Ruqing Yang

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Research Interests

I am interested in the implementation and optimization of functional programming languages, particularly in the following areas:

- Automatic memory management assisted by type systems
- Improved data representation for compute-intensive programs
- Explicit vectorization in functional programming languages
- Formal verification of implementations and optimizations

Education

Hong Kong University of Science & Technology **Aug. 2023 - June 2025 (expected)**
M. Phil. in *Computer Science and Engineering* *Hong Kong S.A.R., China*

- Advisor: Lionel Parreaux

Zhejiang University **Sep. 2019 - June 2023**
B. Eng. in *Computer Science and Technology* *Hangzhou, China*

- GPA: 3.84/4.0
- A/A+ Courses: Programming Language Principles, Compilation Principles, Data Structure and Algorithm, etc.

Projects

MLScript **Autumn 2023 - Now**

- This is an ongoing project in HKUST TACO Lab. It's an object-oriented and functional programming language with numerous advanced type system features.
- Designed an ANF-based IR with join points support and integrated it into MLS compiler.
- Implemented an optimizer based on it. It contains a non-duplicate incremental inliner leveraging function splitting.
- Implemented a C++ backend. Using a universal object representation, and reference counting for memory management.

Calocom **Spring 2022**

- This is a coursework for the course *compilation principle*.
- Designed and implemented a programming language with functional features like algebraic data type, closure, and pattern matching.
- Topics include: type checking, closure conversion, LLVM-based code generation, and runtime system.

SyOC **Spring 2022 - Summer 2022**

- This is an optimizing compiler for SysY (a subset of C) language.
- Typical dataflow analysis: immediate dominator analysis, iterated domination frontier analysis for SSA IR construction.
- Optimizations: constant propagation, CFG simplification, and dead code elimination.
- Implemented linear scan register allocation.

Experience

Teaching Assistant of ***Principles of Programming Languages*** **Sept. 2022 - Jan. 2023**

- Prepared a lab that requires students to implement Hindley-Milner type inference with let generalization in a simple typed lambda calculus.
- Designed and wrote the auto judgement system of labs.

Keynote Presentation in a PL enthusiasts group **July 2023**

- Gave a presentation on the topic of "Efficient Pattern Matching Compilation".

Teaching Assistant of ***Programming with C++*** **Jan. 2024 - June 2024**

- Prepared a lab that helps students learn dynamic memory management in C++.

Skills

Programming Languages: OCaml, Rust, Haskell, C/C++, Zig, Scala, Java, Python, etc.
Proof Assistant: Coq