Nicholas W. Breitling

(+1) 952-905-4220 ◇ breitnw@u.northwestern.edu ◇ linkedin.com/in/nick-breitling

EDUCATION

Northwestern University, *Evanston, IL* · 4.0 GPA *Sep. 2024 - Present*

- Pursuing Bachelor of Science in Computer Science
- Coursework: Computer Systems, Operating Systems, Data Structures and Algorithms, Programming Languages, Dynamics of Programming Languages, Proving Properties of Programs with Mechanized Logic
- Awards and Honors: Tau Beta Pi, Summer Undergraduate Research Grant, High Honors Dean's List

Northeastern University, *Boston, MA* · 4.0 GPA *Sep. 2023 - Apr. 2024*

EXPERIENCE

Programming Languages Research Intern, Northwestern Univ., *Evanston, IL* *Jan. 2025 - Present*

- Design and conduct a Rational Programmer (RP) experiment to investigate the pragmatics of trace contracts
- Examine the space of strategies for replacing a program's integration tests with trace contracts by encoding those strategies with RP algorithms, implemented in Racket
- Quantify RP performance by measuring the quality of resulting test suites with mutation analysis

Compilers Research Intern, Czech Technical University, *Prague, CZ* *Jan. 2024 - Sep. 2024*

- Collaborated on the development of a new infrastructure for just-in-time compilation of R language
- Aided in transition from C++ to Java compile server, focusing on RDS serializer implementation
- Integrated serializer as a communication protocol between C++ frontend and Java backend
- Constructed large-scale integration tests using new communication protocol, comparing server and client-side bytecode to expose numerous inconsistencies

Student Researcher, Minnetonka Research, *Minnetonka, MN* *Sep. 2022 - May 2023*

- Developed a new fluid rendering algorithm, utilizing ray-marching as a means of particle blending
- Created ray-marched and mesh renderers in Vulkan, finding that ray-marching performed best in all benchmarks
- Awarded blue ribbon, purple ribbon, and Stockholm Junior Water Prize at TCRSF

Camp Counselor, Code Ninjas, *Chanhassen, MN* *Summers 2021 - 2023*

- Lead counselor for weekly camps, teaching programming with presentational and one-on-one instruction
- Planned and implemented new lessons in Lua programming, 3D modeling, music distribution, and more

Full-Stack Development Intern, The Humanity Alliance, *Victoria, MN* *May 2021 - May 2023*

- Developed full-stack administration dashboard, aiding in delivery of meals to food-insecure families
- Bridged meal request and route assignment APIs with an interactive map, eliminating manual data editing
- Used Python and Redis for data processing, Flask for web service, and Jinja for templating

EXTRACURRICULARS & PROJECTS

Volunteer CS Educator, Evanston-Skokie School District 65 *Jan. 2025 - Present*

- Teach weekly computer science classes to 5th graders at Oakton Elementary as part of Northwestern research
- Introduce basic programming concepts through use of TunePad, a Python-based music production tool

Embedded Software Developer, Northwestern Baja SAE *Oct. 2024 - Present*

- Implement platform-agnostic, immediate-mode GUI library in C, enabling users to compose and customize layouts in a functional, recursive style
- Use said library to develop customizable heads-up display, informing driver of engine, fuel, and other metrics
- Develop ESP32 microcontroller software for eCVT (electronic continuously-variable transmission) in C++, configuring and tuning hall-sensor and linear encoder PID inputs to maintain optimal output RPM

Other projects *(full list at github.com/breitnw)*

- *mndco11age.xyz:* Portfolio website and webserver; developed with Rust and OpenSSL
- *rhyolite:* Vulkan-based mesh rendering engine, developed with Rust and GLSL
- *micromusic:* Apple Music miniplayer and queue manager, developed with Rust, C, and SDL2

SKILLS

Programming Languages and Tools

- *Systems:* Rust, C, x86 Assembly, C++, GNU/Linux, Vulkan
- *Functional:* Racket, Agda, Haskell, Nix, Emacs Lisp
- *General/Other:* Java, JavaScript, Python, Flask, Jinja, SQLite, Redis, LaTeX