Patrik Buhring

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Education

University of Waterloo, Canada Sept. 2022 – Aug. 2027

- Double Majoring in **Computer Science** (90% MAV) and **Pure Mathematics** (87% MAV).
- Candidate for a **Bachelor's Degree in Mathematics**.

Experience

Informatics Coop Student Jan. 2024 – Aug. 2024
University of Guelph – Center for Biodiversity Genomics
Go, **C**, **Python**, and **Bash**

- Drove a genetic sequence clustering project to completion, researching, and validating the pipeline.
- Optimized pipeline to achieve **40-80% memory reduction** and across-the-board runtime reduction.
- Implemented, and validated multiple genetic and geospatial aggregation endpoints using **FastAPI**.

Vice President, Academic May 2025 – Present
Mathematics Society of the University of Waterloo

- Participates in multiple faculty committees, advocating for student interests through feedback.
- Organizes and runs academic events such as resume critique sessions and course review sessions.
- Facilitates professor-student communication to help uphold university policies and student privacy.

Projects

Terminal Game Engine Dec. 2023
C++

- Wrote a **terminal game engine** as well as a space invaders style game and a snake clone.
- Designed an incredibly flexible **ECS** API that achieves **realtime framerate** on a **terminal**.
- Incorporated **mouse input**, fine-grained rendering using braille characters, and colour support.

Hypersphere: An Exploration of 3D and 4D Spherical Geometry Dec. 2022 – Present
Rust, **WGSL**, **WebGPU**, **WASM**, **JavaScript**, **HTML**, and **CSS**

- Publishes updates to a live **WebGPU enabled** demonstration in a custom-written HTML website.
- Includes a spherical shallow water **fluid simulation** running in Compute Shaders for efficient GPU use.
- Integrates a custom flat shading water shader and various terrain generation modes for visual appeal.
- Developed an open source **4D** math utilities library and separate tech demo.

Hydraulic Erosion Simulation on Spherical Terrain May 2023 – Present
Rust

- Adapts an existing **hydraulic erosion simulation** for spherical terrain: **demo video**.
- Presented a talk demonstrating the project at the Summer 2023 SASMS at UWaterloo.
- Leverages a **SIMD** implementation of simplex noise and multithreading to efficiently use resources.

Hexasphere: Open Source Sphere Generation Aug. 2020 – Present
Rust

- Implements an efficient sphere subdivision algorithm with the aim of reducing distortion.
- Over **3.2 Million** downloads, with more than **16000** projects depending on Hexasphere on GitHub.
- Maintains and updates the project, ensuring quality and well-documented code.
- Optimized to produce cache-friendly meshes for efficiency when rendering very detailed spheres.

Skills

Languages **Rust, Go, C++, C#, Java, C, Bash, Dart, Python, Racket, HLSL, GLSL**
Frameworks & Libraries **OpenGL, DirectX 11, Android, .NET, Linux, CUDA**
Spoken & Written Languages **English, Spanish, French**