

# Patrick Ribas

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## Objective

Hard-working fourth-year Computer Science student looking for a co-op or research opportunity in computer graphics or scientific simulation during the summer or fall of 2022.

## Education

### Rochester Institute of Technology

- Bachelor and Master of Science in Computer Science (Dual Degree), Minor in Math
- 3.89 GPA, Dean's List, Expected Graduation May 2023

## Work Experience

### Algorithm Development Co-op (Full Time), Spectral Sciences, Spring 2021 — Summer 2021

- Wrote Python and C++ code to automatically determine initialization points for in-house fluid simulation software
- Implemented numerical methods to evaluate physically relevant quantities (i.e. gradients) over a mesh that stored relevant data
- Worked with the C++ library Qhull to assist in geometry processing work such as generating a convex hulls or quadtrees
- Used Boost.Python to interact with existing library bindings for C++ code, and to compile C++ to Python
- Navigated Python's tkinter library for a different project to display the results of rocket simulation software

### Sustainability Research Assistant (Full Time), RIT, Summer 2020

- Worked with existing and novel mathematical models to predict methane production of anaerobic lagoons on large farms
- Used numerical and statistical methods to evaluate models, along with the uncertainties and sensitivities of their parameters
- Methods include forward Euler, Monte Carlo simulations, Latin Hypercube Sampling, and Sobol' sensitivity analysis
- Wrote Python code to parse data, evaluate models, reproduce findings of existing papers, and verify statistical methods

## Skills

- **Programming Languages:** Python, C, C++, Java/C#, Three.js, WebGL, Vulkan (learning)
- **Software Development:** Git, Unix, Agile
- **Other:** L<sup>A</sup>T<sub>E</sub>X, Research, Paper Reading, Public Speaking, Communication

## Projects

### Particle-based Fluid Simulation

- Implemented part of Müller et al. to build a real-time fluid simulation for an animation class
- Used Marching Cubes to render a fluid-like surface, and evaluated smoothing kernels over a set of particles
- Built the system in Three.js to show the simulation online

### Procedural Terrain Generator

- Wrote a program to render an infinite 3D landscape in Three.js
- Learned Fractional Brownian Motion to generate points that represent terrain heights
- Used Delaunay Triangulation algorithm to generate a mesh for rendering the terrain and to walk through it in real-time
- Generated simplified terrain using Perlin noise when results were unsatisfactory

### Ray/Path Tracer in C/C++

- Created an offline ray tracer from scratch in C/C++ to render spheres
- Researched and applied methods in Linear Algebra and Probability fundamental to ray tracing
- Implemented random variables for material properties, sampling for anti-aliasing, and matrix/vector transformations

## Courses (bottom row is Spring 2022)

|                                    |                        |                          |                      |
|------------------------------------|------------------------|--------------------------|----------------------|
| Computer Animation Algorithms      | Computational Geometry | Computer Graphics        | Stochastic Processes |
| Parallel and Distributed Systems   | Introduction to AI     | Analysis of Algorithms   | Software Engineering |
| Advanced GPU Programming in Vulkan | Global Illumination    | Geographic Visualization | Climate Change       |

## Other

- **Website:** <https://patribas.github.io/>
- **RIT eSports:** Current DOTA 2 team manager, organize scrims and weekly games; former broadcaster/shoutcaster for DOTA 2 team, minor experience in stream production; acclimated to a fast-paced, communication-heavy environment
- **piRIT:** member of RIT's SIAM chapter
- **Athletics:** Former springboard diver, 3-time Pittsford triathlon finisher (pre-Covid)