Emilien **Breton**

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EXPERIENCE

EcoSafeSense

FIRMWARE ENGINEER — *Ottawa | October 2024–Present*

Cohere

SENIOR DATA QUALITY SPECIALIST — ADVANCED MATHEMATICS — *Freelance | October 2024–Present*

- Writing, auditing and correcting LLM prompts and responses with utmost attention to detail to produce **spotless training data** in formal logic, combinatorics, number theory, graph theory and optimization.

PROJECTS

LTRE Regex Engine

A FAST REGULAR EXPRESSION LIBRARY WRITTEN IN C99 — *C*

- 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 **400 tests** to ensure end-to-end correctness of engine and catch regressions.
- Developed grep-like tool as real-world stress test for engine, achieving performance on par with GNU grep.

Atto-8 Microcomputer

A MINIMALIST 8-BIT MICROCOMPUTER WITH STACK-BASED MICROPROCESSOR — *Rust • C • Assembly*

- Designed entire microcomputer from from logic gates upward, including instruction set architecture, from-scratch assembler and cross-platform emulator, 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.

Atto-8 C Compiler

A RUDIMENTARY C99 COMPILER FOR THE ATTO-8 MICROARCHITECTURE — *Rust • C • Assembly*

- Building C99 compiler from scratch in Rust targeting Atto-8 Assembly language, consisting of preprocessor, parser, typechecker, optimizer and code generator.
- 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**.

VOLUNTEERING

Computer Science Club

CLUB EXECUTIVE — *University of Ottawa | June 2022–Present*

- Running growing community of **over 1000** 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.

Hack the Hill Hackathon

DEVELOPMENT MANAGER — DEVELOPMENT TEAM — *Ottawa | November 2022–October 2024*

- Led development of open-source event management system built with Next.js and Prisma and used by over **1000 hackers** and **50 organizers** throughout hackathon.
- Built and maintained internal sporsorship payment portal powered by Stripe and React.js in collaboration with sponsorship team, enabling processing of over **20 000$**.

SKILLS

- **Languages** — C • Rust • Python • JavaScript • HTML/CSS • JSON • YAML • Markdown • LaTeX • Lua • C++
- **Developer Tools** — GNU/Linux • Vim • Bash • Fish Shell • Git • GDB • GNU Make • Docker
- **Other Technologies** — React • Node.js • Express • Figma • Notion • Cloudflare • GitHub