

# 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**
- Selected Coursework: Homological Algebra, Representation Theory, Algorithmic Game Theory, Machine Learning.
- 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

**Course Transcription**

01/2023 - present

- Publish typeset transcriptions for courses in linear algebra, probability, discrete math, ordinary differential equations, group theory, and Galois theory, among others, in LaTeX (300+ pages). ~150 downloads per month by students. Example [here](#)<sup>4</sup>.

**Migraine Tracker Web App**

11/2025

- Developed a [web application](#)<sup>5</sup> to track migraines using Firebase, Svelte, and JavaScript. Secured with client-side encryption.
- Allows users to make accounts, create and customize calendars, and submit daily logs.

**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](#)<sup>6</sup>. Mentored by Prof. Henri Darmon.

**Gale-Shapley Visualizer**

07/2025

- Developed an [interactive visualizer](#)<sup>7</sup> 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 only peer-reviewed, undergraduate math research journal, which has been defunct since 2014.
- Recruited editorial and grad student review teams, fundraised, and assisted in curating and editing articles.

**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](#)<sup>8</sup>.

## 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](#)  
Student Researcher at the [McGill AI Lab](#)  
CKUT Radio Station, *The McGill Tribune*, Book Club

**GRE** ..... 170/165 Quant/Verbal

**Languages** ..... English (native)

**Interests** ..... Jazz piano, music production, web development, reading

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<sup>4</sup> <https://sumsmcgill.ca/wp-content/uploads/2025/10/Algebra-4-Notes.pdf>  
<sup>5</sup> <https://nicholashayek.com/goodcalendar/>  
<sup>6</sup> <https://nicholashayek.com/tex/MATH/470/470report.pdf>  
<sup>7</sup> <https://nicholashayek.com/matchmaker/>  
<sup>8</sup> <https://nicholashayek.com/proj.html>