

# NATHANIEL REILLY

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## EDUCATION

### University of Waterloo

Sep 2023 – Present

*Bachelor of Computer Science; Human Computer Interaction Specialization*

*Waterloo, Ontario*

- Coursework: Data Structures & Algorithms, Object-Oriented Programming, Graphics Programming, Operating Systems, Compilers, Computer Architecture, Computational Logic, Linear Algebra, Calculus, Probability, Statistics

## TECHNICAL SKILLS

**Programming Languages:** C++, C#, C, Python, Java, Lua, SQL, R, JavaScript, HTML, CSS, Bash

**Frameworks & Libraries:** Unity, UE5, Vulkan, OpenGL, NumPy, Pandas, Matplotlib, TensorFlow, Pytorch, NodeJS, Bullet

**Tools:** Git, Linux, Docker, Jupyter Notebook, Microsoft Azure

## EXPERIENCE

### Vibe Labs Games

December 2024 – Present

*Gameplay Programmer Intern*

*Waterloo, Ontario*

- Designed and implemented multiple core gameplay and UI systems using **Unity/C#**, **Unity ECS & HLSL** for shaders, including comprehensive inventory, quest, and stat buff systems, increasing player retention by **over 200%**.
- Led onboarding and task management** for new interns while driving innovative game design decisions, resulting in scalable systems and a **successful vertical slice prototype**, **securing funding** for a new roguelike project.

### Waterloo Reality Labs

May 2024 – Present

*Software Lead*

*Waterloo, Ontario*

- Leading 10 developers** in building a Unity-based software package in **C#**, **LangChain**, and **Python**, providing real-time VR environment analysis with text descriptions, enhancing accessibility for visually impaired users.
- Developed a Unity ETL pipeline using **C#** and **PyTorch**, capturing hand movement data to train ML gesture recognition models, empowering VR game developers to create immersive, gesture-based gameplay experiences.

## PROJECTS

### Heat Diffusion Sim | Unity, HLSL, C#

March 2025

- Engineered **real-time heat diffusion simulation** for a game in development using Unity compute shaders (**HLSL**), simulating thermal transfer between grid cells for dynamic environmental interaction.
- Leveraged **compute shaders** and a modular grid system as a replacement for CPU-based calculations, achieving an **over 500% increase** in simulation speed, serving as a foundation for performant & engaging gameplay mechanics.

### Vulkan 2D Physics Simulation | C++, Vulkan, Box2D Physics

April 2025

- Developed a **2D orthographic renderer in Vulkan** from scratch, leveraging encapsulation to support dynamic scene updates & user-controlled geometry. Integrated an external physics library & custom rigidbody logic to further enable **high-accuracy, real-time visualization** of arbitrary quadrilateral dice dynamics.

### Settlers of Catan Reinforcement Learning | C++, Python, OpenGL, TorchRL

August 2024

- Developed a high-performance Settlers of Catan game environment in **C++** with **OpenGL** for UI and visualization, tailored for **multi-agent reinforcement learning** to simulate complex strategies and optimize RL performance.
- Training an agent capable of high-level strategic gameplay, leveraging **Python** and **TorchRL** along with the custom Catan environment and pure-competition MARL algorithms for optimal performance.

### Probability Analysis of 6-Sided Dice | C#, Unity

April 2023 - June 2023

- Authored a **20-page paper** investigating the relationship between irregular 6-sided dice geometry and roll outcomes by applying principles of physics and linear algebra, deepening understanding of stochastic behavior in dynamics.
- Simulated **10M+ dice rolls** of over **1,000 unique dice shapes** in **Unity** using **C#** and shaders for custom geometry, substantiating conclusions made in the analytical paper through comprehensive empirical analysis.

### Game jams | Unity, Godot, C#, GDScript, HLSL

September 2024 - Present

- Developed and published within 72 hours** a survival resource management game and spell discovery game during separate Game Jams, implementing comprehensive mechanics such as a modular spell system and base building.