Kaituo Li

Department of Computer Science,
140 Governors Drive
University of Massachusetts, Amherst
MA 01003, USA

Cell Phone: 413-887-9355
Email: kaituo@cs.umass.edu
http://www.linkedin.com/in/kaituo
http://people.cs.umass.edu/~kaituo

Research Interests

Software Engineering

- Program analysis and testing (invariant inference, symbolic execution, automated test generation, testing of distributed and concurrent systems).

Image Processing

- Digital watermarking and information embedding

Education

- **University of Massachusetts, Amherst** — Amherst, MA
  Ph.D. in Computer Science — *Dec 2012 – present*
  Advisor: Yannis Smaragdakis
- **University of Massachusetts, Amherst** — Amherst, MA
  Master of Science in Computer Science—GPA: 3.67 — *Sep 2009 – Nov 2012*
  Advisor: Yannis Smaragdakis
- **Zhejiang University** — Hangzhou, China
  Master of Engineering in Software Engineering—GPA: 3.88 — *Sep 2007 – Jul 2009*
  Entrance exam waived based on outstanding undergraduate record
  Department rank: 1 (Department size: 139 graduates)
- **Jilin University** — Changchun, China
  Bachelor of Engineering in Software Engineering—GPA: 3.83 — *Sep 2003 – Jul 2007*
  Department rank: 1 (Department size: 231 graduates)

Publications List

◆ **Journal Papers**

1. **Kaituo Li**, Christoph Reichenbach, Christoph Csallner, and Yannis Smaragdakis, "**Residual Investigation: Predictive and Precise Bug Detection**", ACM Transactions on Software Engineering and Methodologies, Vol. 24, No. 2, 2014.
2. **Kaituo Li**, Yu Hu and Jiachen Zhang, "**Design and implementation of software firewall supporting dynamic evolution**," *Journal of Computer Applications*, Vol. 28, No. S1, pp. 302-304, 2008 (in Chinese).

◆ **Conferences Papers** [with acceptance rate]

1. **Kaituo Li,** Pallavi Joshi, Aarti Gupta, and Malay K. Ganai. "ReproLite: A Lightweight Tool to Quickly Reproduce Hard System Bugs", in: The ACM Symposium on Cloud

Computing 2014 (SoCC 2014), 2014. [24%]

2. **Kaituo Li,** Christoph Reichenbach, Yannis Smaragdakis, and Michal Young**,** "**Second-Order Constraints in Dynamic Invariant Inference**"**,** in: The 2013 9th Joint Meeting on Foundations of Software Engineering (ESEC/FSE 2013), 2013. [20%]
3. **Kaituo Li**, Christoph Reichenbach, Yannis Smaragdakis, Yanlei Diao, Christoph Csallner, **"SEDGE: Symbolic Example Data Generation for Dataflow Programs",** in: The 28th IEEE/ACM International Conference on Automated Software Engineering (ASE 2013), 2013. [17%]
4. **Kaituo Li**, Christoph Reichenbach, Christoph Csallner, and Yannis Smaragdakis, "**Residual Investigation: Predictive and Precise Bug Detection**", in: The 2012 International Symposium on Software Testing and Analysis (ISSTA 2012), 2012. **ACM SIGSOFT Distinguished Paper Award.** [28.7%]

◆ **Refereed Workshop**

1. **Kaituo Li**, Dan Zhang and Dr Chen, "**Exposure time change attack on image watermarking systems**", in: The 7th International Workshop on Digital Watermarking (IWDW 2008), pp. 170-183, 2008.
2. **Kaituo Li**, Dan Zhang, "**Attack on digital watermarking based on exposure**," in: The 14th National Conference on Image and Graphics (NCIG2008), pp. 162-165, 2008 (in Chinese).

Research Experience

Graduate Research Assistant — Sep 2009 to Jan 2012
Yannis Smaragdakis — University of Massachusetts Amherst

- Explored techniques for expressing, discovering, and employing statically known constraints for improving dynamically discovered invariants.
- Introduced the concept of "residual investigation" for program analysis and enhanced the static bug analyzer FindBugs with several residual investigations.
- Adapted conventional dynamic-symbolic execution in a conventional programming language to the unique features of the dataflow domain.

Graduate Research Assistant — Sep 2007 to Jun 2009
Deren Chen & Dan Zhang — Zhejiang University, China

- Created a generic digital watermarking attack method for robustness test of image watermarking algorithms.

Undergraduate Research Assistant — Dec 2006 to Jun 2007
Jiachen Zhang — Jilin University, China

- Created a software firewall that can be installed, started, stopped, updated, and uninstalled without bringing down the firewall by using netfilter and OSGi framework.

Teaching Experience

Teaching Assistant — Spring 2014
CMPSCI 326 – Web Programming — University of Massachusetts Amherst

- Act as a venture capitalist. Responsible for grading written assignments, holding office hours, and answering questions in the online discussion forums.

Teaching Assistant — Spring 2015, Fall 2014, Fall 2013
CMPSCI 230 – Computer Systems Principles — University of Massachusetts Amherst

- Led a bi-weekly discussion section. Responsible for holding office hours, grading exams, quiz creation.

Teaching Assistant — Spring 2013, Fall 2012
CMPSCI 220 – Programming Methodology — University of Massachusetts Amherst

- Led a weekly discussion section. Responsible for holding office hours, grading exams.

Teaching Assistant — Spring 2012
CMPSCI 105 – Computer Literacy — University of Massachusetts Amherst

- Taught a semi-weekly lab session. Responsible for holding office hours, grading problem sets and exams.

Industry Experience

Lattice Engines, Inc., Boston, MA — Summer 2014
Engineering Intern

- Created a data mining system that can forecast the time required to complete a job in the Lattice SaaS platform, which can vary for a number of reasons: variance in input data set size, hardware resources, software modifications, network availability, network traffic, etc. This work includes statistical modeling, and building infrastructure to efficiently store, analyze and extract data.

NEC Laboratories America Inc, Princeton, NJ — Summer 2013
Research Intern

- Designed a domain-specific language that allows testers to specify all aspects of a potential scenario that causes a given bug in distributed systems.
- Developed a scheduler that takes control over the distributed system execution to enforce certain schedule of system events.
- Implemented a log extractor that automatically generate potential buggy scenario from a sequence of log messages that a tester believes indicates the cause of the bug.

OriginLab Corporation, Northampton, MA
Software Engineer in Test — Summer 2012

- Implemented and maintained automated tests in C# and Ranorex.
- Worked with development and test engineers to identify software defects.

- Assisted in the research and development of new features.

Professional Service

- Co-reviewer for ICSE 2010, POPL 2013
- Student Volunteer for OOPSLA 2010
- Steward for Graduate Employee Organization, UMass Computer Science Department, Spring 2009
- Graduate Representative, UMass Computer Science Department, 2013

Computer Skills

Software Tools:	Matlab, Ant, Junit, Z3, Origin, Ranorex, scikit-learn, Pandas, JAMS (proficient); Mathematica, LINDO, LINGO, GNU Make, Maven (prior experience)
Programming:	Java, AspectJ (expert); C, C++, SQL, Python, C# (proficient); Bash, Perl, Ruby (prior experience)
Distributed Computing:	Cassandra, Pig, Hadoop, Apache Accumulo (proficient)
Networking:	XML (expert); JavaScript, HTML, CSS, ASP, JSP, Macromedia Dreamweaver (prior experience)
Database:	Microsoft SQL Server, Oracle, MySQL, ODBC, JDBC, DB2, postgreSQL (prior experience)
IDEs:	Eclipse, Visual Studio, Vi (proficient)
Platform:	Windows, Linux/Unix (proficient)

Software

SEDGE: https://github.com/kaituo/sedge/
Designed and implemented SEDGE, a dynamic symbolic execution system that generates test cases to exercise the key behavior of the operators that comprise a Pig Latin program.

usemetainv4daikon: http://code.google.com/p/usemetainv4daikon/
Extended Daikon with an annotation mechanism for "meta-invariants" (a.k.a. second-order constraints). Users can pass a separate configuration file with meta-invariants to Daikon. For instance, they can declare that the precondition of method foo is stronger than that of method bar for unrelated methods foo and bar (even though they don't know what the preconditions are). This changes the Daikon processing of the low-level observations and allows eliminating spurious invariants and adding correct invariants without having to re-run any test suites.

getmetainv: http://code.google.com/p/getmetainv/
Designed and implemented the tool getmetainv that can automatically generate "meta-invariants" (a.k.a. second-order constraints) that are constraints about invariants. For instance, our tool can find the precondition of method foo is stronger than that of method bar with a high degree of precision.

Dsc: http://ranger.uta.edu/~csallner/dsc/index.html
Contributed to the design and implementation of the Dsc dynamic symbolic execution engine. Designed and implemented support for the dynamic symbolic execution of instance methods. In particular, implemented support for the reasoning of constraints on the fields of the receiver object, which enables Dsc to analyze parameter-less instance methods. In addition, implemented support for inferring the variable names from the Java byte code. Introduced a smart expression simplification system using Z3 constraint solver and Java. Improved the implementation of the data structure representing the model (test case) by Z3 constraint solver and the data structure representing the symbolic heap inside the Java virtual machine.

Honors and Awards

- ACM SIGOPS Travel Grants — Oct 2014
- Travel Grant, School of Computer Science, University of Massachusetts Amherst — Sep 2013, Sep 2014
- ACM SIGSOFT Distinguished Paper Award — Jul 2012
- ACM SIGSOFT CAPS Travel Award — Jun 2012, Sep 2013
- He Zhijun Scholarship, China — Jun 2009
- Graduate with Distinction, Zhejiang Province, China — May 2009
- Graduate with Distinction, Zhejiang University, China — May 2009
- Tencent Scholarship, the Highest Band, China — Oct 2008
- First Class Honor Award, Zhejiang University, China — Oct 2008
- Insigma Hengtian Scholarship, China — Dec 2007
- Outstanding Academic Research Ability Scholarship, Jilin University, China — Jun 2007
- First Class Stipend, College of Software Technology, Zhejiang University, China — May 2007, Sep 2008
- Graduate with Distinction, Jilin University, China — Nov 2006
- Excellent League Member, Jilin University, China — Sep 2005
- First Class Scholarship, Jilin University, China — Sep 2004, Sep 2005, Sep 2006, Jun 2007
- Excellent Student, Jilin University, China — Sep 2004, Sep 2005, Sep 2006, Jun 2007
- Outstanding English Ability Scholarship, Jilin University, China — Sep 2004

Professional Membership

Java Community Process (JCP)
Association for Computing Machinery (SIGSOFT).

Relevant Coursework

Discrete Math, Artificial Intelligence, Machine Learning, Theory of Computation, Database Design and Implementation, Advanced Software Engineering, Modern Computer Architecture, Object Oriented Languages, Software Quality Assurance, Case Study of Project Management, System Analysis & Design, Software Requirement Engineering, Webservice Technology, Project Management, Algorithm Analysis and Design, Assembly Language, Computer Networks, Operating System, Fundamentals of Compiler and Implementation, Design Patterns, Computer Security, Probability & Statistics, Unix Tools and Scripting

Reference

Professor Yannis Smaragdakis
email: yannis@smaragd.org
Dept. of Informatics
University of Athens
Ilisia , 15784
Greece

Professor Christoph Reichenbach
email: reichenbach@cs.uni-frankfurt.de
Institute for Informatics
Goethe University Frankfurt
60054 Frankfurt am Main
Germany

Professor Christoph Csallner
email: csallner@uta.edu
Computer Science and Engineering Department
University of Texas at Arlington
Box 19015
Arlington, TX 76019-0015

Professor Michal Young
email: michal@cs.uoregon.edu
1202 Dept. of Computer & Information Science
Deschutes Hall
University of Oregon
Eugene, OR 97403-1202

Dr. Pallavi Joshi
email: pallavi@nec-labs.com
NEC Laboratories America
4 Independence Way #200
Princeton, NJ 08540

Dr. Aarti Gupta
email: gupta.aarti@gmail.com
NEC Laboratories America
4 Independence Way #200
Princeton, NJ 08540