John Blake Caven

+1 (904) 580-1419 | blakecaven@outlook.com | linkedin.com/in/blake-caven/ | bcaven.github.io

I recently completed my MS in Computer Science at the University of Notre Dame, focused on machine learning and real-time simulation. My work sits at the intersection of real-time 3D systems, virtual production, applied ML, spatial workflows, and production reliability.

At Notre Dame Studios, I built real-time virtual production capabilities using Unreal Engine 5, stYpe tracking, custom C++ integrations, real-time depth and pose approximation, and digital-twin-based workflows. The work required translating leadership goals into technical milestones, testing hardware and software options, building proof points for production and budget decisions, documenting repeatable workflows, and helping train the next team to operate the capability.

My goal is to build higher-leverage tools, platforms, and productized workflows, not to stay in a traditional TD lane. I am especially interested in systems that shift production from "fix it in post" to "prevent it in real time."

EDUCATION

University of Notre Dame | Notre Dame, IN — May 2026
Master of Science
Major: Computer Science

University of Notre Dame | Notre Dame, IN — May 2025
Bachelor of Science
Major: Computer Science

PROFESSIONAL EXPERIENCE

Notre Dame Studios | Notre Dame, IN — May 2025 - May 2026
Lead Software Engineer

- Pitched and built an on-set virtual production studio from the ground up using UE5. I periodically presented live demonstrations of the system to the Office of Digital Learning and Assistant Vice President for Academic and Community Technology Experience at Notre Dame.
- Implemented a real-time machine learning pipeline directly integrated into UE5 with a blueprint wrapper library for non-technical users. Also designed and built a real-time machine learning pipeline using Blackmagic Design's Decklink capture and playback cards and Libtorch to offload heavier models with a 3.34x performance improvement.
- Built drag-n-drop tools such as aligning arbitrary numbers of child actors to splines, better Maya to UE5 importing, polymorphic interactive elements, and production-tested pipeline for integrating Gaussian Splats in UE5 at 60 fps.
- Built digital twin integrating real footage in the virtual scene using estimated depth information from raw footage.
- Coordinated a small production team building technical and artistic components in UE5.
- Shipped all tools and documentation for their usage and future development in a version-controlled UE5 Plugin.
- Designed, drafted, and presented proposal for interdisciplinary collaboration between Computer Science and Engineering, Film, and Notre Dame Studios for future research, production, and student learning opportunities.

GESS Lab | Notre Dame, IN — January 2025 – May 2026
Research Assistant

- Designed and implemented a real-time particle simulation in C++ inside texture buffers to simulate aeolian patterns on surfaces for interactive computer graphics.
- Restructured GLSL shaders to visualize particle simulation on GPU for a more efficient rendering pipeline with no unnecessary CPU cost and higher fidelity graphics. Skills: C++, GLSL, OpenGL, CMake
- Comprehensive literature review on modern computer graphics and physics simulations, pending publication.

CDW-G | Notre Dame, IN — August 2024 – April 2026
On-Campus Intern

- Provided subject matter expertise and on-campus technical sale support as part of CDW-G's account team serving the University of Notre Dame
- Developed relationships across three campus partners to understand wants, needs, and solutions to meet growing AR needs, presented information to company leadership team to create a custom solution for departments at Notre Dame
- Worked with Notre Dame Athletics to understand available data for next generation sports analytics using modern machine learning techniques.

LEADERSHIP AND ACTIVITIES

Advanced Game Development | Notre Dame, IN December 2025 – May 2026
Graduate Teaching Assistant

- Built a game engine in C++ and GLSL from the ground up using SDL and OpenGL.
- Supported five undergraduate and one graduate student when building their own engines.

Game Development | Notre Dame, IN August 2025 – December 2025
Graduate Teaching Assistant

- Supported 20 undergraduates through office hours, problem solving and custom solutions using Godot Engine.
- Wrote a batch download and extraction script using GraphQL and Python to expedite the grading process.
- Built examples of common components (managing multiple cameras, inventory systems, splitscreen multiplayer) in Godot Engine to serve as inspiration for students' semester projects
- Coordinated with the Video Game Club to host playtesting session for students in Game Development

Technical Concepts of VFX II | Notre Dame, IN January 2025 – May 2025
Teaching Assistant

- Supported 25 undergraduates through teaching Houdini, DaVinci Resolve, and Blender 3D focusing on simulations and compositing for offline-rendered visual effects.
- Independently designed and implemented batch offline rendering solution for Houdini in the Center for Research Computing to allow up to 500 students to utilize university resources to render large 3D scenes.
- Coordinated a team of four TAs to offer one-on-one advising, weekly office hours, and custom solutions for students.

PROGRAMMING PROJECTS

Real-time Voxel Cone-tracer Summer 2026

- Vulkan-based Voxelized Cone-tracer written in C++ and Slang

Offline Monte Carlo Raytracer | BCaven/OfflineRaytracing Summer 2026

- CPU monte-carlo path tracer written in C++ with multi-core tile-based rendering and BVH based triangle meshes
- Native support for Gaussian Splats, tested with 200k splats. Splats support shadowing, indirect illumination, reflection

Creativity Optional | BCaven/creativity-optional Spring 2024

- Real-time Streaming Processor: Lead developer for OSS that allows the user to send arbitrary real-time data to a custom 3D scene. Tested at 60fps with real-time audio and system information streams.
- Built using Flask and ThreeJS. Also managed project documentation and team organization.

Innovate-o-thon | Notre Dame, IN Fall 2021, Spring 2022

- *Top Prize Winner*: Led five person team to the **top prize of $2,000** in the Fall 2021 and Spring 2022 competitions.

INVITED TALKS

- GESS Lab was invited to present at the first Great Lakes Graphics Workshop at the University of Chicago.
- Built and presented two lectures in a senior Game Development project course at the University of Notre Dame
- *Alternative Uses of Game Engines*: Highlighted emerging uses of game engines such as Virtual Production and XR. Used discussion and open-ended questions to encourage participation and creativity when students built their own projects.
- *Best Practices in Godot*: Discussed key differences between Godot and UE5 and the best practices therein.
- 75 minute guest lecture on *Deferred Rendering* for Advanced Game Development class.
- 90 minute guest lecture on *Students' Relationship with Technology* to a mixed group of students, faculty, and staff.

PUBLICATIONS

- Brown, Chase J., et al. "Visualizing digital architectural data for heritage education." IS&T Conference on Visualization and Data Analysis. 2023. 3D visualization of the Roman forum using three.js, potree, and lidar scans collected by team members in the Notre Dame School of Architecture
- Pending publication: Aeolian Patterns in Sand. Our method showed 20x speed up compared to comparable model from 2023.
- Pending publication: Survey of particle simulations

TECHNICAL SKILLS

C++, GLSL, Slang, Vulkan, OpenGL, SDL3, Pytorch, Libtorch, Godot Engine, Unreal Engine, OpenCV, Blackmagic Decklink, Stypeland, Micropython, Multicast, Python, Raspberry Pi, Embedded Programming, CAD, Arduino, HTML, JavaScript, Websockets, Flask, Celery, ThreeJS, Vue, Docker, AWS, Potree, Blender, Maya, Linux