracuse University. February 2025 (online)

*Simplicial complexes arising from integer programs.* Graduate Online Combinatorics Colloquium. October 2024. (online)

*Roller-Coaster, graphs and Perazzo forms.* Joint AMS-UMI meeting, Palermo. July 2024

*Lefschetz properties of monomial ideals via Rees algebras.* AMS Sectional meeting, San Francisco. May 2024

*Lefschetz properties of monomial ideals via Rees algebras.* COMA/NAG Graduate seminar, MSRI/SLMath. May 2024

*Rees algebras and Lefschetz properties of squarefree monomial ideals.* Commutative Algebra section: Canadian Mathematics Society winter meeting, Montreal. December 2023

*Rees algebras and Lefschetz properties of squarefree monomial ideals.* Stockholm Commutative Algebra seminar. October 2023 (online)

## CONTRIBUTED TALKS

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*From points to complexes: a concept of unexpectedness for simplicial complexes.* First Brazilian North-eastern Meeting on Commutative Algebra and Algebraic Geometry, Recife. November 2025

*Playing dominos in the correct dimension.* Science Atlantic - Mathematics, Statistics, and Computer Science Conference 2025. Cape Breton. October 2025

*Coinvariant stresses, Lefschetz properties and random complexes.* Workshop on weak and strong Lefschetz properties across mathematics. Sophus Lie Conference Center, Nordfjordeid, Norway. June 2025

*Coinvariant stresses, Lefschetz properties and random complexes.* Combinatorial Algebra meets Algebraic Combinatorics, Toronto. January 2025

*Lefschetz properties and analytic spread.* Combinatorics and Geometry in Ioannina. September 2024

*Lefschetz properties of squarefree monomial ideals via Rees algebras.* Lefschetz properties in Algebra, Geometry, Topology and Combinatorics, Poland. June 2024

*Powers of a simplex: Resolutions meet Partitions.* Combinatorial Algebra meets Algebraic Combinatorics, Montreal. January 2024

*The weak Lefschetz property and mixed multiplicities of monomial ideals.* Workshop on Lefschetz Properties in Algebra, Geometry, Topology and Combinatorics, Fields institute. May 2023

*The weak Lefschetz property and mixed multiplicities of squarefree monomial ideals.* International Centre for Theoretical Physics summer school, Italy. May 2023

*Homological invariants of ternary graphs.* Banff International Research Station workshop: Interactions Between Topological Combinatorics and Combinatorial Commutative Algebra. April 2023

*Homological invariants of ternary graphs.* Southern Regional Algebra Conference, Tulane university. March 2023 (online)

*A brief dictionary between Algebra and Combinatorics.* Semana de Integração Acadêmica da Universidade Federal do Rio de Janeiro, Brazil 2018 (in portuguese)

## TEACHING POSITIONS

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**Instructor of record: Differential and Integral Calculus II** (online) - Summer 2024/2025

**Instructor of record: Engineering Mathematics II** - Summer 2023/2024

**Lectures for algebraic topology class** - Fall 2024

Lectured, prepared assignments and marked assignments for the last month of the algebraic topology course for graduate and undergraduate students while the instructor was on leave.

**Teaching assistant: Applied Graph Theory** - Fall 2025/2026

**Teaching assistant: Matrix Theory and Linear Algebra I** - Fall 2025/2026, Fall 2024/2025, Winter 2023/2024, Fall 2023/2024

**Teaching assistant: Calculus for the Life and Social Sciences** - Fall 2023/2024, Winter 2022/2023

### At Federal University of Rio de Janeiro

**Teaching assistant: Algebra III (Galois Theory)** - Second semester of 2019

**Teaching assistant: Real analysis I** - Second semester of 2019

**Teaching assistant: Scientific computing I (Numerical Calculus I)** - Second semester of 2018

**Teaching assistant: Algebra II (Group and ring theory)** - First semester of 2019

**Teaching assistant: Algebra I (Modular arithmetic)** - Second semester 2019

**Teaching assistant: Calculus I** - First semester of 2019

## ORGANIZATION OF CONFERENCES AND SEMINARS

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**Co-organizer (with T. Chau, S. Faridi, L. Şega and D. Veer) of BIRS Workshop: Intersection of Commutative Algebra, Combinatorial Topology, and Discrete Geometry (2027, Chennai Mathematical Institute)**

**Co-founder (with D. Teixeira) of online directed reading program for portuguese speaking students: [Projeto Irerê](#) (2026)**

**Co-organizer (with D. Teixeira) of Dalhousie's Math and Stats graduate career day (2026)**

**Co-organizer (with T. Chau) of special session at JMM 2026: Combinatorial Aspects in Commutative Algebra (2026)**

**Co-organizer (with A. Dochtermann and S. Grate) of special session at 2025 Fall South-eastern AMS sectional meeting: Algebraic combinatorics and combinatorial commutative algebra (2025)**

**Co-organizer (with L. Carmona, B. Farah, C. Herkenhoff, G. Miranda, R. Peregrino, G. Radke, F. Sinnecker) of Week of Applied Mathematics and Mathematical Engineering (SEM<sup>2</sup>Ap) (2020, online)** More info on: [Youtube](#), [Instagram](#)