

Joseph Liu

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EDUCATION

University of Waterloo

BMath in Computer Science and Pure Mathematics

Expected May 2028

Average: 97.8%

- Awarded a Mathematics National Scholarship (~15 recipients in Canada).

EXPERIENCE

University of Waterloo, Undergraduate Research Assistant — Waterloo, ON

Sep 2026 – Present

- Researching extensions to the Geni probabilistic programming language compiler to support loops with state using Markov chains, supervised by Dr. Yizhou Zhang.

Bloomberg L.P., Software Engineer Intern — New York, NY

May 2026 – Aug 2026

- Shipped a distributed concurrency limiter in Bloomberg's compliance platform (~**1,500 financial firms**), preventing users from monopolizing shared workers on an Airflow data pipeline processing **~8 TB daily**.
- Drove adoption of an event-driven design that reused existing infrastructure, avoiding a new service and accelerating production deployment by ~3 weeks.
- Re-engineered a Python-based Kafka consumer service to apply a per-user concurrency limit and queue requests in PostgreSQL, validated with end-to-end containerized tests.
- Added Kafka completion events to the Airflow data pipeline to signal queued jobs to proceed, with a TTL-based fallback mechanism and idempotency guards to protect against missing or duplicated events.

TD Bank Group, Software Engineer Intern — Toronto, ON

May 2025 – Aug 2025

- Led development of a full-stack open banking prototype enabling TD clients to connect accounts with other banks; project presented to multiple exec teams and approved for further development.
- Implemented a Python backend ingesting Plaid data into PostgreSQL and exposing it securely over a JWT-authenticated API, enabling a SwiftUI mobile app to display transactions from external bank accounts.

PROJECTS

Obscenity: profanity detection library

[npm](#) / [GitHub](#)

- Authored a profanity detection library in TypeScript used by **550+ open-source projects** and multiple companies; released on npm with **250k+ weekly downloads**.
- Designed an extensible, object-oriented API supporting custom keywords, Unicode-aware input normalization routines, and configurable censor strategies.

YAGPDB: distributed Discord bot

[Website](#) / [GitHub](#)

- Contributed **130+ merged PRs** to open-source Go codebase of Discord bot used by **3.5 million online communities**, resolving dozens of longstanding user-submitted feature requests and bugs.
- Identified, responsibly disclosed, and patched two denial-of-service vulnerabilities in the bot's dynamic scripting runtime, preventing intermittent system downtime for 100k+ users.

Yag-LSP: editor extension for domain-specific scripting language

[VS Code](#) / [GitHub](#)

- Developed a VS Code extension providing code completion, error diagnostics, and refactoring tools to 200+ users.
- Engineered a language server in Rust communicating with a TypeScript frontend over the Language Server Protocol, including an error-tolerant parsing algorithm that provides accurate diagnostics even for incomplete input.

jo3-l.dev: personal tech blog (5k+ views)

[Website](#) / [GitHub](#)

- Author posts on technical topics; see my essays on [the bitap algorithm](#) and [probabilistic programming languages](#).

SKILLS

Languages: Python, TypeScript, Go, C, C++, Rust, Scala, SQL

Technologies: PostgreSQL, Redis, Kafka, Apache Airflow, FastAPI, SQLAlchemy, GitHub Actions, Docker, React, SwiftUI