Xuanrui Qi

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Education

Oct 2019 — Aug 2021	**M.S. in Mathematical Sciences**, *Nagoya University*, Nagoya, Japan.
May 2019	**M.S. in Computer Science**, *Tufts University*, Medford, MA, USA.
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.
Jun 2014	**High School Diploma**, *Shenzhen Middle School*, Shenzhen, Guangdong, China.

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 hardware architectures 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.
Summer 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.

Technical Skills

Programming Languages

Haskell, OCaml, Standard ML, Erlang, Scheme, Python, Java, C/C++

Programming & Software Engineering

Performance engineering (especially GC/interpreted runtime related), dynamic program analysis, concurrent programming, low-level/systems programming

Formal Methods

Theorem proving (Coq, Idris, Agda), type systems, static analysis, program logics, SMT-assisted reasoning

Security

`nmap`, packet analysis, penetration testing, web security (SQL injection, cross-site scripting, etc.), systems security

Other

Git, Linux system administration (Arch & Ubuntu)

Projects

Formal verification of dynamic compact data structures

I did part of the design, implementation and modeling in Coq. Research publication in preparation.

`https://github.com/affeldt-aist/succinct`

Elephant Tracks II: high-performance, extensible GC tracing framework

I did most of the design and implementation of a prototype in C++. The resulting system's performance increased more than $10\times$ compared to our previous systems.

`https://github.com/ElephantTracksProject/et2-java`

JumboViz: visualizing GC traces

I did most of the JVM-related hacking in C++.

`https://github.com/HeapVisCapstone`

Dynamic, Distributed File Backup System

I collaborated with two colleagues in design and implementation in Erlang.

`https://github.com/DistBackup/dbscore`

Research Publications

Research Papers

1. Reynald Affeldt, Jacques Garrigue, **Xuanrui Qi**, and Kazunari Tanaka. Proving Tree Algorithms for Succinct Data Structures. Accepted to 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. Accepted to 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.

Relevant Coursework

PL "Programming Languages" (incl. functional programming), "Concurrent Programming" (in Erlang), "Program Analysis, Verification & Synthesis", "Foundations and Pragmatics of Dependently-Typed Systems for Interactive Proof-Assistance and Certifiably-Safe Programming"

Security "Computer Systems Security", "Cryptography"

Theory & Algorithms "Algorithms", "Advanced Algorithms", "Theory of Computation"

Others "Working with Corpora"