Tyler Beach

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Education

University of Alberta December 2025
Bachelor of Science in Computer Science *Edmonton, AB*

Experience

Software Developer Intern January 2025 - April 2025
QOL MedTech *Calgary, AB*

- Architected and launched a scalable, multi-tenant web app for a fast-paced startup using **Next.js, Fastify, TypeScript, and Tailwind CSS**, enabling remote physiotherapy for Clients, Trainers, and Admins.
- Built and documented RESTful APIs in **Fastify** and integrated them with a **PostgreSQL** database, enabling reliable data flow between the frontend and backend services.
- Designed and implemented secure, role-based authentication and authorization workflows using **JWT**, **AWS Cognito**, **RDS**, and **S3**, ensuring HIPAA-compliant data access and storage.
- Created the startup's first 3D motion visualization system for remote physiotherapy trainers, enabling accurate patient movement analysis through real-time Three.js rendering of sensor data.

Projects

MediMinutes | *Next.js, TypeScript, Tailwind, AWS, PostgreSQL, Prisma, Python* Website

- Engineered a gamified medical learning platform featuring **daily crosswords**, **symptom-diagnosis matching**, and **interactive quizzes**, with 200+ topics and progress tracking via personalized dashboards.
- Architected a reward system with unlockable avatar customization to boost user engagement and retention.
- Created an automated content pipeline using **Beautiful Soup** and **custom algorithms** to generate daily puzzles from 20k+ medical data points, eliminating manual updates.
- Implemented secure authentication (**Google OAuth + custom auth**) and real-time leaderboards to foster competitive learning among medical students.

Gazprea Compiler | *C++, LLVM, MLIR, ANTLR4* Website

- Developed a compiler for a general-purpose language, generating **LLVM IR** using **MLIR** and supporting features like function calls, loops, conditionals, type aliasing, vectors and 2D arrays.
- Implemented a lexer and parser using **ANTLR4**, generating a custom heterogeneous Abstract Syntax Tree (AST).
- Wrote **2000+ unit tests** for every feature, ensuring comprehensive coverage and reliability, testing against a competitive suite of 600+ test cases, ensuring quality and correctness.
- Achieved **1st overall ranking among 12 teams**, outperforming peers in runtime performance, memory management, and feature completion.
- Configured **CI/CD pipelines** using **GitHub Actions** to automate compilation and testing workflows

ASCII / Voxel Renderer | *C++, SDL2* Website

- Built a real-time software 3D renderer from scratch in C++, progressing from ASCII ray-casted worlds to a fully **voxel-based engine** with lighting and shadows.
- Optimized performance through algorithmic improvements (**DDA vs ray marching**), buffering strategies, and incremental rendering refinements.
- Ported the renderer to **SDL2**, rewriting core systems to support windowing, input handling, double buffering, minimap visualization, and smooth real-time interaction.

Course Helper Bot | *Python, Express.js, JavaScript, MongoDB, Heroku, Linux* Repository

- Scraped and normalized the entire University of Alberta course catalog (1,000+ courses) using **Python** and **BeautifulSoup**, storing structured data in **MongoDB** for efficient querying.
- Developed an interactive **Discord bot** using **Discord.js** that provided instant access to course details.
- Architected a **scalable backend system** deployed on **Heroku** and self hosted bot on my **Linux** server.

Skills

Languages: TypeScript, C++, C, Java, Python, JavaScipt, RISC-V/ARM/x86 Assembly, SQL
Frameworks: React, Next.js, Node.js, Express.js, Fastify, Django, Flask, Tailwind
Technologies: AWS, Github Actions CI/CD, Docker, Firebase, PostgreSQL, ANTLR4, LLVM/MLIR
Relevent Coursework: Compiler Design, Computer Architecture, Operating Systems, Software Engineering, Computer Networking, Machine Learning, Reinforcement Learning, Natural Language Processing, Image Processing