

Frank Fan

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EDUCATION

PhD, Computer Science | University of Waterloo, Waterloo, ON Sep 2026 – Present
Advisor: Prof. Gladimir V. G. Baranoski, Natural Phenomena Simulation Group. Focus: spectral rendering, light transport.

Master of Mathematics (MMath), Computer Science | University of Waterloo, Waterloo, ON Sep 2024 – Apr 2026
GPA 4.0/4.0. Thesis: [A Biophysically-Based Framework for the Simulation and Visualization of Chlorophyll Fluorescence Under Different Illumination Conditions](#).

Bachelor of Computer Science (BCS) | University of Waterloo, Waterloo, ON Sep 2019 – Apr 2024
GPA 3.8/4.0. Coursework: Computer Graphics, Advanced Computer Graphics, Numerical Computation, Algorithms.

PUBLICATIONS

- Y. Sun, G. V. G. Baranoski, **F. Fan**, S. Steinfield. [A Phasor-based Camera-Space Construction for Making Radiometric Accumulation Assumptions Explicit](#). *Eurographics Symposium on Rendering (EGSR)*, 2026.
- F. Fan**, G. V. G. Baranoski. [A Study on Rendering Techniques to Visually Represent Sparkles](#). *Technical Report CS-2024-02*, University of Waterloo, 2024.

RESEARCH EXPERIENCE

Graduate Researcher | Natural Phenomena Simulation Group, University of Waterloo Sep 2024 – Present

- Built a biophysically based, multispectral framework that simulates and renders chlorophyll fluorescence under ultraviolet and visible excitation, grounded in fluorescence spectroscopy and extensible to other fluorescent materials (MMath thesis).
- Validated its predictive capability against qualitative trends in physical measurements, and rendered chlorophyll solutions across varied experimental and illumination conditions for realistic image synthesis.
- Co-authored an EGSR 2026 paper making the radiometric accumulation assumptions of rendering explicit via a phasor-based camera-space construction; maintain the group's research site (npsg.uwaterloo.ca) on Linux.

Undergraduate Research Assistant | University of Waterloo, Waterloo, ON Sep 2023 – Apr 2024

- Studied the Uniform Theory of Diffraction (UTD) with GGX microfacet models to capture wave-optics effects in physically based BRDFs, comparing wave-optical and geometric-optics reflectance (Prof. Shlomi Steinberg).
- Compared stochastic, spectral, and rasterization-based techniques for rendering sparkle phenomena on visual fidelity and computational cost; published as a technical report (Prof. Gladimir Baranoski).

WORK EXPERIENCE

Teaching Assistant | University of Waterloo, Waterloo, ON Sep 2024 – Present

- TA for six course offerings: CS488 Computer Graphics (3 terms, including 1 as Lead TA), CS398 Introduction to Graphics Programming, CS370 Numerical Computation, and CS245 Logic and Computation.
- Held office hours, marked assignments and projects, and answered student questions on Piazza.

Software Developer (Co-op) | Rocscience Inc., Toronto, ON Jan 2023 – Apr 2023

- Built the 3D Barrier Design and Analysis feature of RocFall3, a commercial rockfall simulator still shipping today, which engineers use to size and place rockfall barriers from simulated 3D impacts.
- Developed C# algorithms computing trajectory height, impact angle, velocity, and kinetic energy from collisions between falling rocks and mesh surfaces, and engineered the data structure that stores and queries these results.
- Built 3D visualizations of rock-barrier impacts with trajectory height and energy heatmaps (Eyeshot, OpenGL).

Software Developer (Co-op) | Tactic Studios, Toronto, ON May 2022 – Aug 2022

- Built a CI pipeline on the Perforce API to sync branches, trigger remote builds, and automate game asset baking, saving approximately 2 hours of manual work per week for a team of 20 developers.

Software Developer (Co-op) | Rocscience Inc., Toronto, ON Sep 2021 – Dec 2021

- Rearchitected C++ spatial partitioning for dense polygon meshes, replacing a 3D uniform grid with an octree to accelerate point-mass-to-mesh collision detection in rockfall simulation.

Software Developer (Co-op) | PSI Technologies Inc., Saskatoon, SK Jan 2021 – Apr 2021

- Built a tool in C# (.NET WinForms) that slices a 3D model along any plane to expose its interior cross section, in geotechnical meshing software used to design and build roads.

TECHNICAL SKILLS

Languages: C++, C, C#, Python, GLSL, MATLAB, Java, JavaScript, SQL, Bash

Rendering: Physically based rendering, spectral rendering, light transport, radiometry, fluorescence simulation, BRDF and microfacet models (GGX), ray tracing, path tracing, Monte Carlo integration, rasterization, OpenGL, GLSL shaders

Algorithms and Tools: Octrees, BVH, spatial data structures, collision detection, computational geometry, numerical methods; Git, Perforce, Linux, .NET, ImGui, PostgreSQL, CI/CD, LaTeX