

Emilien Breton

PROJECTS

Atto-8 Microcomputer

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

- Designed ecosystem of hardware and software 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 demos in Assembly running natively on microcomputer — memory monitor • sprite editor • Tetris clone • native assembler • postfix notation calculator.
- Built microcomputer in hardware using 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 average of **20% increase** in execution speed and **10% reduction** in binary size.
- 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 printf supporting conversion specifiers %d, %u, %x, %c, %s and %p.

LTRE Regex Engine

A FAST REGULAR EXPRESSION LIBRARY WRITTEN IN C99 *C*

- Built regex engine in C99 which compiles regular expressions down to deterministic finite automata to match input strings in **linear time** without backtracking.
- Wrote extensive test suite of over **100 tests** to ensure end-to-end correctness of engine.
- Developed grep-like tool supporting flags -v, -x, -i, -n and -c as real-world stress test for engine.

DBLess Password Manager

A HASH-BASED, DATABASE-LESS PASSWORD MANAGER *C • Python*

- Devised custom hash procedure based on SHA-256 in Python which deterministically generates passwords on demand without requiring encryption or password storage.
- Reimplemented password generation algorithm in C along with SHA-256 routines as per FIPS PUB 180-4 for use as interactive CLI tool.

VOLUNTEERING

Hack the Hill Hackathon

DEVELOPMENT MANAGER — DEVELOPMENT TEAM *Ottawa | November 2022 — Present*

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

uOttawa Computer Science Club

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

- Building community of over **1000** computer science students at the University of Ottawa.
- Collaborated executive board to brainstorm, organize and schedule a dozen events by designing marketing material with Figma and hosting workshops for over **100 students**.

EXPERIENCE

Zeptile Software

SOFTWARE ENGINEER — WEB3 *Remote | October 2022 — October 2023*

- Implemented various smart contracts in Solidity as per specification and ensured **100% test coverage** through Chai and Hardhat.

EDUCATION

University of Ottawa

BSC WITH HONOURS IN COMPUTER SCIENCE *September 2021 — Present*
November 2020

- Admission scholarship — 95%+ average.

SKILLS

Languages

Rust • C • Python • JavaScript

Development Tools

NixOS • Neovim • Fish Shell • Git

Other Technologies

React • Node.js • HTML • CSS • JSON • YAML • Markdown • LaTeX • Lua • x86 Assembly • C++ • Bash • GDB • Linux • Arduino • VS Code • Figma • Notion • Docker • Cloudflare • GitHub

Spoken Languages

• French *Native*
• English *Native*
• Spanish *Intermediate*
• Russian *Elementary*

Other Interests

Electronics • Robotics • CAD • 3D Printing • Finance • Mathematics • Drone Building • Music • Boulderling

CONTACT

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