John Blake Caven

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I am a Master's student studying Computer Science at the University of Notre Dame focused on interactive real-time 3D applications with experience developing virtual production pipelines using Unreal Engine. With a background in distributed systems, machine learning, and computer graphics I bring fresh perspectives to difficult problems. Right now I am developing a machine learning pipeline for live video that has a 3.34x framerate increase over alternative methods.

EDUCATION

University of Notre Dame | Notre Dame, IN — May 2026
Master of Science — *GPA: 4.00*
Major: Computer Science

University of Notre Dame | Notre Dame, IN — May 2025
Bachelor of Science — *GPA: 3.40*
Major: Computer Science

PROFESSIONAL EXPERIENCE

Notre Dame Studios | Notre Dame, IN — May 2025 - Present
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 before optimization. Skills: C++, UE5, Blueprints, Libtorch, Decklink, OpenCV
- Coordinated a small team building technical and artistic components in UE5.

GESS Lab | Notre Dame, IN — January 2025 – Present
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 – Present
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

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

- Supported 20 undergraduates through office hours, helping problem solve and creating custom solutions for projects using Godot Engine.
- Wrote a batch download and extraction script to reduce time required to grade student's projects using GraphQL and Python.
- 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

Distributed Systems | University of Notre Dame Fall 2024

- Designed and deployed distributed server cluster with sequential consistency that dynamically created and removed servers to match server load.
- Stress-tested server cluster with up to 256 simultaneous clients with an average latency of 0.075 seconds

Creativity Optional | University of Notre Dame 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 competition and the Spring 2022 competition.

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. Inspired boxing game using haptic feedback gloves.
- *Best Practices in Godot*: Discussed key differences between Godot and UE5 and the best practices therein.

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

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