

# Cesai Li

## Curriculum Vitae

### Contact Information

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**Office Address:** Department of Mathematics and Statistics  
Boston University  
Duan Family Center for Computing & Data Sciences Office 410  
665 Commonwealth Ave, Boston, MA, 02215

**E-mail:** cesai@bu.edu

**Website:** <https://cesail.github.io>

### Education

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**Ph.D. in Mathematics**, Boston University 2024–present

**Bachelor of Science in Mathematics**, University of British Columbia 2020–2024  
Graduated with Distinction

### Research Interests

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Mathematical physics, quantum field theory, factorization algebra, algebraic structures of quantum observables, applications of category theory and homological algebra in mathematical physics, quantum error correction, topological quantum error correction codes, graphical calculus (Penrose graphical notation, tensor networks, ZX calculus)

### Research Experience

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- **Preliminary Exam Reading Project**, Boston University 2025 Summer–Fall
  - Advisor: Brian Williams
  - Topic: *Topological field theories*
  - Studied functorial TQFT, quantum groups, Reshetikhin-Turaev invariants of knots and links
  - Developed a Python program to calculate the Jones polynomial of a link from its diagrammatic language, utilizing  $U_q(\mathfrak{sl}_2)$  representations and the Penrose graphical notation.
- **Research Assistant**, University of Saskatchewan 2023 Summer
  - Advisor: Alex Weekes
  - Topic: *On the monopole formula and its generalizations*
  - Algebraic geometry, combinatorics, 3d  $\mathcal{N} = 4$  Coulomb branches

### Teaching Experience

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- **Teaching Fellow** for CAS MA 242C Linear Algebra, BU 2025 Fall
- **Instructor of Record** for CAS MA 116 Statistics II, BU 2025 Summer 2
- **Instructor of Record** for CAS MA 116 Statistics II, BU 2025 Summer 1
- **Teaching Assistant** for MATH 100 Differential Calculus, UBC 2022 Fall

### Honours and Awards

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- Dean's Fellowship, Boston University 2024 Fall–2025 Spring
- The Canadian Federation of University Women Gaming Education Award 2023
- Dean's Honour List, University of British Columbia 2021

## Certifications

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- **Completion of the LPS Qubit Collaboratory Quantum Computing Summer Short Course 2025** AUG 2025  
Issued by Laboratory for Physical Sciences (LPS) Qubit Collaboratory
  - Quantum two-level systems, classical and quantum circuits, quantum algorithms, Quantum error correction, introduction to qubit types: semiconductor-based, neutral atom, superconducting, trapped ion
  - Implemented Grover's search algorithm on Quantum Inspire's Tuna-5 quantum computer with Qiskit

## Community Involvement

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- **Directed Reading Program Mentor**, Boston University 2025 Spring
  - Mentee: Zhengkai Li
  - Topic: *Complete classification of finitely generated abelian groups*
- **Volunteer Tutor**, UBC 2023 Fall–2024 Spring
  - Offered algebra and analysis tutoring to four undergraduate students in mathematics

## Conferences and Workshops Attended

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- Homotopical algebra in geometry, topology, and physics JUN 20-24, 2025  
at Northwestern University, Evanston, IL
- Physical Mathematics of QFT Summer School 2025 JUN 09-13, 2025  
at University of Massachusetts Amherst, Amherst, MA
- GTA: Philadelphia 2025 10th Annual Graduate Student Conference MAY 30-JUN 01, 2025  
in Algebra, Geometry, and Topology at Temple University, Philadelphia, PA
- New England Algebraic Topology and Mathematical Physics Seminar NOV 2–3, 2024  
— A miniconference in topology and quantum field theory at Providence College, Providence, RI