Varun Pathak

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Education

McMaster University **Expected Graduation: May 2028**

Software Engineering and Management Co-op (B.Eng.Mgt.) *Hamilton, ON*

- Dean's Honors List, **CGPA: 3.8/4.0**
- **Relevant Courses:** Data Structures and Algorithms, Object-Oriented Programming, Databases, Software Design, Agile Methodology, Probability and Statistics, Client Requirements.

Relevant Experience

AI/Machine Learning Engineer **Oct. 2024 – Present**

McMaster Artificial Intelligence Society (MacAI) *Hamilton, ON*

- Currently collaborating with **a multidisciplinary research team alongside Dr. Istvan David** to develop and evaluate human-guided multi-agent reinforcement learning (MARL) frameworks, improving coordination and decision-making across agents by **up to 34%** in simulated environments.
- Designed and implemented custom MARL simulation environments in Python to test policy/reward shaping methods, achieving **42% faster convergence compared to unguided baselines**.
- Conducted **over 200 training trials** comparing unguided vs. human-guided MARL, **demonstrating 21% higher collective task success and improved stability** in complex cooperative tasks.

Instructional Assistant Intern (Co-op) **Sept. 2025 - Present**

McMaster University *Hamilton, ON*

- Led Python and engineering design (Autodesk Inventor) to **450+ students** weekly through labs and tutorials, while providing personalized support during office hours.
- Built a Python automation utility that flagged potential academic dishonesty cases by **scanning 1100+** Autodesk Inventor files for metadata irregularities, improving grading integrity and **saving manual review time by 80%.**
- Supervised a team of **60+ teaching assistants**, coordinated grading duties, and conducted weekly meetings to maintain instructional consistency and performance.
- Created an automated grading and assignment-tracking spreadsheet that streamlined TA workflows by allocating students, tracking project submission deadlines, and setting marking deadlines for **1000+ students**.

Personal Projects

Fragment | *CMU TartanHacks Finalist* **Feb. 2026**

Python, FastAPI, React Native, Supabase.

- Placed **Top 5** and presented on stage at **Carnegie Mellon University** with **over 1,100 participants and 279 projects**.
- Built a passive networking application that connects like-minded people in the background using a Bluetooth mesh.
- Implemented vector-based matching to surface relevant connections in high-density environments.

Biometric & AI-Driven Medical Assistance Exchange | *Deltahacks XII Winner* | 🔗 **Jan. 2026**

Swift, XCode, Firebase (Auth, Firestore), Google Gemini API, Vision OCR, Arduino.

- **Won Canada's largest student-run hackathon** by building an iOS emergency response platform for real-time medical coordination using biometric triggers and AI guidance.
- Engineered a secure Firebase-backed backend with cloud messaging and Firestore models to support emergency broadcasts, personal information, and verified medic workflows.
- Integrated Gemini-powered medical AI and ESP32-based fall detection to generate instant structured incident reports for patients and responding medics.

AI Receipt Management System | 🔗 **Dec. 2024 – Jan. 2025**

Python, AWS S3, Flask, PostgreSQL.

- Built an OCR-based receipt ingestion system to automatically extract and categorize expenses, **reducing entry time by 50%**.
- Designed a scalable PostgreSQL schema and API to store and **query 10,000+ receipts for personal finance analytics**.
- Integrated AWS S3 with secure access controls to support high-volume uploads while reducing storage costs.

Technical Skills

Languages: Python, Java, SQL, Bash/Unix, HTML, CSS, JavaScript, R, Swift

Developer Tools: Git, GitHub, AWS, React/React Native, Maven, MongoDB, Apache Log4j, UML, Office 365 (Excel)

Certifications: DELF B1 (French, 2022)