

# Linhai Song

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## Interests

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- Performance Optimization & Tuning for Large Software
- Program Analysis and Software Testing

## Employment

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FireEye Research Labs, FireEye, Inc. Staff Research Scientist	CALIFORNIA, USA 2015.11 – Present
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## Education

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University of Wisconsin-Madison Ph.D. in Computer Science (M.S. along the way) Advisor: Shan Lu Thesis: Understanding, Detecting, and Diagnosing Real-World Performance Bugs	WISCONSIN, USA 2010.08 – 2015.10
Institute of Computing Technology, Chinese Academy of Sciences M.S. in Computer Science Advisor: Xueqi Cheng	BEIJING, CHINA 2007.08 – 2010.06
Huazhong University of Science and Technology B.E. in Software Engineering	HUBEI, CHINA 2003.08 – 2007.06

## Academic Award

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### MICRO Best Paper Runner Up, 2014

- “COMP: Compiler Optimizations for Manycore Processors” published in MICRO’2014
- One of five papers selected from 273 MICRO’2014 submissions

### ACM SIGPLAN Research Highlights Award, 2011

- “Automated Atomicity-Violation Fixing” published in PLDI’2011
- One of eight papers selected from all papers published in 13 ACM SIGPLAN conferences in 2011

## Research Experience

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Staff Research Scientist, FireEye Research Labs	2015.11 – Present
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- Conduct data mining for the security repository on VirusTotal;
- Design and implement an end-point anti-virus system;
- Design and implement algorithms to calculate similarity between JavaScript programs.

Research Assistant, University of Wisconsin-Madison	2011.01 – 2015.10
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- Design and implement a series of static-dynamic hybrid analysis for inefficient loops;
- Study the correlation between features of critical sections and their change histories;
- Explore the design space of applying statistical debugging to performance failure diagnosis;
- Implement a dynamic technique to detect inefficient nested loops for C/C++ programs;
- Design and implement a series of static rule-based detectors for performance bugs;
- Conduct a comprehensive study on 110 real-world performance bugs;

- Implement the deadlock detection module in an atomicity violation concurrent bug fixing project.

**Research Intern, FutureWei Technologies Inc.**

2014.05 – 2014.09

- Demonstrate a static bug detection technique for inefficient loops with Cond-Break fixes;
- Demonstrate a failure diagnosis technique built on hardware performance counters.

**Research Intern, NEC Labs America**

2013.05 – 2013.08

- Explore performance bottlenecks for Intel Xeon Phi manycore coprocessors (MIC);
- Design and implement three source-to-source compiler optimizations for parallel loops which offload computation to MIC.

**Research Intern, Microsoft Research Asia**

2010.05 – 2010.07

- Design and implement a toolkit for graphical model inference based on secondary development on Visio;
- Get **excellent** assessment for this project.

**Research Assistant, Institute of Computing Technology, Chinese Academy of Sciences**

2007.09 – 2010.05

- Design two separate algorithms to extract news articles and blog posts respectively;
- Implement the web content extraction module for a web retrieve system.

## Publications

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### Refereed Conference Publications

1. **Linhai Song**, Shan Lu  
*Program Analysis for Inefficient Loops*, **Under Submission**.
2. Rui Gu, Guoliang Jin, **Linhai Song**, Linjie Zhu, Shan Lu  
*What Change History Tells Us About Thread Synchronization*, **FSE'2015**.
3. **Linhai Song**, Min Feng, Nishkam Ravi, Yi Yang, Srimat Chakradhar  
*COMP: Compiler Optimizations for Manycore Processors*, **MICRO'2014**.  
**Won MICRO'2014 Best Paper Runner Up**
4. **Linhai Song**, Shan Lu  
*Statistical Debugging for Real-World Performance Problems*, **OOPSLA'2014**.  
(A followup work is under submission.)
5. Adrian Nistor, **Linhai Song**, Darko Marinov, Shan Lu  
*Toddler: Detecting Performance Problems via Similar Memory-Access Patterns*, **ICSE'2013**.
6. Guoliang Jin\*, **Linhai Song\***, Xiaoming Shi, Joel Scherpelz, Shan Lu  
*Understanding and Detecting Real-World Performance Bugs*, **PLDI'2012**.  
(\*: alphabetical order of surnames)  
**Most cited paper from PLDI'2012**
7. Guoliang Jin, **Linhai Song**, Wei Zhang, Shan Lu, Ben Liblit  
*Automated Atomicity-Violation Fixing*, **PLDI'2011**.  
**Won ACM SIGPLAN Research Highlights Award**

### Other Publications

1. **Linhai Song**, Heqing Huang, Wu Zhou, Wenfei Wu, Yiyang Zhang  
*Learning from Big Malwares*, **APSys'2016**.
2. **Linhai Song**, Shan Lu  
*Program Analysis for Inefficient Loops*, UChicago CS **Technical Report TR-2016-06**.
3. Dongdong Deng, Guoliang Jin, Marc de Kruijf, Ang Li, Ben Liblit, Shan Lu, Shanxiang Qi, Jinglei Ren, Karthikeyan Sankaralingam, **Linhai Song**, Yongwei Wu, Mingxing Zhang, Wei Zhang, Weimin Zheng  
*Fixing, Preventing, and Recovering from Concurrency Bugs*, **Science China Information Sciences**, April 2015.
4. **Linhai Song**, Shan Lu  
*Statistical Debugging for Real-World Performance Problems*, **GCASR'2015 Poster**.
5. **Linhai Song**, Shan Lu

## Publications before Ph.D

1. Yan Guo, Huifeng Tang, **Linhai Song**, Yu Wang, Guodong Ding  
*ECON: An Approach to Extract Content from Web News Page*, **APWeb'2010** (CCF Class C).
2. **Linhai Song**, Xueqi Cheng, Yan Guo, Bo Wu, Yu Wang  
*Blog Post Extraction Using Title Finding*, **CCIR'2009**.
3. Yu Wang, Bingxing Fang, Bo Wu, **Linhai Song**, Yan Guo  
*Schema Matching Incorporating with Attribute Distribution Features*, **CCIR'2009**.
4. Feng Guan, Xiaoming Yu, Zeying Peng, Hongbo Xu, Yue Liu, **Linhai Song**, Xueqi Cheng  
*ICTNET at Web Track 2009 Ad-hoc Task*, **TREC'2009**.
5. Xueke Xu, Yue Liu, Hongbo Xu, Xiaoming Yu, **Linhai Song**, Feng Guan, Zeying Peng, Xueqi Cheng  
*ICTNET at Blog Track TREC 2009*, **TREC'2009**.
6. Bo Wu, Xueqi Cheng, Yu Wang, Yan Guo, **Linhai Song**  
*Simultaneous Product Attribute Name and Value Extraction from Web Pages*, **WI'2009 workshop**.
7. **Linhai Song**, Xueqi Cheng, Yan Guo, Yue Liu, Guodong Ding  
*ContentEx: A framework for automatic content extraction programs*, **ISI'2009 short**.

## Patents

1. Min Feng, Srimat Chakradhar, **Linhai Song**  
*Compiler Optimization for Many Integrated Core Processors*, U.S. Patent No. 20150277877, Oct 1st, 2015.

## Professional Services

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- Reviewer for the Journal of Computer Science and Technology
- PC member of Artifact Evaluation session in PLDI'2015
- PC member of Artifact Evaluation session in ISSTA'2014

## Talks

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1. Understanding, Detecting, and Diagnosing Real-World Performance Bugs  
National University of Singapore, March 2016
2. Understanding, Detecting, and Diagnosing Real-World Performance Bugs  
Microsoft Research Asia, December 2015
3. Understanding, Detecting, and Diagnosing Real-World Performance Bugs  
Peking University, June 2015
4. Understanding, Detecting, and Diagnosing Real-World Performance Bugs  
Pivotal Labs, May 2015
5. Statistical Debugging for Real-World Performance Problems  
Conference Presentation in OOPSLA'2014, October 2014
6. Statistical Debugging for Real-World Performance Problems  
WISDOM Workshop II, May 2014
7. Optimizing Memory Performance on Many Integrated Core Coprocessors  
NEC Labs America, August 2013
8. Understanding and Detecting Real-World Performance Bugs  
Conference Presentation in PLDI'2012, June 2012
9. Understanding and Detecting Real-World Performance Bugs  
Programming Languages Seminar, University of Wisconsin-Madison, May 2012

## Skills

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- **Languages:** C/C++, C#, Java, Python, PHP, SQL, HTML, JavaScript, Bash
- **Instrumentation & Analysis:** LLVM, PIN, GCC, GDB
- **Tools & Libraries:** Pthread, OMP, STL, SVN, GIT, MySQL, SQLite
- **Platforms:** Linux, Windows, Intel MIC