Xuanrui Qi

Graduate School of Mathematics, Nagoya University
Furo-cho, Chikusa-ku
Nagoya, Aichi 464-8602, Japan
✉ *xuanrui@cs.tufts.edu*
https://www.xuanruiqi.com

Education

Oct 2019 — now **M.S. in Mathematical Sciences 博士前期課程多元数理科学専攻**, *Nagoya University*, Nagoya, Japan.
Advisor: Jacques Garrigue

May 2019 **M.S. in Computer Science**, *Tufts University*, Medford, MA, USA.
Advisors: Samuel Z. Guyer, Cyrus Omar (University of Michigan, unofficial)
GPA: 3.77/4.0

May 2018 **B.S. in Computer Science, *magna cum laude*, with honors in thesis**, *Tufts University*, Medford, MA, USA.
Second major: international relations, **Minor**: mathematics
Advisor: Samuel Z. Guyer
GPA: 3.72/4.0

Jun 2014 **High School Diploma**, *Shenzhen Middle School*, Shenzhen, Guangdong, China.

Research Interests

Dependently-typed programming, interactive proof assistants, type-driven development, typed functional programming languages, type theory, constructive mathematics.

Positions

Aug — Sept 2019 **Intern Engineer**, *SiFive, Inc.*, San Mateo, CA, USA.
Interning at SiFive's San Mateo office, working with Murali Vijayaraghavan on formally verifying a RISC-V processor in Coq.

Jun — Aug 2018 **Research Visitor**, *Graduate School of Mathematics, Nagoya University*, Nagoya, Japan.
Hosted and advised by Professor Jacques Garrigue.

Jun — Aug 2017 **Research Assistant**, *Department of Computer Science, Tufts University*, Medford, MA, USA.
Research assistant under Professor Sam Guyer, working in the RedLine Systems Research Group.

Jul — Aug 2016 **Intern**, *Institute of Automation, Chinese Academy of Sciences*, Beijing, China.
Interned at the State Key Laboratory of Control and Management of Complex Systems, working on computer vision.

Research Publications

Research Papers

1. Reynald Affeldt, Jacques Garrigue, **Xuanrui Qi**, and Kazunari Tanaka. Proving Tree Algorithms for Succinct Data Structures. The 10th Conference on Interactive Theorem Proving (ITP 2019).
2. **Xuanrui (Ray) Qi**. Elephant Tracks II: Practical, Extensible Memory Tracing. Senior Honors Thesis, Tufts University, 2018. *Thesis committee*: Sam Guyer (chair), Kathleen Fisher.

Talks & Presentations

1. Reynald Affeldt, Jacques Garrigue, **Xuanrui Qi**, and Kazunari Tanaka. Experience Report: Type-Driven Development of Certified Tree Algorithms in Coq. The Coq Workshop 2019.
2. **Xuanrui (Ray) Qi**. From Tactics to Structure Editors for Proofs. Off the Beaten Track 2019 (OBT '19).
3. **Xuanrui (Ray) Qi**. A Practical and Extensible Framework for Garbage Collection Tracing. SPLASH 2018 Student Research Competition.

Research Projects

Hazel: live programming with typed holes

With Cyrus Omar (University of Michigan), I'm working on extending Hazel, the live functional programming language with typed holes, to support additional features. Currently, I am working on adding first-class support for polymorphism.

Formal verification of compact data structures

This is the project I worked on during my research visit at Nagoya University in 2018. We extended our Coq formalization and verification of properties of compact data structures — namely efficient bit vectors — by adding and verifying dynamic operations to the said data structures.

Elephant Tracks II: high-performance GC tracing toolkit

This is the research project leading to my senior honors thesis at Tufts University. Elephant Tracks II is a dynamic analysis framework for memory in managed programming languages which works by generating a memory trace, i.e. a record of object allocations, pointer updates, and object deaths. With a team of researchers from Google and the Australian National University, we aspire to bring the utility of memory tracing to more programmers, and to make memory tracing even greater. I am in charge of most of the implementation in C++ and Java.

JumboViz: visualizing GC traces

A visualization toolkit for Elephant Tracks (and Elephant Tracks II) GC traces, aiming to generate visualizations useful for programmers. This is a collaboration with a team at Tufts University.

Short-Term Research Visits

June 2019   **Department of Computer Science, University of Chicago**, Chicago, IL, USA. Visited Cyrus Omar and UChicago programming languages research group for one week.

Teaching Experience

Teaching Assistant

- Calculus I (G30 Program), Fall 2019, Nagoya University
- Concurrent Programming (COMP 50CP), Fall 2017 & 2018, Tufts University

Non-Technical Courses

- Peer instructor (instructor of record), Spring 2018, Experimental College @ Tufts University

Other Activities

- Participant, Oregon Programming Languages Summer School 2017
- Programming Language Mentoring Workshop scholarship awardee, ICFP 2017
- Student Volunteer, POPL 2018