

40 St George St  
M5S 2E4 Toronto, ON  
Canada

✉ alex.kroitor@mail.utoronto.ca  
🌐 akroitor.github.io  
Citizenship: CA, US, UK

# Alexander Paul Kroitor

## Education

- 2024–Present **PhD in Mathematics**, *University of Toronto*, Toronto, Canada, (GPA: –).  
○ **Advisor:** Prof. Tristan Collins.
- 2022–2024 **M.Math. in Combinatorics and Optimization**, *University of Waterloo*, Waterloo, Canada, (GPA: 94/100).  
○ **Advisor:** Prof. Stephen Melczer.  
○ **Thesis:** Non-Generic Analytic Combinatorics in Several Variables and Lattice Path Asymptotics
- 2019–2022 **B.Sc. in Honours Mathematics**, *McGill University*, Montréal, Canada, (GPA: 3.90/4.00).  
○ Minor in Computer Science.  
○ Graduated with First Class Honours.

## Publications

1. Alexander Kroitor and Stephen Melczer. Completing the asymptotic classification of mostly symmetric short step walks in an orthant. *Accepted to Annals of Combinatorics*, 2024.
2. Alexander Kroitor. A first result in complex approximation. *Notes from the Margin*, XIV, 2023.

## Research Interests

- Geometry, analysis on surfaces, PDEs.
- Complex analysis in one and several variables.

## Conference Talks

- **Restricted Lattice Walks using Analytic Combinatorics in Several Variables**, *Canadian Mathematical Society Winter Meeting*, Dec. 3 2023

## Seminar Talks

- Nov 2024 **A New Proof of Narasimhan and Seshadri**, *Student Complex Geometry Seminar*
- Apr 2024 **Lattice Path Enumeration Through ACSV**, *Algebraic Enumeration Seminar*, April 11 2024
- Jan 2024 **Speaker**, *Waterloo Crystals Learning Seminar*
- Nov 2023 **Speaker**, *Waterloo Causal Set Theory Learning Seminar*
- Oct 2023 **Speaker**, *Waterloo Toric Varieties Learning Seminar*
- Sep 2023 **Speaker**, *Waterloo Chip Firing Learning Seminar*
- Jul 2023 **Speaker**, *Waterloo Bott and Tu Learning Seminar*
- Jun 2023 **Analytic Combinatorics via Fourier-like Integrals**, *Algebraic Enumeration Seminar*, June 29 2023
- May 2023 **Speaker**, *Waterloo Morse Theory Learning Seminar*
- Nov 2022 **Speaker**, *Waterloo Grad Seminar*

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## Outreach and Public Service

- Sep 2024 - **MGSA Social Committee Event Coordinator**, *University of Toronto*, Toronto  
Present Planned and ran events for the UofT graduate student body as a member of the Math Graduate Student Association (MGSA) council.
- May 2025 **OGMC Committee Member**, *University of Toronto*, Toronto  
On the organization committee for the 2025 rendition of the Ontario Graduate Mathematics Conference.
- Mar 2025 **Bird's Eye Conference Committee Member**, *University of Toronto*, Toronto  
On the organization committee for the 2025 rendition of the Bird's Eye Conference hosted at UofT.
- Jan 2025 **Directed Reading Program Mentor**, *University of Toronto*, Toronto  
Participating in the 2025 rendition of the UofT Directed Reading Program as a mentor, meeting with undergraduate students weekly.
- Jan 2025 **Math Mentorship Mentor**, *University of Toronto*, Toronto  
Participating in the 2025 rendition of the UofT Math Mentorship program, meeting weekly with paired high school students.
- Nov 2024 **Putnam Preparation Session Organizer**, *University of Toronto*, Toronto  
Ran a problem session for undergraduates taking the Putnam exam, a role usually reserved for faculty members.
- July 2023 **Teaching Assistant**, *Université Paris-Saclay*, Paris  
Ran an exercise session at the 2023 *Mathematical Summer in Paris*, a Summer school for advanced high school students.
- Feb 2023 **Speaker**, *Vanier College*, Montréal  
Gave a talk at Vanier College's 2023 *Science Week* to pre-university students.

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## Awards

- 2024–2029 **Faculty of Arts and Science Top Doctoral Fellowship**, *University of Toronto*, Toronto  
Merit-based fellowship awarded to two incoming doctoral students in the department of mathematics.
- Fall 2024 **Faculty of Arts and Science Doctoral Recruitment Award**, *University of Toronto*, Toronto
- Fall 2024 **Blyth Fellowship**, *University of Toronto*, Toronto
- Summer 2022 **Science Undergraduate Research Award**, *McGill University*, Montréal
- Summer 2022 **ISM Undergraduate Summer Scholarship**, *McGill University*, Montréal  
- declined
- Summer 2021 **ISM Undergraduate Summer Scholarship**, *McGill University*, Montréal

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## Research Projects

- Summer 2022 **The Weil Conjectures and the Local Zeta Function**, *McGill University*, Montréal, Canada  
In this research project, the local zeta function and its properties were studied. The Weil conjectures and related properties were reviewed. Funded by a McGill [SURA](#) grant.  
Supervised by Prof. Dmitry Jakobson, Dr. Mohammad Shirazi, and Prof. Paul Gauthier.
- Winter 2022 **Spectral Graph Theory and The Trace Formula**, *McGill University*, Montréal, Canada  
Reviewed spectral graph theory and their relationship with spectral geometry using Chung. Read through a set of notes on analysis on manifolds. Also studied Selberg's trace formula and related background from Chavel.  
Supervised by Prof. Dmitry Jakobson.
- Summer 2021 **A Review of Complex Approximation Theory in One Variable**, *McGill University*, Montréal, Canada  
In this research project, important approximation theorems of functions on the Riemann sphere were studied, particularly on compact and closed subsets. Multiple applications, such as the boundary behaviour of analytic functions and Birkhoff's universality theorem, were then examined. Funded by an [ISM](#) Undergraduate Summer Research Scholarship.  
Supervised by Prof. Dmitry Jakobson, Dr. Mohammad Shirazi, and Prof. Paul Gauthier.

Fall 2021 **Hyperbolic Geometry**, *McGill University*, Montréal, Canada

Defined and studied Riemannian metrics and surfaces. Studied hyperbolic geometry and the spectra of compact manifolds using Buser.

Supervised by Prof. Dmitry Jakobson.

## Teaching Experience

2024–2024 **Teaching Assistant**, *University of Toronto*, Toronto

- TA for introductory linear algebra class (1 term)

2022–2024 **Teaching Assistant**, *University of Waterloo*, Waterloo

- TA for introductory algebra class (1 term)
- TA for introductory combinatorics/graph theory class (4 terms)
  - Conducted tutorials, enhancing student engagement and understanding.
  - Acted in leadership role in Fall 2023, designing tutorial questions beyond course material.
  - Stepped in to deliver 6 lectures and teach during instructor's absence.
  - Frequently offered additional office hours to provide support for students.
- TA for introductory integral calculus class (1 term)
  - Conducted tutorials and graded assignments.

2021–2022 **Student Grader**, *McGill University*, Montréal

Evaluated and provided feedback on student assignments for 2 terms in an introductory algebra course.

## Summer Schools

Jun 2024 **MSRI Summer School on Special Geometric Structures and Analysis**, *St. Mary's College, California*

## Conferences

Dec 2023 **Canadian Mathematical Society Winter Meeting**, *Montréal*

June 2023 **Canadian Mathematical Society Summer Meeting**, *Ottawa*

Jan 2023 **Combinatorial Algebra meets Algebraic Combinatorics**, *University of Waterloo*

Dec 2022 **Canadian Mathematical Society Winter Meeting**, *Toronto*

June 2022 **Canadian Mathematical Society Summer Meeting**, *Saint-John's*

## Interests

I enjoy playing guitar and singing.

Choir **Waterloo University Choir**, *Sept 2022 - Present*

Choir **Orchestre Philharmonique et Choeur des Mélomanes**, *Sept 2021 - Sept 2022*