# NICHOLAS C. 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: 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** — 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

**Migraine Calendar** — 11/2025

- Developed a web application[4] 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 here[5]. Mentored by Prof. Henri Darmon.

**Stable Matching Visualizer** — 07/2025

- Developed an interactive simulator[6] 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.
- Build 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 here[7].

**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 here[8].

## 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

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[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