John Rathgeber

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Education

Brown University Expected Graduation: May 2027
Sc.B. Computer Science and Mathematics, A.B. Music *Providence, RI*

- **GPA:** 3.9
- **Coursework:** Data Structures and Algorithms, Deep Learning, Computer Systems, Computer Vision, Compilers, Honors Statistics, Honors Linear Algebra, Differential Geometry, Abstract Algebra, Analysis

Experience

Electronic Theatre Controls May 2025 – Aug. 2025
Software Engineer Intern *Middleton, WI*

- Developed a system to **manage configs** across **1000+** networked devices in real time using **Python** and **Typescript**, enabling **live view/edit** through **REST APIs** and **MQTT**-based message exchange.
- Built a **multithreaded backend service** with custom **PostgreSQL** integration to support **IP multicast-based entity discovery**, used to maintain consistent state across distributed UIs with <**50ms** sync delay.

Wisconsin Department of Transportation May 2024 – Aug. 2024
Computer Vision Intern *Madison, WI*

- Developed a **Python** pipeline to **estimate 3D GPS positions** of traffic signs from **3M+** vehicle-mounted images, automating a previously manual process and reducing processing time from **3 months to 5 days**.
- Used **YOLOv5** and **DepthAnything** to detect signs and estimate depth maps, and applied **linear algebra** and **spherical geometry** to estimate accurate coordinates and enable statewide sign mapping for the first time.

SoilNet May 2024 – Aug. 2024
Data Science Intern *Belleville, WI*

- Optimized **MySQL** schema with **covering indexes** and automated **REST API** data ingestion, improving database query performance by **40%** and reducing manual data processing overhead by **2 hours daily**.
- Built **SQL-based ETL pipelines** to analyze soil and plant data, identifying crop yield trends and delivering visualized findings for a USDA grant-backed project that secured **$1M** in SBIR funding.

Leadership

Brown University Sep. 2025 – Present
Undergraduate Teaching Assistant *Providence, RI*

- **Lead** weekly recitations and office hours for **CSCI 0220: Discrete Structures and Probability** (**100+** students), covering topics such as **combinatorics, probability, graph theory, and logic**.

Tumor Detection Sep. 2024 – Dec. 2024
Technical Lead *Providence, RI*

- **Led a team** to build and train a **Convolutional Neural Network** (CNN) brain tumor classification model in **Python** with **TensorFlow**, **Keras**, and a VGG-16 backbone, **exceeding 95% accuracy** on MRI scan data.

Projects

IMO Problem Formalization | *Lean, Number Theory, Competitive Math* Sep. 2025 – Dec. 2025

- **Formalized** Problem 3 from the 1998 **International Mathematical Olympiad (IMO)** using the **Lean 4** theorem prover, translating informal mathematical writing into **machine-checkable logic**.
- **Published** verified code to the official *Compfiles* library, establishing the canonical proof for the problem.

Custom I/O Caching Library | *C, Strace, GDB* Jan. 2024 – May 2024

- Built a custom **C-based I/O caching library** to wrap read, write, and seek operations, reducing system call frequency and cutting disk access latency by **100x–1000x** through **buffered memory caching**.
- Engineered cache eviction, alignment, and correctness for edge cases, meeting <**5x** stdio performance targets.

Technical Skills

Languages: Python, C/C++, JavaScript, TypeScript, Java, SQL, OCaml, Lean
Libraries/Frameworks: Node.js, React, Flask, PyTorch, Tensorflow, Keras, OpenCV, Tailwind
Tools: VS Code, Git, Docker, Kubernetes, pgAdmin, Firebase, Postman, Swagger, Jira