Alexander Broihier

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EDUCATION

University of Illinois at Urbana-Champaign — **Expected May 2026**

Bachelor of Science Mathematics, Statistics and Computer Science; James Scholar — GPA: 4.0/4.0

ACM: SIGma Co-Lead (Math and Algorithms Club)

Relevant Coursework: Data Structures, Algorithms, System Programming, Distributed Systems, Compilers

TECHNICAL SKILLS

Programming Languages: C, C++, Java, JavaScript, TypeScript, Python, Rust, Ocaml
Frameworks/Tools: Git, Pandas, React, Next.js, SQL, MongoDB, Redis, Spring Boot, Docker, Linux

EXPERIENCE

Box – *Software Engineering Intern* — May 2024 – August 2024
- Implemented distributed event processing using **Apache Helix** and **Zookeeper** to split work over 10+ processes and delivered 6 weeks ahead of schedule
- Engineered a configurable framework in **Java** and **Redis** to concurrently process 100,000+ events per second
- Provided an internal events service with **OpenAPI** and **Spring Boot** deployed with **Kubernetes** on **GCP**
- Introduced 8 tracked metrics along with unit and integration tests for 9 classes, uncovering 3 bugs in existing code

IBM – *Accelerate Program: Software Development Track* — June 2024 – July 2024
- Studied software design topic such as full stack development and application security with IBM leaders
- Collaborated in groups of 10+ participants to progress through weekly coding projects

Compilers Research — January 2024 – Present
- Apply compiler methodologies to data science to increase performance of exploratory data analysis workflows
- Construct novel benchmarks for dataframes, uncovering over 600x performance differences between libraries

Undergraduate Course Assistant — January 2023 – Present
- Create and maintain online **C++** problems in **Docker** application to assess course knowledge of 800+ students
- Execute lab sections and office hours to help students learn course concepts and use **GDB** and **Valgrind** to debug

PeopleWeave Research Project — April 2023 – January 2024
- Automated collection of authorship data in **Python** with **Parsel** to power models developed by other teams
- Utilized AWS and multithreading to bolster development workflow and data scraper performance (5x speedup)

PROJECT HIGHLIGHTS

Compiler and Interpreter (*C*) — December 2023 – January 2024
- Created a stack-based bytecode compiler and interpreter in **C** to implement an imperative object-oriented language
- Implemented bytecode optimizations to speed up common use cases for method calls (7x speedup)
- Designed around single pass compilation to ensure performance and enable use as a REPL interpreter

News Aggregator (*Python, TypeScript, React, Next.js, MongoDB*) — May 2023 – July 2023
- Implemented a data scraper in **Python** with **Parsel** to automatically gather and store current news information
- Leveraged **OpenAI API** to AI generate a daily welcome message based on gathered data of current events
- Provided a front-end **React** and **Next.js** app allowing users to search through and view 125+ news articles per day
- Utilized **Google Cloud** as an identity provider to implement secure authentication

Multiplayer Connect Four App (*Rust*) — November 2022 – December 2022
- Implemented a front-end web app with **Yew** framework, providing 3 game modes and 2 AI opponents
- Managed multiplayer lobbies over **TCP** by leveraging **Tokio** as an asynchronous multithreaded runtime
- Included foreign feature interface for existing **C++** code to bolster the back-end server with cheat detection
- Used **GitHub Actions** to automatically build and deploy the web app when code is pushed to GitHub

VEX Robotics Competition Robot Control Codebase (*C++*) — February 2021 – May 2022
- Designed a **JavaScript** simulation to test autonomous robot motion algorithms, saving 10+ hours
- Developed then iterated upon the structure and API of a real-time, multithreaded, object-oriented **C++** codebase, allowing teammates to quickly specify advanced, accurate autonomous movement
- Achieved the highest programming skills score at the state competition for Illinois in 2022 with 36.25% more points than second place