Weihao Qu

Ph.D. Candidate
Department of Computer Science and Engineering
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EDUCATION

Ph.D.(transferred) Sep. 2019 - Present, Computer Science and Engineering, Boston University, MA

Ph.D. Aug. 2016 - June. 2019, Computer Science and Engineering, University at Buffalo, NY

Advisors: Prof. Marco Gaboardi

M.S Aug.2014 - Feb.2016, Computer Science and Engineering, University at Buffalo

B.S. Sep. 2010 - Jun. 2014, Electronic Engineering, Tianjin University, Tianjin, China

EMPLOYMENT

Software Engineer Intern	Zuora, Beijing,China	June. 2016 - Aug. 2016
Research Intern	MPI-SWS, Germany	June. 2018 - Aug. 2018
Research Intern	MPI-SWS, Germany	June. 2019 - Aug. 2019

TECHNICAL EXPERIENCE

Restful API : Designed and implemented the 'Revenue Recognition Rule' Restful API for Zuora Finance, designed over 100 JUnit test cases to test the APIs.

Android Programming : Developed a fall detection app which runs in background and alerts when fall is detected, the latency of detection is controlled within 3 seconds.

Database management system : Developed a Java program which takes the SQL query and returns the proper result from the database.

Operating System : Implemented the virtual memory system for the Unix-style operating system OS/161 and basic system calls for file system.

RESEARCH INTERESTS

I have board interests in Programming language and Differential Privacy. I am particularly interested in type-and-effect systems.

PUBLICATIONS

Weihao Qu, Marco Gaboardi, Deepak Garg. *Relational cost analysis for functional-imperative programs.* ACM SIGPLAN International Conference on Functional Programming (ICFP), 2019, Berlin, Germany, August 2019.

Ezgi Cicek, **Weihao Qu**, Gilles Barthe, Marco Gaboardi, Deepak Garg. *Bidirectional Type Checking for Relational Properties.* Programming Language Design and Implementation (PLDI), 2019, Phoenix, Arizona, USA, June 2019.

RESEARCH EXPERIENCE

University at Buffalo
Research Assistant, Sept. 2018 - present
Department of Computer Science and Engineering

(1) **Relational cost analysis for functional-imperative programs**. The difference in the execution cost of two programs is denoted 'relative cost', which has broad applications in compiler optimization, information flow ,and security. We provided a type and effect system 'ARel' which predicts a precise upper bound on the relative cost of two functional imperative programs. To express imperative features, 'ARel' supports mutable arrays. This work also comes with an implementation, a software called 'biARel' which type checks programs in our system. These checked programs involve Fast-Fourier Transform, Insertion Sort, Naiver String Search algorithm ,etc.

(2) **Programming Framework on Adaptive Data Analysis**. An adaptive data analysis is based on multiple queries over a data set, in which some queries rely on the results of some other queries and results in high generalization errors. To address this issue, data analysts are adopting different mechanisms in their algorithms. To better utilize these mechanisms requires au understanding of the depth of chain of queries these mechanisms can generate in the data analysis. Our framework provides a language whose type system can provide the upper bound on the aforementioned adaptive depth.

MPI-SWS
Research Intern, June. 2018 - Aug. 2018 ; June. 2019 - Aug. 2019

(3) **Bidirectional Type Checking for Relational Properties**. Relational type systems have broad applications in information flow, differential privacy, and cost analysis. These relational type systems often use relational refinement and relational effects to exploit the similarity of the structure of two programs. However, relational type systems do not achieve the practical appeal as their non-relational counterpart, in part due to the lack of a general foundation for implementation. We take a step in this direction and develop bidirectional type checking for systems with relational refinements and effects.

TEACHING EXPERIENCE

University at Buffalo
Teaching Assistant
Sep. 2016 - Dec. 2016, *CSE115 & 116: Introduction to Computer Science I, II*
Jan. 2017 - May. 2018, *CSE305 : Introduction on Programming Language*
Provided recitations twice per week for 30 undergrads, Graded exams and online homework, mentored course projects, and held office hours for students.

PROGRAMMING LANGUAGES

OCaml, SML, Java, C, Matlab, JavaScript, SQL.

PROFESSIONAL SERVICE

- NII Shonan School: Attender of meetings on Semantics of Effects, Resources, and Applications
- POPL2018 SRC: Presenter of Relational Cost Analysis with State (poster) & Volunteer
- EGLPLS2019 : Presenter of Relational Cost Analysis for functional-imperative Programs. (talk)
- ICFP2019: Presenter of Relational Cost Analysis for functional-imperative Programs. (talk)