Varun Pathak

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Education

McMaster University   **Expected Grad: May 2027**
Software Engineering and Management Co-op (B.Eng.Mgt.)   *Hamilton, ON*
- Dean's Honors List (2023, 2024)

Relevant Courses:
- Data Structures and Algorithms
- Object-Oriented Programming (Java)
- Databases (SQL)
- Digital Systems + Comp. Architecture
- Software Design Patterns + SDLC
- Financial Accounting + Economics

Projects

Blockchain - "Garden of Eden" | *Source Code*   **Java | MongoDB | BouncyCastle**
- Developed a decentralized blockchain wallet system in **Java**, utilizing MongoDB for scalable transaction storage, resulting in a robust and secure platform capable of handling high transaction volumes without data integrity issues.
- Engineered a secure transaction system utilizing **ECDSA** from **BouncyCastle** for digital signatures and **SHA-256** for hashing, and implemented custom wallet functionality with public/private key pairs incorporating **Java Security**.
- Developed and integrated **MongoDB**'s **NoSQL** database for scalable storage of transaction-block data, and enabling real-time tracking and querying of blockchain activities.

Maze Runner | *Source Code*   **Java | Apache Log4j | API**
- Implemented a maze-solving approach that adheres to the **right-hand rule and breadth-first searching (BFS)** to navigate mazes, including dynamic direction changes based on wall detection and directional turns.
- Integrated **Apache Log4j** for comprehensive logging of maze-solving processes. Enabled detailed traceability of algorithm execution and path-finding decisions, which improved debugging capabilities and facilitated performance analysis.
- Emphasized clean code principles and best practices in **Java**, including **encapsulation**, **modular design**, and clear method documentation. Ensured maintainability and scalability of the codebase through well-defined **interfaces**, such as the MazeSolver interface, and well-organized method responsibilities.

Personal Portfolio | *Website* | *Source Code*   **HTML | CSS | JavaScript | Google Sheets**
- Developed a professional online personal portfolio using **HTML, CSS, and JavaScript** characteristics.
- Exploited **HTML/CSS** tags to create responsive, visual effects.
- Created an **automated text-receive system**, storing contact information in Google Sheets.

Relevant Experience

McMaster Artificial Intelligence Society   **2024 – Present**
Project Member   *Hamilton, ON*
- Collaborating with a **team of 5+ members** in building a custom traffic light agent using **SUMO-RL, Python, and ML techniques** to enable dynamic traffic light control.
- Training and optimizing a **R-learning agent** with machine learning models, applying reward shaping to actively reduce congestion and improve traffic flow efficiency.
- Monitoring agent performance in real-time with **TensorFlow and Matplotlib**, tuning hyper-parameters to enhance simulation results and minimize wait times.

AskTutors. INC   **2023 – Present**
Tutor (Math + Physics)   *Oakville, ON*
- One-on-one tutoring sessions (online + in-person) for **12+ students concurrently** in Grades 3-12 in **Math and Physics**, prioritizing individual learning gaps and enhancing overall understanding.
- Tailored lesson plans to meet diverse student needs and learning styles (inc. IEP).
- Monitored and assessed student progress, adjusting instructional techniques as needed to ensure optimal growth.

Technical Skills

Languages: Java, Python, C, C++, MATLAB, Verilog, Bash/Unix, HTML, CSS, JavaScript, SQL

Developer Tools / Frameworks: Git, Maven, GitHub, TensorFlow, MongoDB, Apache Log4j, UML, Microsoft Office

Verbal Languages: English (Fluent, Native), French (DELF B1 Certified), Punjabi (Full Verbal Proficiency).