

# 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 Coursework:** Data Structures & Algorithms, Machine Learning, Scalable Software Architectures, Linear Algebra, Discrete Math, Probability, Fundamentals of Computer Programming (I, 1.5, II)
- **Organizations:** Men's Rugby, The Garage (Startup Incubator), NU-D65 CS Partnership (TIDAL & tiilt Labs)

## SKILLS

**Languages:** Python, C, C++, JavaScript, TypeScript, SQL

**Frameworks & Libraries:** FastAPI, React, PyTorch, NumPy, Pandas

**Tools & Platforms:** Git, GitHub, Linux/Bash, CUDA, Jupyter Notebook, AWS, Render, Vercel

## PROJECTS

### SmartSchedule | *TypeScript, React, TensorFlow, Tailwind CSS*

- Building an intelligent scheduling engine for **paper.nu**, Northwestern's premier course planning platform with **10,000+** users and **2,500,000+** uses, that automatically generates optimal course plans based on user inputs like major, degree requirements, class times, travel distance, means of transportation, and breaks
- Designing a novel "course vibe" recommendation system using **sentence-transformer embeddings** to help students discover new classes and provide semantically relevant course suggestions

### ImageLab | *Python, TypeScript, SQL, FastAPI, React, Next.js, AWS, Tailwind CSS, Pillow, Puter.js*

- Architected and deployed a full-stack cloud application with a **FastAPI** backend and **React + Next.js** frontend, containerized with **Docker** for deployment on **Render** and **Vercel**
- Engineered 15+ image transformation algorithms using **Pillow** and integrated AI-powered generation via **Puter.js**, implementing **AWS Rekognition** for automated labeling with fault-tolerant retry logic
- Built scalable cloud infrastructure with **AWS S3** storage and an **RDS MySQL** database, implementing **JWT** authentication with **SHA-256** hashing and role-based access for secure multi-user workflows

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

- Engineered a computer vision pipeline using **YOLOv5** and **ByteTrack** for real-time object tracking, utilizing **K-Means clustering** algorithms to analyze jersey colors for automated team assignment
- Developed a View Transformer using **Perspective Transformation** and **Optical Flow** to stabilize camera movement, mapping 2D pixels to real-world pitch coordinates for precise speed and distance analytics.
- Resolved memory bottlenecks by implementing a resolution scaling logic that reduced usage by **4x**, ensuring stable performance on standard hardware through garbage collection and frame optimization

### nuPython | *C, C++, STL*

- Engineered a **2000+ line** language interpreter of supporting mixed-type arithmetic and pointer operations, constructing a custom RAM system with  **$O(\log n)$**  binary search for efficient variable lookup and storage
- Developed an interactive GDB-style debugger capable of step-by-step execution and state inspection, implementing graph unlinking algorithms to manipulate the Program Graph for control flow management

## EXPERIENCE

### Computer Science Educator | Northwestern TIDAL & tiilt labs

Jan. 2026 - Present

- Co-leading **two** weekly fifth-grade classrooms in the Evanston/Skokie School District (D65), guiding **40+** students through creative, project-based Python curriculums using TunePad for musical expression
- Facilitating an equitable computing environment by mastering lesson materials on variables, conditionals, and debugging, while adapting instruction to support diverse learners and build student confidence

### 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 **10+** themed activities, events, and games each week