Lingming Zhang

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Research Interests

Software Engineering, in particular: Test Generation, Regression Testing, Mutation Testing, Automated Debugging, Program Transformation and Analysis.

Formal Methods and Programming Languages, in particular: Symbolic Execution, Model Checking, First-Order Logic, Program Invariant Inference, and Points-to Analysis.

Academic Experience

2014 – NOW **Assistant Professor**, The University of Texas at Dallas, USA

2011 – 2014 **Research Assistant**, The University of Texas at Austin, USA

Education Background

2010 – 2014 **Ph.D. student in Software Engineering**, The University of Texas, Austin, USA
Software Verification, Validation and Testing Group
GPA: 3.91, Advisor: Sarfraz Khurshid (khurshid@ece.utexas.edu)

2007 – 2010 **M.S. in Computer Science**, Peking University, Beijing, China
Software Testing and Program Analysis Research Group
GPA: 3.80, Advisor: Lu Zhang (zhanglu@sei.pku.edu.cn)

2003 – 2007 **B.S. in Computer Science**, Nanjing University, Nanjing, China

Conference Publications

[C15] **Lingming Zhang**, Guowei Yang, Neha Rungta, Suzette Person, Sarfraz Khurshid. Feedback-Driven Dynamic Invariant Discovery. In *Proceedings of the International Symposium on Software Testing and Analysis (ISSTA 2014)*, pages 362-372, July 2014.

[C14] **Lingming Zhang**, Lu Zhang, Sarfraz Khurshid. Injecting Mechanical Faults to Localize Developer Faults for Evolving Software. In *Proceedings of the ACM SIGPLAN Conference on Object-Oriented Programming Systems, Languages, and Applications (SPLASH/OOPSLA 2013)*, pages 765-784, October 2013.

[C13] **Lingming Zhang**, Milos Gligoric, Darko Marinov, Sarfraz Khurshid. Operator-based and Random Mutant Selection: Better Together. In *Proceedings of the 28th IEEE/ACM Conference on Automated Software Engineering (ASE 2013)*, pages 92-102, November 2013.

[C12] **Lingming Zhang**, Dan Hao, Lu Zhang, Gregg Rothermel and Hong Mei. Bridging the Gap Between the Total and Additional Test-Case Prioritization Strategies. In *Proceedings of the 35th IEEE/ACM International Conference on Software Engineering (ICSE 2013)*, pages 192-201, May 2013.

[C11] **Lingming Zhang**, Darko Marinov, Sarfraz Khurshid. Faster Mutation Testing Inspired by Test Prioritization and Reduction. In *Proceedings of the International Symposium on Software Testing and Analysis (ISSTA 2013)*, pages 235-245, July 2013.

[C10] Milos Gligoric, **Lingming Zhang**, Cristiano Pereira and Gilles Pokam. Selective Mutation Testing for Concurrent Code. In *Proceedings of the International Symposium on Software Testing and Analysis (ISSTA 2013)*, pages 224-234, July 2013.

[C9] **Lingming Zhang**, Darko Marinov, Lu Zhang, Sarfraz Khurshid. Regression Mutation Testing. In *Proceedings of the International Symposium on Software Testing and Analysis (ISSTA 2012)*, pages 331-341, July 2012.

[C8] **Lingming Zhang**, Miryung Kim, Sarfraz Khurshid. FaultTracer: A Change Impact and Regression Fault Analysis Tool for Evolving Java Programs. In *Proceedings of the 20th ACM SIGSOFT International Symposium on the Foundation of Software Engineering (FSE 2012)*, tool demonstration track, pages 40:1-4, November 2012.

[C7] **Lingming Zhang**, Darko Marinov, Lu Zhang, Sarfraz Khurshid. An Empirical Study of JUnit Test-Suite Reduction. In *Proceedings of the 22nd IEEE International Symposium on Software Reliability Engineering (ISSRE 2011)*, pages 170-179, November 2011.

[C6] Shadi Abdul Khalek, Guowei Yang, **Lingming Zhang**, Darko Marinov, Sarfraz Khurshid. TestEra: A Tool for Testing Java Programs Using Alloy Specifications. In *Proceedings of the 26th IEEE/ACM International Conference on Automated Software Engineering (ASE 2011)*, tool demonstration track, pages 608-611, November 2011.

[C5] **Lingming Zhang**, Miryung Kim, Sarfraz Khurshid. Localizing Failure-Inducing Program Edits Based on Spectrum Information. In *Proceedings of the 27th IEEE International Conference on Software Maintenance (ICSM 2011)*, pages 23-32, September 2011. **Invited to the Special Issue of Journal of Software Maintenance and Evolution (JSME).**

[C4] **Lingming Zhang**, Tao Xie, Lu Zhang, Nikolai Tillmann, Jonathan de Halleux. Test Generation via Dynamic Symbolic Execution for Mutation Testing. In *Proceedings of the 26th IEEE International Conference on Software Maintenance (ICSM 2010)*, pages 1-10, September 2010.

[C3] **Lingming Zhang**, Ji Zhou, Dan Hao, Lu Zhang, and Hong Mei. Prioritizing JUnit Test Cases in Absence of Coverage Information. In *Proceedings of the 25th IEEE International Conference on Software Maintenance (ICSM 2009)*, pages 19-28, September 2009.

[C2] **Lingming Zhang**, Ji Zhou, Dan Hao, Lu Zhang, and Hong Mei. Jtop: Managing JUnit Test Cases in Absence of Coverage Information. In *Proceedings of the 24th IEEE/ACM International Conference on Automated Software Engineering (ASE 2009)*, tool demonstration track, pages 677-679, November 2009.

[C1] Dan Hao, **Lingming Zhang**, Lu Zhang, Jiasu Sun and Hong Mei. VIDA: Visual Interactive Debugging. In *Proceedings of the 31st IEEE/ACM International Conference on Software Engineering (ICSE 2009)*, tool demonstration track, pages 583-586, May 2009.

Journal Publications

[J2] **Lingming Zhang**, Miryung Kim, Sarfraz Khurshid. FaultTracer: A Spectrum-Based Approach to Localizing Failure-Inducing Program Edits. *Journal of Software Maintenance and Evolution (JSME)*, accepted for publication. **An extended version of our ICSM 2011 paper.**

[J1] Hong Mei, Dan Hao, **Lingming Zhang**, Lu Zhang, Gregg Rothermel. A Static Approach to Prioritizing JUnit Test Cases. *IEEE Transactions on Software Engineering (TSE)*, Vol.38, No.6, pages 1258-1275, November 2012. **An extended version of our ICSM 2009 paper.**

Industry Experience

Summer 2013 **Google Summer of Code** – Participant

Participated in the 2013 Google Summer of Code. Worked with NASA Ames and NASA Langley research labs on the *iDiscovery* project. Designed and implemented an automated approach guided by symbolic execution and model checking for generating higher-quality program invariants.

Summer 2013 **eBay Inc.**, Austin – Intern

Worked as a software intern for building test sharing and reusing infrastructure for various eBay development teams. Implemented the project using various web-development tools and frameworks, e.g., *Spring*, *ActiveMQ*, *MongoDB*, and so on. The project was highly rated by our manager and director, and was invited for a formal demonstration in eBay San Jose.

Fall 2012 **Intel Inc.**, Silicon Valley – Collaborator

Collaborated with Intel Labs at Silicon Valley in automated evaluation of testing techniques for concurrent code. Implemented *CoMutation*, an automated test evaluation framework for concurrent code based on mutation testing. Performed the first study on reducing the cost of mutation testing for concurrent code using selective mutation.

Summer 2012 **eMetric Inc.**, Berkeley – Intern

Worked as a team leader for building automated test generation infrastructure for web-based systems. Used *Selenium* to automatically generate actual test events based on various strategies. Used *JSCoverage* to evaluate the quality of generated test events and guide the further generation. Found more than 50 bugs during the internship.

2009 – 2010 **Microsoft Research**, Redmond – Collaborator

Collaborated with the Foundations of Software Engineering group in automated test generation. Used mutation testing to guide symbolic execution. Used the Microsoft *Pex* engine with *Z3* SMT solver to solve mutant-killing constraints and generate high-quality test inputs.

2008 – 2009 **IBM China Software Development Lab (IBM CSDL)**, Beijing – Intern

Worked as an intern in the InfoSphere Replication Server Testing group. Manually designed test cases to expose possible faults. Used Perl scripts to automatically test the IBM DB2 system and its interaction with other systems.

Teaching Experience

Spring 2013 Teaching Assistant, Software Testing (EE360T/EE382V), The University of Texas at Austin

Spring 2009 Teaching Assistant, Multi-Agent Technology, Peking University, China

Honors and Awards

Nov. 2013 Chinese Government Award for Outstanding Students Abroad Nominee: 500 outstanding Chinese oversea students selected across 29 countries

May. 2013 ACM SigSoft CAPS Travel Grant for attending ICSE 2013 (USD500)

Nov. 2012 ACM SigSoft CAPS Travel Grant for attending FSE 2012 (USD500)

Jan. 2010 Chiang Chen Oversea PHD Fellowship (USD50,000), awarded to 10 students in the whole China: only 1 student selected from Peking University

Nov. 2009 International Academic Exchange Scholarship (RMB10,000), Peking University

Sep. 2009 Suzhou Industry Scholarship (RMB5,000), Peking University

Apr. 2009 Morgan Stanley Research Fellowship (RMB10,000)

Sep. 2008 Kwang-Hua Scholarship (RMB3,000), Peking University

Aug. 2008 Excellent Volunteer of the 29th Olympics, Technique Team, National Stadium

Sep. 2006 Second-class people's Scholarship (RMB3,000), Nanjing University

Sep. 2005 Scholarship of Song Ching Ling Foundation (RMB3,000), Nanjing University

Sep. 2004 Scholarship of Song Ching Ling Foundation (RMB3,000), Nanjing University

Sep. 2004 Distinguished Student Award (for social work), Nanjing University

Expertise and Skills

Systems Windows, Mac, and Linux

Languages Java, C#, C++, C, JavaScript, SQL, HTML, Alloy, and SMT

Tools Eclipse, Visual Studio, JUnit, MbUnit, ASM Bytecode Manipulation Framework, Eclipse JDT, Common Compiler Infrastructure, Java PathFinder, Javalanche, Pex, Selenium, JSCoverage, MySQL, IBM DB2, Subversion, Git, MongoDB, ActiveMQ, Raptor, Spring, jQuery, IBM Symphony ILP Solver, and Z3 SMT Solver

Professional Service

PC Member 30th IEEE International Conference on Software Maintenance (ICSM 2014)

PC Member 25th IEEE International Symposium on Software Reliability Engineering (ISSRE 2014)

AEC Member ACM SIGPLAN Conference on Object-Oriented Programming Systems, Languages, and Applications (OOPSLA 2014)

AEC Member International Symposium on Software Testing and Analysis (ISSTA 2014)

PC Member 29th IEEE International Conference on Software Maintenance (ICSM 2013)

Reviewer IEEE Transaction on Software Engineering (TSE 2014)

Reviewer Journal of Software Testing, Verification and Reliability (STVR 2014)

Reviewer IEEE Transaction on Software Engineering (TSE 2013)

Reviewer Journal of Software Testing, Verification and Reliability (STVR 2013)

Reviewer IEEE Transaction on Software Engineering (TSE 2012)

Co-Reviewer	22rd International Symposium on the Foundations of Software Engineering (FSE 2014)
Co-Reviewer	International Symposium on Software Testing and Analysis (ISSTA 2014)
Co-Reviewer	28th IEEE/ACM Conference on Automated Software Engineering (ASE 2013)
Co-Reviewer	21rd International Symposium on the Foundations of Software Engineering (FSE 2013)
Co-Reviewer	6th International Conference on Software Testing, Verification and Validation (ICST 2013)
Co-Reviewer	11th ACM Workshop on Program Analysis for Software Tools and Engineering (PASTE 2013)
Co-Reviewer	28th ACM Symposium On Applied Computing (SAC 2013)
Co-Reviewer	20th International Symposium on the Foundations of Software Engineering (FSE 2012)
Co-Reviewer	18th International Symposium on Formal Methods (FM 2012)
Co-Reviewer	27th IEEE/ACM International Conference on Automated Software Engineering (ASE 2012)
Co-Reviewer	IEEE Transaction on Software Engineering (TSE 2011)
Co-Reviewer	26th IEEE/ACM International Conference on Automated Software Engineering (ASE 2011)
Co-Reviewer	International Symposium on Software Testing and Analysis (ISSTA 2011)
Co-Reviewer	The Java PathFinder Workshop 2011
Volunteer	24th IEEE International Conference on Software Maintenance (ICSM 2008)

Conference Talks

ASE 2013	Operator-based and Random Mutant Selection: Better Together, Nov. 2013.
OOPSLA 2013	Injecting Mechanical Faults to Localize Developer Faults for Evolving Software, Oct. 2013.
ISSTA 2013	Faster Mutation Testing Inspired by Test Prioritization and Reduction, Jul. 2013.
ISSTA 2013	Selective Mutation Testing for Concurrent Code, Jul. 2013.
ICSE 2013	Bridging the Gap Between Total and Additional Test Prioritization Strategies, May 2013.
FSE 2012	A Change Impact and Regression Fault Analysis Tool for Evolving Java Programs, Nov. 2012.
ISSTA 2012	Regression Mutation Testing, Jul. 2012.
ISSRE 2011	An Empirical Study of JUnit Test-Suite Reduction, Nov. 2011.
ICSM 2011	Localizing Failure-Inducing Program Edits Based on Spectrum Information, Sep. 2011.
ICSM 2009	Prioritizing JUnit Test Cases in Absence of Coverage Information, Sep. 2009.

Guest Lectures

Nov. 2013	**University of Illinois at Urbana-Champaign.** *Regression Testing and Mutation Testing in Tandem*, invited by Prof. Darko Marinov.
Nov. 2013	**University of Texas at San Antonio.** *Using Regression Mutation Testing to Detect and Localize Software Bugs*, invited by Prof. Xiaoyin Wang.
Nov. 2013	**University of Texas at Austin.** *Localizing Failure-Inducing Program Edits Based on Spectrum Information*, Course EE461L by Prof. Miryung Kim, Software Engineering and Design.
Mar. 2013	**University of Texas at Austin.** *FaultTracer: A Change Impact and Regression Fault Analysis Tool for Evolving Java Programs*, Course EE382C by Prof. Sarfraz Khurshid, Verification and Validation of Software.
Feb. 2013	**University of Texas at Austin.** *Automated Fault Localization Techniques*, Course EE360T by Prof. Sarfraz Khurshid, Software Testing.
Nov. 2012	**University of Texas at Austin.** *Towards Localizing Failure-Inducing Program Edits*, Course EE382V by Prof. Sarfraz Khurshid, Verification and Validation of Software.
Sep. 2012	**University of Texas at Austin.** *Introduction to Fault Localization*, Course EE382C by Prof. Sarfraz Khurshid, Verification and Validation of Software.
Apr. 2012	**University of Texas at Austin.** *Test generation via Dynamic Symbolic Execution for Mutation Testing*, Course EE382C by Prof. Sarfraz Khurshid, Verification and Validation of Software.
Feb. 2012	**University of Texas at Austin.** *Localizing Failure-Inducing Program Edits Based on Spectrum Information*, Course EE360T by Prof. Sarfraz Khurshid, Software Testing.
Jun. 2011	**Texas Symposium on Software Engineering.** *TestEra: Testing Java programs using Alloy specifications*, invited talk.

References

Supervisor	**Dr. Sarfraz Khurshid**, Associate Professor

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Department of Computer Science, University of Illinois at Urbana-Champaign
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201 N. Goodwin Ave., Urbana, IL 61801, USA

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Electrical and Computer Engineering, The University of Texas at Austin
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Co-Author **Dr. Gregg Rothermel**, Professor and Jensen Chair of Software Engineering
Department of Computer Science and Engineering, University of Nebraska at Lincoln
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366 Avery Hall, University of Nebraska, Lincoln, Nebraska, 68588

Committee Chair **Dr. Dewayne E. Perry**, Professor and Motorola Regents Chair of Software Engineering
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