Jay Rao

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EDUCATION

Northwestern University Expected June 2028

Bachelor of Arts (B.A.) in **Computer Science** (**Artificial Intelligence** Concentration) Dean's List (Fall 2025)

- **Relevant Courses:** Data Structures & Algorithms, Fundamentals of Computer Programming (I, 1.5, II), Linear Algebra, Probability
- **Organizations:** Men's Rugby, Develop + Innovate for Social Change, The Garage @ Northwestern

SKILLS

Languages: Python, JavaScript, C, C++, HTML/CSS, MATLAB
Frameworks & Libraries: FastAPI, React, Next.js, Tailwind CSS, PyTorch, scikit-learn, Pandas, OpenCV, YOLO
Tools & Platforms: Git, GitHub, Docker, Linux/Bash, CUDA, Jupyter Notebook, Render, Vercel

PROJECTS

PitchSense | *Python, YOLOv5, OpenCV, PyTorch, scikit-learn, NumPy*

- Developed an optimized computer vision pipeline using **YOLOv5** and **ByteTrack** to detect match objects, implementing input downscaling and memory management for large-file inference on consumer hardware
- Engineered a team assignment system using **K-Means clustering** for color analysis on player jerseys, enabling automated team identification and real-time ball possession statistics
- Built a View Transformer using Perspective Transformation to map 2D video coordinates to a 2D top-down tactical view, and integrated speed/distance estimation modules calculating real-time player metrics
- Implemented Optical Flow to estimate camera movement and adjust object coordinates, with **Pandas**-based ball position interpolation to maintain continuous tracking during occlusions

nuPython Interpreter and Debugger | *C, C++, Docker, Linux/Bash*

- Built a complete interpreter and GDB-style debugger for nuPython (a Python-like language) across **2,000+** lines of **C/C++** code, implementing the full execution pipeline from parsing to runtime
- Engineered a custom memory management system supporting variable lookup, dynamic array growth, and stable address allocation supporting integers, floats, strings, booleans, pointers, and None types
- Developed an expression evaluator with automatic type coercion, control flow (if/elif/else, while loops), built-in functions (print, input, int, float), and debugger features including single-step execution, variable inspection/modification, and semantic error detection

ImageLab | *Python, JavaScript, FastAPI, React, Next.js, Tailwind CSS, Docker, Render, Pillow, Hugging Face API*

- Reimagined a terminal-based BMP editor into a full-stack, cloud-deployed image processing platform with a polished web interface and expanded functionality
- Engineered a **FastAPI** backend with modular endpoints for image transformations supporting all major formats (PNG, JPG, WebP, BMP) and AI-assisted edits via **Hugging Face** models, with advanced filters
- Developed a **Next.js** + **React** + **TypeScript** frontend with **TailwindCSS**, containerized with **Docker**, and deployed to **Render/Vercel**

EXPERIENCE

Head Counselor | Camp Argo / Camp Instructor | Camp RA Jun. 2024 - Aug. 2024 / Jun. 2025 - Jul. 2025

- Supervised and led **20+** school-aged children of all abilities through games, songs, and group activities
- Collaborated with counselors and leads to create engaging themed activities, events, and games each week
- Adapted activities to individual needs and resolved conflicts, ensuring smooth transitions of **10+** activities

VA Ambassador | U.S. Department of Veteran Affairs Sep. 2022 - Sep. 2023

- Coordinated transportation for **50+** elderly and low-mobility patients weekly, ensuring timely medical care
- Supported hospital operations by guiding patients, answering inquiries, and assisting with on-site logistics
- Collaborated with medical staff to improve patient flow and enhance coordination across departments