

NICHOLAS CARMINE HAYEK

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EDUCATION

McGill University

Montreal, QC

B.A. Honours Mathematics and Computer Science

08/2022 - 05/2026

- GPA: **3.81/4.0**
- Coursework: Propositional Proof Complexity, Homological Algebra, Representation Theory, Galois Theory.
- Honours: D. Lorne Gales Scholarship; Tomlinson Engagement Award for Mentoring; Dean's Honour List.

WORK EXPERIENCE

Department of Mathematics & Statistics, McGill

Montreal, QC (In Person)

Course Assistant

08/2025 - present

- Run a weekly problem seminar for 330 students in Advanced Calculus for Engineers.
- Review and grade homework assignments for 80 students in Honours Algebra I.

Indiana University Indianapolis (IUI) REU Program

Indianapolis, IN (In Person)

Biomath Modelling Research Intern

06/2024 - 08/2024

- Modeled corticostriatal brain networks involved in binge alcohol drinking in rodents using a continuous-time neural network.
- Verified results from literature and analyzed model dynamics to gain insights into the biological mechanisms of addiction.
- Presented findings at the Indiana Undergraduate Math Research Conference and at the IUI Summer Research Symposium. Mentored by Prof. Alexey Kuznetsov with help from the Indiana Alcohol Research Center.

ACADEMIC PROJECTS

Course Transcription

01/2023 - present

- Typeset guides in algebra, probability, discrete math, group theory, among others, in LaTeX.
- ~150 downloads per month by students. Example [here](#)⁴.

Honours Research Project

05/2025 - 08/2025

- Studied supersingular elliptic curve isogeny graphs (SIGs) over finite fields and their applications to cryptography.
- Implemented SIGs and supersingular j -invariant finders in Python, as well as a hash function based on traversals along SIGs, which may be used to encrypt 128-bit messages. Report [here](#)⁵. Mentored by Prof. Henri Darmon.

Director of the *McGill Undergraduate Mathematics Research Journal*

08/2024 - 05/2025

- Initiated and oversaw the re-establishment of McGill's peer-reviewed, undergraduate mathematics research journal, which has been defunct since 2014.
- Recruited and managed editorial and grad student review teams, fundraised, and assisted in curating and editing articles.

Migraine Calendar

05/2025

- Developed a [web application](#)⁶ to track migraines securely, using a client-side, key wrapping encryption scheme. The app allows users to make accounts, create and customize calendars, and submit daily logs. Built with Firebase and JavaScript.

Virtual Musical Instrument Development

12/2024 - 01/2025

- Developed a VST/AU virtual musical instrument in C++, based on 350 self-recorded clips of a Steinway Model B.
- Implemented adjustable attack, decay, sustain, and release parameters and velocity-based sample selection. Users can play live or recorded music using a piano keyboard controller. Link [here](#)⁷.

SKILLS AND ADDITIONAL INFORMATION

ComputerPython, Java, C, C++, OCaml, Linux, Assembly, JavaScript (Svelte),

Data Science (Matplotlib, Pandas, NumPy, SciPy), LaTeX

Extracurricular ActivitiesVice President, External of the Society of Undergraduate Mathematics Students

Student Researcher at the McGill AI Lab

CKUT Radio Station, *The McGill Tribune*, Book Club

LanguagesEnglish (native)

InterestsJazz piano, reading, web development

¹ <https://nicholashayek.com/>

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³ <https://www.linkedin.com/in/nicholas-hayek-b24b1a243/>

⁴ <https://sumsmcgill.ca/wp-content/uploads/2025/10/Algebra-4-Notes.pdf>

⁵ <https://nicholashayek.com/tex/MATH/470/470report.pdf>

⁶ <https://nicholashayek.com/goodcalendar/>

⁷ <https://nicholashayek.com/proj.html>