

Emilien Breton

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— EXPERIENCE —

- EcoSafeSense**
FIRMWARE ENGINEER
• Writing firmware for ESP32-based air quality sensor and complementary test bench.

Ottawa | October 2024–Present
- Cohere**
SENIOR DATA QUALITY SPECIALIST — ADVANCED MATHEMATICS
• Wrote, audited and corrected LLM prompts and responses to produce **spotless training data** in formal logic, combinatorics, number theory, graph theory and mathematical optimization.

Freelance | October 2024–April 2025

— PROJECTS —

- DFA Regex Engine**
• Built regex engine in C99 that compiles regular expressions down to minimal deterministic finite automata to match input strings in **linear time** without backtracking.
• Wrote extensive test suite of over **500 tests** to ensure end-to-end correctness of engine and catch regressions.
• Developed grep-like tool as real-world stress test for engine and achieved performance on par with GNU grep.
- Breadboard Microcomputer**
• Designed 8-bit microcomputer from from logic gates upward, including instruction set architecture, from-scratch assembler and cross-platform emulator in Rust, totaling over **20 000 SLOC** and **750 hours** of work.
• Wrote various utilities in Assembly running natively on microcomputer — Wozmon-inspired memory monitor • 16×16 sprite editor • Tetris clone • native assembler • postfix notation calculator.
• Built microcomputer in hardware by hand-wiring discrete 74HC-series logic chips on breadboards.
- Rudimentary C Compiler**
• Building C99 compiler from scratch in Rust targeting breadboard microcomputer’s instruction set.
• Implemented dead code elimination, constant folding and strength reduction, resulting in **20% increase** in generated code performance and **10% reduction** in binary size across test suite.
• Developed extensive C standard library, including heap allocator supporting **malloc and free**, string handling functions such as **strlen and memcpy** and input/output routines including **getline and printf**.
- Multilayer Perceptron**
• Wrote static reverse-mode automatic differentiation library in C99 for use in deep learning.
• Designed multilayer perceptron model and implemented stochastic gradient descent, momentum and L2 regularization, achieving **97% accuracy** on MNIST database after 3 minutes training on 16 threads.

— VOLUNTEERING —

- Computer Science Club**
CLUB EXECUTIVE
• Running growing community of **over 1500** computer science students at the University of Ottawa.
• Collaborating with executive board to brainstorm, plan, fund and market monthly events and meetups, such as workshop on Vim bindings and mini-course on the λ -calculus.

University of Ottawa | June 2022–Present
- Hack the Hill Hackathon**
DEVELOPMENT MANAGER — DEVELOPMENT TEAM
• Led development of open-source event management system based on Next.js and Prisma and used by over **1000 hackers** and **50 organizers** throughout hackathon.
• Built and maintained internal payment portal powered by Stripe and React.js in collaboration with sponsorship team that processed upwards of **20 000\$**.

Ottawa | November 2022–October 2024

— AWARDS —

- **AIT Hackathon 3.0** — 1st place, Mocha challenge

September 2025
- **uOCTF 2025** — 1st place

March 2025
- **uOttHack 6** — 1st place, QNX challenge

January 2025
- **CS Games 2024** — 1st place, IOT challenge

March 2024
- **uOCTF 2024** — 1st place

November 2023
- **DeFi The Conventional** — 1st place, DeFi challenge

March 2022

— SKILLS —

- **Languages** — C • Rust • Python • Haskell • JavaScript

• **Tools** — GNU/Linux • GDB • GNU Make • Vim • React
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