NICHOLAS C. HAYEK

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EDUCATION

McGill University Montreal, QC
B.A. Honours Mathematics and Computer Science 08/2022 - 05/2026

- GPA: 3.8/4.0
- Coursework: Algorithmic Game Theory, Modern Algebra (I-IV), Machine Learning, Propositional Proof Complexity.
- 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

- 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.

PROJECTS

Course Transcription 01/2023 - present

- Publish typeset transcriptions of McGill courses in probability, discrete math, ordinary differential equations, group theory, and Galois theory, among others, in LaTeX (300+ pages). Roughly 150 downloads per month by students. Example here[4].

Migraine Tracker Web App 11/2025

- Developed a web application[5] to track migraines using Firebase, Svelte, and JavaScript.
- Allows users to make accounts, create and customize calendars, and submit daily logs.

Gale-Shapley Visualizer 10/2025

- Developed an interactive visualizer[6] of the Gale-Shapley Deferred Acceptance algorithm, after a learning about the topic in Algorithmic Game Theory.

Honours Thesis 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[7]. Mentored by Prof. Henri Darmon.

Director of the McGill Undergraduate Mathematics Research Journal 08/2024 - 05/2025

- Oversaw the revamping of the *McGill Undergraduate Mathematics Research Journal*, which has been defunct since 2014.
- Recruited editorial and grad student peer-review team, fundraised, and assisted in curating articles, editing and layout.

Virtual Musical Instrument Development 12/2024 - 01/2025

- Developed a VST/AU virtual musical instrument[8] 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.

Satisfiability Solver 12/2024

- Developed a satisfiability solver in the functional language OCaml to analyze solution spaces of Boolean formulas.
- Optimized this common tool using tail recursion and memoization for stack and space efficiency.

SKILLS AND ADDITIONAL INFORMATION

Computer	Python, Java, C, C++, OCaml, Linux, Assembly, JavaScript, Svelte, Data Science (Matplotlib, Pandas, NumPy, SciPy), LaTeX
Extracurricular Activities	Vice President, External of the *Society of Undergraduate Mathematics Students* Researcher at the *McGill AI Research Lab* CKUT Radio Station, *The McGill Tribune*, Book Club
GRE	170/165 Quant/Verbal

Languages	English (native)
Interests	Jazz piano, music production, reading

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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/goodcalendar/
[6] https://nicholashayek.com/matchmaker/
[7] https://nicholashayek.com/tex/MATH/470/470report.pdf
[8] https://nicholashayek.com/proj.html