

NICHOLAS C. HAYEK

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EDUCATION

McGill University

B.A. Honours Mathematics and Computer Science

Montreal, QC

08/2022 - 05/2026

- **GPA: 3.81/4.0**

- Coursework: Algorithmic Game Theory, Quantitative Risk Management, Machine Learning, Stochastic Processes, Galois Theory.
- Awards: D. Lorne Gales Scholarship, Tomlinson Engagement Award for Mentoring, Dean's Honour List.

WORK EXPERIENCE

Department of Mathematics & Statistics, McGill

Course Assistant

Montreal, QC (In Person)

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

Biomath Modelling Research Intern

Indianapolis, IN (In Person)

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

Migraine Calendar

11/2025

- Developed a [web application⁴](#) to track migraines using Firebase, Svelte, and JavaScript. Data is secured using a client-side, key wrapping encryption scheme. The app allows users to make accounts, create and customize calendars, and submit daily logs.

Honours Thesis in Algebraic Number Theory

05/2025 - 08/2025

- Researched 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 messages. Report [here⁵](#). Mentored by Prof. Henri Darmon.

Stable Matching Visualizer

07/2025

- Developed an [interactive simulator⁶](#) of the Gale-Shapley deferred acceptance algorithm, in JavaScript.

Director of the McGill Undergraduate Mathematics Research Journal

08/2024 - 05/2025

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

Virtual Musical Instrument Development

12/2024 - 01/2025

- Developed a VST/AU virtual musical instrument based on over 350 self-recorded clips of a Steinway Model B.
- Built in C++ with 4 channels of audio. 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 [here⁷](#).

Math Transcriptions

01/2023 - present

- Typeset guides in linear algebra, probability, discrete math, group theory, and representation theory, among others, in LaTeX.
- ~150 downloads per month by students. Example [here⁸](#).

SKILLS AND ADDITIONAL INFORMATION

Computer Python, Java, C, C++, OCaml, Linux, Assembly, JavaScript (Svelte), Data Science (Matplotlib, Pandas, NumPy, SciPy), LaTeX

Extracurricular Activities Student Researcher at the [McGill AI Lab](#) (2025)
Vice President at the [Society of Undergraduate Mathematics Students](#) (2024-26)
Member at the CKUT Radio Station, *The McGill Tribune*, and Book Club

GRE 170/165 Quant/Verbal

Languages English (native)

Interests Jazz piano, web development, reading

¹ <https://nicholashayek.com/>

² <https://github.com/hayekn>

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

⁴ <https://nicholashayek.com/goodcalendar/>

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

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

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

⁸ <https://sumsmcgill.ca/wp-content/uploads/2025/10/Algebra-4-Notes.pdf>