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
Relevant Coursework: Data Structures, Algorithms, System Programming, Database Systems, Compilers
Relevant Fall Coursework: Distributed Systems, Compiler Construction

Technical Skills

Programming Languages: Java, C, C++, 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 – Present
- Implementing distributed event processing using **Apache Helix** and **Zookeeper** to split work over 10+ processes and delivering 6 weeks ahead of schedule
- Engineering a configurable framework in **Java** and **Redis** to concurrently process 100,000+ events per second
- Providing an internal events service with **OpenAPI** and **Spring Boot** deployed with **Kubernetes** on **GCP**
- Adding 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 – Present
- Studying software design topic such as full stack development and application security with IBM leaders
- Collaborating 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
- Run 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
- Automate collection of authorship data in **Python** with **Parsel** to power models developed by other teams
- Utilize AWS and multithreading to bolster development workflow and data scraper performance (5x speedup)

Project Highlights

Docker Clone (*Go*) June 2024
- Constructed a lightweight **Docker** like containerization service in **Go** to isolate processes run on **Linux** machines

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
- Allowed users to view 125+ news briefings per day and search for articles through a front-end **Next.js** app
- 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
- Leveraged an asynchronous back-end runtime using **Tokio** to concurrently manage numerous multiplayer lobbies
- 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