






# RAJAN MAGHERA

4th Year @ UAlberta | Interested in compilers, code optimization, HPC, educating, software engineering.

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## EXPERIENCE

### COMPILER DESIGN AND OPTIMIZATION LAB RESEARCH STUDENT

May 2022 – August 2022, May 2023 - Present | Edmonton, AB | Under supervision of J. Nelson Amaral

- Conducted research and analysis on **Inline Caching in SpiderMonkey** (Firefox JS Engine) focusing on emitting JIT IR and evaluating the potential for optimizing the order of linked lists utilized for caching frequently executed operations at call sites in **JavaScript**.
- Performed a comprehensive limit study to assess the impact of size limits on the linked lists employed for operation caching.
- Developed an internal reporting tool using **Next.js, React, and MongoDB**, designed specifically for JS benchmarks. This tool enabled efficient tracking and analysis of benchmark data, enhancing performance evaluation and optimization efforts.

### UNIVERSITY OF ALBERTA TEACHING ASSISTANT

Sept 2022 – Apr 2023 | Edmonton, AB

- Designed and developed lab assignments for CMPUT 229 (Computer Architecture) course, including creating automated marking scripts for efficient evaluation.
- Received positive student review scores, consistently **surpassing the median**, for teaching lessons, providing lab demonstrations, and offering consultation.

## PROJECTS

### RISC-V ASSEMBLY STATIC ANALYSIS TOOL

May 2023 - present

- Developed a **VSCode** Extension in **Rust**, providing linting, calling convention, and control flow error detection for **RISC-V** assembly, addressing common mistakes made by students in a Computing Architecture course.
- Implemented parser and static analysis algorithms based on dataflow analysis, liveness analysis, and available expressions.
- Utilized Rust's low-level capabilities and easy cross-compilation to **WASM**, enabling real-time feedback in an IDE without external dependencies.

### GAZPREA COMPILER

Sept 2022 - Dec 2022

- Collaborated in a team of four to design and implement a compiler in **C++** for the **Gazprea Language**, targeting **LLVM**.
- Successfully utilized **ANTLR4** to generate the parser and emitted LLVM IR, achieving passing results on approximately 90% of teaching team tests.
- Demonstrated the ability to plan and distribute work effectively in large software engineering projects.

### SEXUAL REPRODUCTIVE HEALTH APP

Jan 2023 - Apr 2023

- Served as the Scrum Master, leading a team of 6 individuals in the development of a sexual reproductive health educational app for AI4Society in **Flutter** using **Firebase**.
- Took on a multifaceted full-stack role, from designing the front-end interface to architecting the back-end, and implementing **CI/CD** on GitHub Actions.
- Developed an online admin panel in **Retool** for text and image content.

## SKILLS

### Languages

C++ • C • Rust • JavaScript  
TypeScript • Dart • Julia • Python  
CSS3 • HTML5

### Frameworks

React • Next.JS • Flutter • Django

### Tools

LLVM • ANTLR • WASM • MongoDB  
SQL • Firebase

## EDUCATION

### UNIVERSITY OF ALBERTA

BSC. SPECIALIZATION IN COMPUTING  
SCIENCE, MINOR IN BUSINESS

Sept 2020 - Present | Edmonton, AB

GPA: 3.97 / 4.0 (Dean's Honour Roll)

### MCNALLY HIGH SCHOOL

ALBERTA DIPLOMA, IB CERTIFICATE

Sept 2017 - June 2020 | Edmonton, AB

Valedictorian

## AWARDS

2022 - 2023

NSERC Undergraduate Student  
Research Award (x2)

2021

Microquest Leadership Award in  
Computing Science

Alberta Innovates Summer Research  
Studentship

2020

Schulich Leaders Scholarship

## EXTRA-CURRICULARS

### WEEK OF WELCOME

JUNIOR, SENIOR VOLUNTEER

Feb 2021 - present

- Organized and led campus tours.
- Managed 12 volunteers.

### PHI GAMMA DELTA

TREASURER, FUNDRAISING CHAIR

Jan 2022 - Dec 2022

- Managed budget of over \$50k.
- Coordinated with 50+ members.