

# Louis-Roy Langevin

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## Education

### McGill University

2024–Present

*M.Sc. in Mathematics and Statistics (Thesis)*

Supervisor: Prof. Adrian Vetta

**Research Areas:** Algorithmic Game Theory, Combinatorial Optimization, Discrete Mathematics

**Coursework:** Combinatorial Optimization, Probabilistic Analysis of Algorithms, Advanced Probability Theory, Convex Optimization, Topological Methods in Combinatorics

### McGill University

2021–2024

*B.Sc. Honours Mathematics and Computer Science*

Graduated with **First Class Honours and Distinction**

**GPA:** 3.91 / 4.0

## Professional Experience

### AI trainer in mathematics for Meta (Incoming)

Creating and solving hard math problems to train AI models.

### AI trainer in mathematics for Scale AI (2024–Present)

Creating and solving hard math problems to train large language models.

## Research Experience

### Randomized Serial Dictatorship and Envy Bounds (2025)

Improved upper bounds on envy in randomized serial dictatorship mechanisms, closing the gap to known lower bounds. Manuscript in preparation.

### Popular Matchings in Preference Graphs (2025)

Investigated conditions for majority satisfaction in preference graphs. Co-authored paper accepted to WINE 2025 (preprint on arXiv).

### Elections in Metric Spaces (2025)

Derived new lower bounds on Condorcet-like guarantees under  $L_p$  norms. Manuscript in preparation.

### NP-Hardness of a Toothpick Rotation Problem (2025)

Proved NP-hardness via reduction from Planar 3-SAT; exploring special-case algorithms. Manuscript in preparation.

## Root Detection in Random Recursive Trees (2024)

Resolved an important root recovery problem in uniform attachment trees (preprint on arXiv).

## The Rejection Method: Efficiency Bounds (2024)

Analyzed probabilistic bounds on rejection sampling. Presented at MIT URTC 2025 (preprint on arXiv).

## Burning Number Conjecture on Graphs (2023)

Worked under Prof. Sergey Norin on cops and robbers and graph burning bounds.

## Subelliptic Operators & Legendre Functions (2022)

Studied zeros of linear combinations of Legendre functions (collaboration McGill / Dalhousie).

## Publications & Preprints

- *The Popular Dimension of Matchings*  
with Frank Connor, Ndiamé Ndiaye, Agnès Totschnig, Rohit Vasishta, & Adrian Vetta  
WINE 2025.
- *Optimally revealing bits for rejection sampling*  
with Alex Waese-Perlman  
MIT URTC 2025
- *Optimal root recovery for uniform attachment trees and  $d$ -regular growing trees*  
with Louigi Addario-Berry, Catherine Fontaine, Robin Khanfir, & Simone Têtu  
submitted to Annals of Applied probability.

## Teaching & Mentoring

- **Teaching Assistant**, McGill University
  - Algorithmic Game Theory (Fall 2025)
  - Calculus 2 (Winter 2025)
  - Calculus 1 (Fall 2024)
- **Course Assistant**, McGill University
  - Discrete Mathematics (Winter 2023)
  - Honours Analysis 1 (Fall 2022)
- **Research Mentor**, McGill Directed Reading Program (Winter 2025)  
Supervised two undergraduates in algorithmic game theory research.
- **Instructor**, McGill Programming Summer Camp (2024, 2025)  
Taught algorithms and data structures to high school students.
- **Founder & Educator**, *Cégepien* Online Platform  
Created online math preparation program; over 50 participants.  
Produced educational videos with 17,000+ followers (@le.cegepien).

## Service & Leadership

- Co-Organizer, 27th ISM Graduate Student Colloquium, May 2025.
- Presenter, WINE 2025; MIT URTC 2025; ISM Colloquium 2025.
- Presenter, Seminars in Undergraduate Mathematics in Montreal, 2025.
- Hackathon Judge, Code.jam() 2024 (2nd place winner in 2023).

## Scholarships & Grants

- Graduate Excellence Award, McGill University, 2024-25 and 2025-26.
- Kenneth Eade Fellowship, McGill University, 2025-26.
- Lin Graduate Award, McGill University, 2025.
- Undergraduate Student Research Award, NSERC, 2023 and 2024.
- Undergraduate Research Scholarship, ISM, 2022 and 2024.

## Honors & Awards

- First Class Honours with Distinction, McGill University, 2024.
- Team Canada Representative, International Physics Tournament, ETH Zürich, 2024.
- W.B. Putnam Competition — Top 600 in North America, 2023.
- Canadian Open Mathematics Challenge — 3rd National, 2020.
- Association Mathématique du Québec Contest — 1st National, 2019