

# Shan Lu

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## RESEARCH INTERESTS

Tool support for improving the reliability and efficiency of large scale software systems

## EMPLOYMENT

2019 – present Professor, Dept. of Computer Science, University of Chicago  
2014 – 2019 Associate Professor, Dept. of Computer Sciences, University of Chicago  
2009 – 2014 Assistant Professor, Dept. of Computer Sciences, University of Wisconsin – Madison

## EDUCATION

2008 University of Illinois at Urbana-Champaign, Urbana, IL  
Ph.D. in Computer Science  
Thesis: Understanding, Detecting, and Exposing Concurrency Bugs (Advisor: Prof. Yuanyuan Zhou)  
2003 University of Science & Technology of China, Hefei, China  
B.S. in Computer Science

## HONORS AND AWARDS

2019 **Best Paper Award @ SOSP** for paper [C62] (SOSP 2019)  
2019 **ACM Distinguished Member**  
2019 **ACM SIGSOFT Distinguished Paper Award @ ICSE** for paper [C58] (ICSE 2019)  
2017 **Google Scholar Classic Paper Award** for paper [J1] (OSDI 2004 & IEEE-TSE 2006)  
*Top 10 most cited software systems papers published in 2006 based on [Google Scholar](#)*  
2016 **Best Paper Award @ OSDI** for paper [C41] (OSDI 2016)  
2015 **Google Faculty Research Award**  
2015 **ACM SIGSOFT Distinguished Paper Award @ ICSE** for paper [C36] (ICSE 2015)  
2014 **ACM SIGSOFT Distinguished Paper Award @ FSE** for paper [C33] (FSE 2014)  
2014 **Alfred P. Sloan Research Fellow**  
*Among 126 “early-career scholars (who) represent the most promising scientific researchers working today”*  
2013 **Best Paper Award @ FAST** for paper [C29] (FAST 2013)  
2013 **Distinguished Alumni Educator Award**  
*Among 3 awardees selected by Department of Computer Science, University of Illinois*  
2011 **ACM SIGPLAN Research Highlights @ PLDI** for paper [C22] (PLDI 2011)  
2010 **NSF Career Award**  
2006 **IEEE Micro Top Picks in Computer Architecture @ ASPLOS** for paper [C8] (ASPLOS 2006)

## PROFESSIONAL SERVICE HIGHLIGHTS

**Professional Society**  
2019 – present ACM SIGOPS Chair  
2015 – 2019 ACM SIGOPS Vice Chair  
**Conference Program Chairs**  
2020 USENIX Symposium on Operating Systems Design and Implementation (**OSDI**), with Jon Howell  
2018 ACM SIGSOFT Asia-Pacific Workshop on Systems (**APSys**), with Wenguang Chen  
2015 USENIX Annual Technical Conference (**ATC**), with Erik Riedel  
**Journal Editor**  
2016 – present Associate Editor for IEEE Computer Architecture Letters (**CAL**)  
**Committees**  
Search committee chair for ACM Transactions on Computer Systems Editor-in-Chief (2018)  
Steering committee member of ASPLOS (2016 --), HotOS (2016 --), APSys (2018 --)

Program committee member of SOSOP ('17,'15,'13), OSDI ('16,'12,'10), ASPLOS ('19—'17,'14), PLDI ('17,'15,'13)  
Distinguished referee of ACM Transactions on Software Engineering and Methodology (2013—2014)

## RESEARCH AND CREATIVE SCHOLARSHIP<sup>1</sup>

### Refereed Conference Papers

- ICML'20** C68. Chengcheng Wan<sup>S</sup>, Henry Hoffmann, Shan Lu, and Michael Maire. "Orthogonalized SGD and Nested Architectures for Anytime Neural Networks", International Conference on Machine Learning, 2020. (Acceptance Rate: 21.8%, 1088 out of 4990)
- FSE'20** C67. Rahmadi Trimananda, Seyed Amir Hossein Aqajari, Jason Chuang, Brian Demsky, Guoqing Harry Xu, and Shan Lu, "Understanding and Automatically Detecting Conflicting Interactions between Smart Home Applications", The International Symposium on Foundations of Software Engineering, 2020. (Acceptance Rate: 28.0%, 101 out of 360)
- ATC'20** C66. Chengcheng Wan<sup>S</sup>, Muhammad Santrijaji, Eri Rogers<sup>S</sup>, Henry Hoffmann, Michael Maire, and Shan Lu, "ALERT: Accurate Learning for Energy and Timeliness", The USENIX Annual Technical Conference, 2020. (Acceptance Rate: 18.6%, 65 out of 348)
- EuroSys'20** C65. Chi Li<sup>S</sup>, Shu Wang<sup>S</sup>, Henry Hoffmann, and Shan Lu, "Statically Inferring Performance Properties of Software Configurations", The EuroSys 2020. (Acceptance Rate: 18.4%, 43 out of 234)
- ICSE'20** C64. Junwen Yang<sup>S</sup>, Utsav Sethi<sup>S</sup>, Cong Yan, Alvin Cheung, and Shan Lu, "Managing Data Constraints In Database-Backed Web Applications", The 42<sup>nd</sup> International Conference on Software Engineering, 2020. (Acceptance Rate: 20.9%, 129 out of 617)
- CIDR'20** C63. Cong Yan, Alvin Cheung, Junwen Yang<sup>S</sup>, Shan Lu, "View-Driven Optimization of Database-Backed Web Applications", The Conference on Innovative Data Systems Research, January 2020.
- SOSP'19** C62. Guangpu Li<sup>S</sup>, Shan Lu, Madanlal Musuvathi, Suman Nath, Rohan Padhye, "Efficient and Scalable Thread-Safety Violation Detection --- Finding Thousands of Concurrency Bugs During Testing", Symposium on Operating Systems Principles, October 2019. (Acceptance Rate: 13.8%, 38 out of 276)  
**Won SOSP Best Paper Award.**
- SOSP'19** C61. Cheng Cai, Christian Navasca, Khanh Nguyen, Brian Demsky, Shan Lu, Miryung Kim, Guoqing Xu, "Generuk: Thin Computation over Big Native Data Using Speculative Program Transformation", Symposium on Operating Systems Principles, October 2019. (Acceptance Rate: 13.8%, 38 out of 276)
- PLDI'19** C60. Guangpu Li<sup>S</sup>, Haopeng Liu<sup>S</sup>, Xianlan Chen, Haryadi Gunawi, Shan Lu, "DFix: Automatically Fixing Timing Bugs in Distributed Systems", 40<sup>st</sup> ACM SIGPLAN Conference on Programming Language Design and Implementation, June 2019. (Acceptance Rate: 27.7%, 76 out of 274)
- ICSE'19** C59. Lefan Zhang<sup>S</sup>, Weijia He, Jesse Martinez, Noah Brackenburg, Shan Lu, and Blase Ur, "Synthesizing and Repairing Trigger-Action Programs Using LTL Properties", The 41<sup>st</sup> International Conference on Software Engineering, May 2019. (Acceptance Rate: 20.6%, 109 out of 529)
- ICSE'19** C58. Junwen Yang<sup>S</sup>, Cong Yan, Chengcheng Wan<sup>S</sup>, Shan Lu, and Alvin Cheung, "View-Centric Performance Optimization for Database-Backed Web Applications", The 41<sup>st</sup> International Conference on Software Engineering, May 2019. (Acceptance Rate: 20.6%, 109 out of 529)  
**Won SIGSOFT Distinguished Paper Award. Featured on "a morning paper"**
- EuroSys'19** C57. Jeffrey F. Lukman, Huan Ke, Cesar A. Stuardo, Riza O. Suminto, Dikaimin Simon, Daniar H.

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<sup>1</sup> Students directly under my supervision are denoted by "S"

Kurniawan, Satria Priambada, Chen Tian, Feng Ye, Tanakorn Leesatapornwongsa, Aarti Gupta, Shan Lu, Haryadi S. Gunawi “Highly Scalable Testing of Complex Interleavings in Cloud Systems”, EuroSys, 2019. (Acceptance Rate: 21.7%, 45 out of 207)

- FAST’19** C56. Cesar A. Stuardo, Tenakorn Leesatapornwongsa, Riza O. Suminto, Huan Ke, Jeffrey F. Lukman, Wei-Chiu Chuang, Shan Lu, Haryadi S. Gunawi, “SCK: A Single-Machine Approach for Discovering Scalability Bugs in Large Systems”, 17th USENIX Conference on File and Storage Technologies, Feb. 2019. (Acceptance Rate: 17.9%, 26 out of 145)
- ASPLOS’18** C55. Haopeng Liu<sup>5</sup>, Xu Wang, Guangpu Li<sup>5</sup>, Shan Lu, Feng Ye, and Chen Tian, “FCatch: Automatically Detecting Time-of-Fault Bugs in Cloud Systems”, 23rd International Conference on Architectural Support for Programming Languages and Operating Systems. (Acceptance Rate: 18.2%, 56 out of 307)
- ASPLOS’18** C54. Shu Wang<sup>5</sup>, Chi Li<sup>5</sup>, William Sentosa<sup>5</sup>, Henry Hoffmann, and Shan Lu, “Understanding and Auto-Adjusting Performance-Sensitive Configurations”, 23rd International Conference on Architectural Support for Programming Languages and Operating Systems. (Acceptance Rate: 18.2%, 56 out of 307)
- ASPLOS’18** C53. Khanh Nguyen, Lu Fang, Christian Navasca, Guoqing Harry Xu, Brian Demsky, and Shan Lu, “Skyway: Connecting Managed Heaps in Distributed Big Data Systems”, 23rd International Conference on Architectural Support for Programming Languages and Operating Systems, March 2018. (Acceptance Rate: 18.2%, 56 out of 307)  
*Featured on “[a morning paper](#)”*
- ICSE’18** C52. Junwen Yang<sup>5</sup>, Cong Yan, Pranav Subramaniam<sup>5</sup>, Shan Lu, and Alvin Cheung, “A Comprehensive Study and Discovery of Performance Problems in Database-Backed Web Applications”, The 40th International Conference on Software Engineering, 2018. (Acceptance Rate: 20.9%, 105 out of 502)  
*Featured on “[a morning paper](#)” and “[Hacker News](#)”*
- ATC’18** C51. Yuxi Chen<sup>5</sup>, Shu Wang<sup>5</sup>, Shan Lu, Karthikeyan Sankaralingam, “Applying Hardware Transactional Memory for Concurrency-Bug Failure Recovery in Production Runs”, USENIX Annual Technical Conference, 2018. (Acceptance Rate: 20.1%, 76 out of 378)
- EuroSys’18** C50. Jiaxin Li<sup>5</sup>, Yuxi Chen<sup>5</sup>, Haopeng Liu<sup>5</sup>, Shan Lu, Yiming Zhang, Haryadi Gunawi, Xiaohui Gu, Dongsheng Li, and Xicheng Lu, “PCatch: Automatically Detecting Performance Cascading Bugs in Cloud Systems”, EuroSys, April 2018. (Acceptance Rate: 16.4%, 43 out of 262)
- IC2E’18** C49. Ting Dai, Jingzhu He, Xiaohui Gu, and Shan Lu, “Understanding Real-World Timeout Problems in Cloud Server Programs”, IEEE International Conference on Cloud Engineering (IC2E), April 2018. (Acceptance Rate: 19.0%, 12 out of 63)  
*[Nominated for Best Paper Award](#)*
- SoCC’18** C48. Ting Dai, Jingzhu He, Xiaohui Gu, Shan Lu, and Peipei Wang, “DScope: Detecting Real-World Data Corruption Hang Bugs in Cloud Server Applications”, ACM Symposium on Cloud Computing, Nov. 2018. (Acceptance Rate: 24.3%, 39 out of 160)
- FSE-demo’18** C47. Junwen Yang<sup>5</sup>, Cong Yan, Pranav Subramaniam<sup>5</sup>, Shan Lu, and Alvin Cheung, “PowerStation: Automatically detecting and fixing inefficiencies of database-backed web applications in IDE”, 32nd ACM SIGSOFT International Symposium on the Foundations of Software Engineering [Demo-Track], November 2018. (Acceptance Rate: 38.8%, 14 out of 36)
- ASPLOS’17** C46. Haopeng Liu<sup>5</sup>, Guangpu Li<sup>5</sup>, Jeffrey F. Lukman, Jiaxin Li<sup>5</sup>, Shan Lu, Haryadi S. Gunawi, and Chen Tian, “DCatch: Automatically Detecting Distributed Concurrency Bugs in Cloud Systems”, 22nd International Conference on Architectural Support for Programming Languages and Operating Systems, April 2017.

(Acceptance Rate: 17.4%, 56 out of 321)

- ICSE'17** C45. Linhai Song<sup>S</sup>, and Shan Lu, "Performance Diagnosis for Inefficient Loops", The 39th International Conference on Software Engineering, May 2017. (Acceptance Rate: 16.4%, 68 out of 415)
- ICSE'17** C44. Ankit Choudhary, Shan Lu, and Michael Pradel, "Efficient Detection of Thread Safety Violations via Coverage-Guided Generation of Concurrent Tests", The 39th International Conference on Software Engineering, May 2017. (Acceptance Rate: 16.4%, 68 out of 415)
- CIKM'17** C43. Cong Yan, Junwen Yang<sup>S</sup>, Alvin Cheung, and Shan Lu, "Understanding Database Performance Inefficiencies in Real-World Web Applications", ACM International Conference on Information and Knowledge Management, November 2017. (Acceptance Rate: 21%, 171 out of 820)
- ASPLOS'16** C42. Jeffrey F. Lukman, Tanakorn Leesatapornwongsa, Shan Lu, and Haryadi S. Gunawi, "TaxDC: A Taxonomy of Concurrency Bugs in Datacenter Distributed Systems", 21st International Conference on Architectural Support for Programming Languages and Operating Systems, April 2016. (Acceptance Rate: 22.1%, 53 out of 240)
- OSDI'16** C41. Tianyin Xu, Xinxin Jin, Peng Huang, Yuanyuan Zhou, Shan Lu, Long Jin, Shankar Pasupathy, "Early Detection of Configuration Errors to Reduce Failure Damage", 12th USENIX Symposium on Operating Systems Design and Implementation, November 2016. (Acceptance Rate: 17.6%, 47 out of 267)  
**Best Paper Award** (among 3 best-paper winners). **Featured on** "[a morning paper](#)"
- OSDI'16** C40. Khanh Nguyen, Lu Fang, Guoqing (Harry) Xu, Brian Demsky, Shan Lu, Sanazsadat Alamian, Onur Mutlu, "Yak: A High-Performance Big-Data-Friendly Garbage Collector", 12th USENIX Symposium on Operating Systems Design and Implementation, 2016. (Acceptance Rate: 17.6%, 47 out of 267)
- FSE'16** C39. Haopeng Liu<sup>S</sup>, Yuxi Chen<sup>S</sup>, and Shan Lu, "Understanding and Generating High Quality Patches for Concurrency Bugs", ACM SIGSOFT International Symposium on the Foundations of Software Engineering, November 2016. (Acceptance Rate: 27.1%, 74 out of 273)
- OOPSLA'16** C38. Zhiqiang Zuo, Lu Fang, Siau Cheng Khoo, Harry Xu, and Shan Lu, "Low-Overhead and Fully Automated Statistical Debugging with Abstraction Refinement", ACM International Conference on Object Oriented Programming Systems Languages and Applications, 2016. (Acceptance Rate: 25.6%, 52 out of 203)
- SOSP'15** C37. Lu Fang, Khanh Nguyen, Guoqing (Harry) Xu, Brian Demsky, and Shan Lu, "[Interruptable Tasks: Treating Memory Pressure As Interrupts for Highly Scalable Data-Parallel Programs](#)", 25th ACM Symposium on Operating Systems Principles, 2015. (Acceptance Rate: 16.1%, 30 out of 186)
- ICSE'15** C36. Adrian Nistor<sup>S</sup>, Po-Chun Chang<sup>S</sup>, Cosmin Rădoi, and Shan Lu, "[CAMEL: Detecting and Fixing Performance Problems That Have Non-Intrusive Fixes](#)", The 37th International Conference on Software Engineering, 2015. (Acceptance Rate: 18.5%, 84 out of 452)  
**Won SIGSOFT Distinguished Paper Award** (among 6 distinguished-paper winners).
- FSE'15** C35. Rui Gu<sup>S</sup>, Guoliang Jin<sup>S</sup>, Linhai Song<sup>S</sup>, Linjie Zhu<sup>S</sup>, and Shan Lu, "[What Change History Tells Us About Thread Synchronization](#)", 29th ACM SIGSOFT International Symposium on the Foundations of Software Engineering, 2015. (Acceptance Rate: 25.4%, 74 out of 291)
- ASPLOS'14** C34. Joy Arulraj<sup>S</sup>, Guoliang Jin<sup>S</sup>, and Shan Lu, "[Leveraging the Short-Term Memory of Hardware to Diagnose Production-Run Software Failures](#)", 19th International Conference on Architectural Support for Programming Languages and Operating Systems, March 2014. (Acceptance Rate: 22.6%, 49 out of 217)

- FSE'14** C33. Mingxing Zhang, Yongwei Wu, Shan Lu, Shanxiang Qi, Jinglei Ren, and Weimin Zheng, "[AI: a Lightweight System for Tolerating Concurrency Bugs](#)", 28th ACM SIGSOFT International Symposium on the Foundations of Software Engineering, 2014. (Acceptance Rate: 22.3%, 61 out of 273) **Won SIGSOFT Distinguished Paper Award (among 6 distinguished-paper winners).**
- OOPSLA'14** C32. Linhai Song<sup>S</sup> and Shan Lu, "[Statistical Debugging for Real-World Performance Problems](#)", International Conference on Object-Oriented Programming, Systems, Languages & Applications, October 2014. (Acceptance Rate: 28.4%, 53 out of 186)
- ASPLOS'13** C31. Joy Arulraj<sup>S</sup>, Po-Chun Chang<sup>S</sup>, Guoliang Jin<sup>S</sup>, and Shan Lu, "[Production-Run Software Failure Diagnosis via Hardware Performance Counters](#)", 18<sup>th</sup> International Conference on Architectural Support for Programming Languages and Operating Systems, March 2013. (Acceptance Rate: 22.7%, 44 out of 193)
- ASPLOS'13** C30. Wei Zhang<sup>S</sup>, Marc de Kruijf, Ang Li<sup>S</sup>, Shan Lu, and Karthikeyan Sankaralingam, "[ConAir: Featherweight Concurrency Bug Recovery Via Single-Threaded Idempotent Execution](#)", 18<sup>th</sup> International Conference on Architectural Support for Programming Languages and Operating Systems, March 2013. (Acceptance Rate: 22.7%, 44 out of 193)
- FAST'13** C29. Lanyue Lu, Andrea C. Arpaci-Dusseau, Remzi H. Arpaci-Dusseau, and Shan Lu, "[A Study of Linux File System Evolution](#)", 11<sup>th</sup> USENIX Conference on File and Storage Technologies, February 2013. (Acceptance Rate: 18.9%, 24 out of 127) **Best Paper Award (among 2 best-paper award winners)**
- ICSE'13** C28. Adrian Nistor<sup>S</sup>, Linhai Song<sup>S</sup>, Darko Marinov, and Shan Lu, "[Toddler: Detecting Performance Problems via Similar Memory-Access Patterns](#)", 35<sup>th</sup> International Conference on Software Engineering, May 2013. (Acceptance Rate: 18.5%, 85 out of 461)
- OOPSLA'13** C27. Dongdong Deng<sup>S</sup>, Wei Zhang<sup>S</sup>, and Shan Lu, "[Efficient Concurrency-Bug Detection Across Inputs](#)", International Conference on Object-Oriented Programming, Systems, Languages & Applications, October 2013. (Acceptance Rate: 26.4%, 50 out of 189)
- CAV'13** C26. William Harris, Guoliang Jin<sup>S</sup>, Shan Lu, and Somesh Jha, "[Validating Library Usage Interactively](#)", 25<sup>th</sup> International Conference on Computer Aided Verification, July 2013.
- OSDI'12** C25. Guoliang Jin<sup>S</sup>, Wei Zhang<sup>S</sup>, Dongdong Deng<sup>S</sup>, Shan Lu, and Ben Liblit, "[Automated Concurrency-Bug Fixing](#)", USENIX Symposium on Operating Systems Design and Implementation, October 2012. (Acceptance Rate: 11.6%, 25 out of 215)
- PLDI'12** C24. Guoliang Jin<sup>S</sup>, Linhai Song<sup>S</sup>, Xiaoming Shi<sup>S</sup>, Joel Scherpelz<sup>S</sup>, and Shan Lu, "[Understanding and Detecting Real-World Performance Bugs](#)", Programming Language Design and Implementation, June 2012. (Acceptance Rate: 18.8%, 48 out of 255)
- ASPLOS'12** C23. Haris Volos, Andres Jaan Tack, Michael Swift, Shan Lu "[Applying Transactional Memory to Concurrency Bugs](#)", 17<sup>th</sup> International Conference on Architectural Support for Programming Languages and Operating Systems, 2012. (Accept. Rate: 21.5%, 37 out of 172)
- PLDI'11** C22. Guoliang Jin<sup>S</sup>, Linhai Song<sup>S</sup>, Wei Zhang<sup>S</sup>, Shan Lu, Ben Liblit, "[Automated Atomicity-Violation Fixing](#)", Programming Language Design and Implementation, 2011. (Acceptance Rate: 23.3%, 55 out of 236) **ACM SIGPLAN Research Highlights Award (Top 8 papers selected from all papers in 13 SIGPLAN conferences in 2011 for "high quality and broad appeal")**
- ASPLOS'11** C21. Wei Zhang<sup>S</sup>, Junghee Lim, Ramya Olichandran<sup>S</sup>, Joel Scherpelz<sup>S</sup>, Guoliang Jin<sup>S</sup>, Shan Lu, Thomas Reps, "[ConSeq: Detecting Concurrency Bugs through Sequential Errors](#)", 16<sup>th</sup> International Conference on

Architectural Support for Programming Languages and Operating Systems, March 2011.  
(Acceptance Rate: 21.0%, 32 out of 152)

- ASPLOS'10** C20. Wei Zhang<sup>5</sup>, Chong Sun<sup>5</sup>, Shan Lu,  
“[ConMem: Detecting Severe Concurrency Bugs through an Effect-Oriented Approach](#)”, 15<sup>th</sup> International Conference on Architectural Support for Programming Languages and Operating Systems, March 2010.  
(Acceptance Rate: 17.7%, 32 out of 181)
- OOPSLA'10** C19. Guoliang Jin<sup>5</sup>, Aditya Thakur, Ben Liblit, Shan Lu,  
“[Instrumentation and Sampling Strategies for Cooperative Concurrency Bug Isolation](#)”, International Conference on Object-Oriented Programming, Systems, Languages & Applications, Oct. 2010.  
(Acceptance Rate: 27%, 45 out of 164)
- OOPSLA'10** C18. Yao Shi, Soyeon Park, Zuoning Yin, Shan Lu, Yuanyuan Zhou, Wenguang Chen, Weimin Zheng,  
“[DefUse: Definition-Use Invariants for Detecting Concurrency and Sequential Bugs](#)”, International Conference on Object-Oriented Programming, Systems, Languages & Applications, Oct. 2010.  
(Acceptance Rate: 27%, 45 out of 164)
- SIGMETRICS** C17. YadiMa, Suman Banerjee, Shan Lu, Cristian Estan,  
“[Leveraging Parallelism for Multi-dimensional Packet Classification on Software Routers](#)”, ACM SIGMETRICS International Conference on Measurement and Modeling of Computer Systems, June 2010.  
(Acceptance Rate: 16%, 29 out of 184)
- SOSP'09** C16. Soyeon Park, Weiwei Xiong, Zuoning Yin, Rini Kaushik, Kyu H. Lee, Shan Lu, Yuanyuan Zhou,  
“[PRES: Probabilistic Replay with Execution Sketching on Multiprocessors](#)”, 22<sup>nd</sup> ACM Symposium on Operating Systems Principles, October 2009.  
(Acceptance Rate: 16.4%, 23 out of 140)
- ASPLOS'09** C15. Soyeon Park, Shan Lu, Yuanyuan Zhou,  
“[CTrigger: Exposing Atomicity Violation Bugs from Their Hiding Places](#)”, 14<sup>th</sup> International Conference On Architectural Support for Programming Languages and Operating Systems, March 2009.  
(Acceptance Rate: 25.7%, 29 out of 113)
- ASPLOS'08** C14. Shan Lu, Soyeon Park, Eunsoo Seo, Yuanyuan Zhou,  
“[Learning from mistakes — a comprehensive study of real world concurrency bug characteristics](#)”, 13<sup>th</sup> International Conference on Architectural Support for Programming Languages and Operating Systems.
- SOSP'07** C13. Shan Lu, Soyeon Park, Chongfeng Hu, Xiao Ma, Weihang Jiang, Zhenmin Li, Raluca Popa, Yuanyuan Zhou, “MUVI: Automatically Inferring Multi-Variable Access Correlations and Detecting Related Semantic and Concurrency Bugs”, 21<sup>st</sup> ACM Symposium on Operating Systems Principles, October 2007.
- SOSP'07** C12. Joseph Tucek, Shan Lu, Chengdu Huang, Spiros Xanthos, and Yuanyuan Zhou, “Triage: Diagnosing Production Run Failures at the User’s Site”, 21<sup>st</sup> ACM Symposium on Operating Systems Principles.
- FSE'07** C11. Shan Lu, Weihang Jiang and Yuanyuan Zhou, “A Study of Interleaving Coverage Criteria”, 15<sup>th</sup> ACM SIGSOFT Symposium on the Foundations of Software Engineering (short paper), September 2007.
- EuroSys'07** C10. Joseph Tucek, James Newsome, Shan Lu, Chengdu Huang, Spiros Xanthos, David Brumley, Yuanyuan Zhou and Dawn Song, “Sweeper: A Lightweight End-to-end System for Defending Against Fast Worms”, 2<sup>nd</sup> ACM SIGOPS EuroSys (**EuroSys**), March 2007.
- MICRO'06** C9. Shan Lu, Pin Zhou, Wei Liu, Yuanyuan Zhou, Josep Torrellas, “PathExpander: Architectural Support for Increasing the Path Coverage of Dynamic Bug Detection”, 39<sup>th</sup> Annual IEEE/ACM International Symposium on Microarchitecture, December 2006.

- ASPLOS'06** C8. Shan Lu, Joe Tucek, Feng Qin, and Yuanyuan Zhou, "AVIO: Detecting Atomicity Violations via Access-Interleaving Invariants", 12<sup>th</sup> International Conference on Architecture Support for Programming Languages and Operating Systems, October 2006.  
**IEEE Micro Top Picks Award**  
(Top 11 papers selected from all papers in computer architecture conferences in 2006)
- OSDI'06** C7. Chad Verbowski, Emre Kiciman, Arunvijay Kumar, and Brad Daniels, Shan Lu, Juhan Lee, Yi-Min Wang, Roussi Roussev. "Flight Data Recorder: Monitoring Persistent-State Interactions to Improve Systems Management", 7<sup>th</sup> Symposium on Operating System Design and Implementation, Nov. 2006.
- SIGMETRICS** C6. Chad Verbowski, Brad Daniels, Emre Kiciman, Shan Lu, Roussi Roussev, Yi-Min Wang and Juhan Lee. "Analyzing Persistent State Interactions to Improve State Management", Joint International Conference on Measurement and Modeling of Computer Systems (short paper), June 2006.
- HPCA'05** C5. Feng Qin, Shan Lu and Yuanyuan Zhou, "SafeMem: Exploiting ECC-Memory for Detecting Memory Leaks and Memory Corruption During Production Runs", 10<sup>th</sup> International Symposium on High-Performance Computer Architecture, February 2005.
- OSDI'04** C4. Zhenmin Li, Shan Lu, Suvda Myagmar and Yuanyuan Zhou, "CP-Miner: A Tool for Finding Copy-paste and Related Bugs in Operating System Code", 6<sup>th</sup> Symposium on Operating System Design and Implementation, December 2004.
- MICRO'04** C3. Pin Zhou, Wei Liu, Long Fei, Shan Lu, Feng Qin, Yuanyuan Zhou, Samuel Midkiff and Josep Torrellas, "AccMon: Automatically Detecting Memory-related Bugs via Program Counter-based Invariants", 37<sup>th</sup> Annual IEEE/ACM International Symposium on Micro-architecture, December 2004.
- PCS'04** C2. Keman Yu, Shan Lu, Jiang Li and Shipeng Li, "Half-pixel Motion Estimation Bypass Based on a Linear Model", 24<sup>th</sup> Picture Coding Symposium, December 2004.
- ICICSP'03** C1. Shan Lu, Keman Yu, Jiang Li and Shipeng Li, "A Low Complexity 2-Power Transform for Video Compression", 4<sup>th</sup> International Conference on Information, Communications & Signal Processing, 2003.
- Journal Articles**
- IEEE-TPDS** J10. Yuxi Chen<sup>s</sup>, Shu Wang<sup>s</sup>, Shan Lu, and Karthikeyan Sankaralingam, "Applying Transactional Memory for Concurrency-Bug Failure Recovery in Production Runs", IEEE Transactions on Parallel and Distributed Systems, 2019.
- IEEE-TPDS** J9. Ting Dai, Daniel Dean, Peipei Wang, Xiaohui Gu, Shan Lu, "Hytrace: A Hybrid Approach to Performance Bug Diagnosis in Production Cloud Infrastructures", IEEE Transactions on Parallel and Distributed Systems, Volume 30, Issue 1, 2019.
- IEEE-TSE** J8. Mingxing Zhang, Yongwei Wu, Shan Lu, Shanxiang Qi, Jinglei Ren, Weimin Zheng, "A Lightweight System for Detecting and Tolerating Concurrency Bugs", IEEE Transactions on Software Engineering, Vol. 42, Issue 10, 2016.
- J7. DongDong Deng<sup>s</sup>, GuoLiang Jin<sup>s</sup>, Marc de Kruijf, Ang Li<sup>s</sup>, Ben Liblit, Shan Lu, ShanXiang Qi, JingLei Ren, Karthikeyan Sankaralingam, LinHai Song<sup>s</sup>, YongWei Wu, MingXing Zhang, Wei Zhang<sup>s</sup>, WeiMin Zheng, "Fixing, preventing, and recovering from concurrency bugs", Science China Information Sciences, April 2015.
- ACM-TOS** J6. Lanyue Lu, Andrea C. Arpaci-Dusseau, Remzi H. Arpaci-Dusseau, and Shan Lu, "A Study of Linux File System Evolution, ACM Transactions on Storage, Volume 10, Issue 1, 2014.
- ACM-TOSEM** J5. Wei Zhang<sup>s</sup>, Chong Sun<sup>s</sup>, Junghee Lim, Shan Lu, and Thomas Reps, "ConMem: Detecting Crash-Triggering Concurrency Bugs through an Effect-Oriented Approach", ACM Transactions on Software Engineering and Methodology, Volume 22, Issue 2, 2013.

- IEEE-TODS** J4. Shan Lu, Soyeon Park, and Yuanyuan Zhou, “Detecting Concurrency Bugs From the Perspectives of Synchronization Intentions”, IEEE Transactions on Parallel and Distributed Systems, Vol. 23, Iss. 6, 2012.
- IEEE-TSE** J3. Shan Lu, Soyeon Park, and Yuanyuan Zhou, “Finding Atomicity-Violation Bugs Through Unserializable Interleaving Testing”, IEEE Transactions on Software Engineering, Volume 38, Issue 4, 2011.
- IEEE-Micro** J2. Shan Lu, Joe Tucek, Feng Qin, and Yuanyuan Zhou, “AVIO: Detecting Atomicity Violations via Access-Interleaving Invariants”, **IEEE Micro** Special Issue: Top Picks from Computer Architecture Conferences, January-February 2007.
- IEEE-TSE** J1. Zhenmin Li, Shan Lu, Suvda Myagmar and Yuanyuan Zhou, “CP-Miner: finding copy-paste and related bugs in large-scale software code”, IEEE Transactions on Software Engineering (**IEEE-TSE**), 2006.

#### **Workshop Papers**

- HotOS** W7. Haopeng Liu<sup>5</sup>, Shan Lu, Madan Musuvathi, Suman Nath, “What Bugs Cause Production Cloud Incidents?”, The 17th Workshop on Hot Topics in Operating Systems, May 2019.  
*Featured on “Morning Paper” blog.*
- HotPar** W6. Dongdong Deng<sup>5</sup>, Wei Zhang<sup>5</sup>, Borui Wang<sup>5</sup>, Peisen Zhao<sup>5</sup>, and Shan Lu, “Understanding the Interleaving Space Overlap across Inputs and Software Versions”, USENIX Workshop on Hot Topics in Parallelism, June 2012.
- Evaluate** W5. Joel Scherpelz<sup>5</sup>, and Shan Lu, “Lessons from performance bugs for performance evaluation”, Workshop on Experimental Evaluation of Software and Systems in Computer Science, October 2010.
- WODA** W4. Aditya Thakur, Rathijit Sen, Ben Liblit, and Shan Lu, “Cooperative Crug Isolation”, 7th International Workshop on Dynamic Analysis, July 2009.
- HotDep** W3. Joseph Tucek, Shan Lu, Chengdu Huang, Spiros Xanthos, Yuanyuan Zhou, “Automatic Online Failure Diagnosis at the End-User Site”, 2nd Workshop on Hot Topics in System Dependability, November 2006.
- ASID** W2. Zhenmin Li, Lin Tan, Xuanhui Wang, Shan Lu, Yuanyuan Zhou and Chengxiang Zhai, “Have Things Changed Now? – An Empirical Study of Bug Characteristics in Modern Open Source Software”, 1st Workshop on Architectural and System Support for Improving Software Dependability, October 2006.
- Bug** W1. Shan Lu, Zhenmin Li, Feng Qin, Lin Tan, Pin Zhou and Yuanyuan Zhou, “BugBench: A Benchmark for Evaluating Bug Detection Tools”, Workshop on the Evaluation of Software Defect Detection Tools, 2005.

#### **Magazine Articles**

- ;login:** M2. Lanyue Lu, Andrea Arpaci-Dusseau, Remzi Arpaci-Dusseau, and Shan Lu, “A Study of Linux File System Evolution”, ;login: The USENIX Magazine, Volume 38, Number 3, June 2013.
- CCCF** M1. Shan Lu, “Challenges and Opportunities in Fighting Concurrency Bugs in Multi-threaded Software”, Communications of the China Computer Federation, February 2013.

#### **Patents**

- 2013 P3. Yuanyuan Zhou, Shan Lu, and Joseph Andrew Tucek, “Atomicity Violation Detection Using Access Interleaving Invariants”, U.S. patent No. 8533681, Sep. 10<sup>th</sup>, 2013. (**Licensed to Intel**)
- 2011 P2. Brad Daniels, John Dunagan, Arunvijay Kumar, Juhan Lee, Shan Lu, Roussi Roussev, Chad Verbowski, “Thread Interception and Analysis”, U.S. patent No. 7865777, Jan. 4<sup>th</sup>, 2011.
- 2008 P1. Shan Lu, Keman Yu, Jiang Li, and Shipeng Li, “Low-complexity 2-power transform for image/video compression”, U.S. Patent No. 7379500, May 27<sup>th</sup>, 2008.



## PROFESSIONAL SERVICE

### Professional Society Service

|   |                |
|---|----------------|
| ACM SIGOPS Chair  | 2019 – present |
| ACM SIGOPS Vice Chair   | 2015 – 2019    |
| ACM Transactions on Computer Systems Editor-in-Chief Search Committee Chair | 2018           |
| ACM SIGOPS Information Director   | 2013 – 2015    |
| ACM SIGSOFT Dissertation Award Committee                                    | 2013           |

### Conference Chairing & Steering Committee Service

|   |                 |
|---|-----------------|
| Program Co-Chair for USENIX Symposium on Operating Systems Design and Implementation ( <b>OSDI</b> )                  | 2020            |
| Program Co-Chair for USENIX Annual Technical Conference ( <b>ATC</b> )  | 2015            |
| Steering Committee Member for Architectural Support for Programming Languages and Operating Systems ( <b>ASPLOS</b> ) | 2016 – present  |
| Steering Committee Member for Workshop on Hot Topics in Operating Systems ( <b>HotOS</b> )                            | 2016 -- present |

### Journal Editorship

|   |                |
|---|----------------|
| Associate Editor for IEEE Computer Architecture Letters (CAL) | 2016 --present |
|---|----------------|

### Other Conference & Workshop Organization Service

|  |      |
|--|------|
| Chair for ACM Asia-Pacific Workshop on Systems ( <b>APSys</b> )              | 2018 |
| Co-Organizer for Diversity Workshop at SOSP                                  | 2017 |
| Sponsorship Chair for SOSP   | 2017 |
| Chair for 8th Workshop on Programming Languages and Operating Systems (PLOS) | 2015 |
| Chair for ACM Student Research Competition at ICS                            | 2011 |

### Conference Program Committee Service (selected)

|   |
|---|
| ACM Symposium on Operating Systems Principles ( <b>SOSP</b> ), 2017, 2015, 2013   |
| USENIX Symposium on Operating Systems Design and Implementation ( <b>OSDI</b> ), 2016, 2012, 2010                       |
| ACM SIGPLAN Conference on Programming Language Design and Implementation ( <b>PLDI</b> ), 2017, 2015, 2013              |
| Int. Conf. on Architectural Support for Programming Languages and Operating Systems ( <b>ASPLOS</b> ), 2019--2017, 2014 |
| International Conference on Object-Oriented Programming, Systems, Languages, and Applications ( <b>OOPSLA</b> ), 2014   |
| <b>EuroSys</b> , 2013   |
| IEEE/IFIP International Conference on Dependable Systems and Networks ( <b>DSN</b> ), 2013                              |
| International Conference on Runtime Verification ( <b>RV</b> ), 2012  |
| USENIX Annual Technical Conference ( <b>USENIX ATC</b> ), 2014, 2010  |

### Conference Reviewer Service (selected)

|   |
|---|
| ACM SIGPLAN Conference on Programming Language Design and Implementation ( <b>PLDI</b> ), 2014, 2008                                  |
| USENIX Symposium on Operating Systems Design and Implementation ( <b>OSDI</b> ), 2014   |
| International Conference on Architectural Support for Programming Languages and Operating Systems ( <b>ASPLOS</b> ), 2016, 2013, 2010 |
| International Symposium on Computer Architecture ( <b>ISCA</b> ), 2014, 2013, 2012, 2009  |
| International Symposium on Microarchitecture ( <b>Micro</b> ), 2013, 2012, 2011, 2007   |
| IEEE International Symposium on High-Performance Computer Architecture ( <b>HPCA</b> ), 2013, 2014                                    |

### Funding Proposal Review Service

|   |
|---|
| National Science Foundation, 2014, 2015, 2016, 2017, 2018, 2019, 2020     |
| Natural Sciences and Engineering Research Council of Canada (NSERC), 2012 |
| U.S.-Israel Binational Science Foundation, 2010                           |

## TEACHING

### Courses Taught In University of Chicago

| Course#    | Course Title               | Quarters   |
|------------|----------------------------|--|
| CS 331     | Advanced Operating Systems | 2015 Winter, 2015 Fall, 2016 Fall, 2017 Fall, 2019 Winter, 2020 Winter |
| CS 220     | Software Construction      | 2014 Fall, 2016 Spring, 2017 Winter, 2018 Winter, 2018 Fall, 2019 Fall |
| MPCS 52030 | Operating Systems          | 2018 Spring, 2019 Spring, 2020 Spring                                  |

### Courses Taught In University of Wisconsin

| Term   | Year | Course# | Course Title                      | Size | Evaluation    |
|--------|------|---------|-----------------------------------|------|---------------|
| Spring | 2014 | CS 537  | Introduction to Operating Systems | 49   | 4.60 out of 5 |
| Fall   | 2013 | CS 739  | Distributed Systems               | 31   | 4.38 out of 5 |
| Fall   | 2012 | CS 739  | Distributed Systems               | 24   | 4.57 out of 5 |
| Spring | 2012 | CS 736  | Advanced Operating Systems        | 35   | 4.45 out of 5 |
| Spring | 2011 | CS 736  | Advanced Operating Systems        | 30   | 4.68 out of 5 |
| Fall   | 2010 | CS 537  | Introduction to Operating Systems | 54   | 4.43 out of 5 |
| Spring | 2010 | CS 537  | Introduction to Operating Systems | 40   | 4.41 out of 5 |
| Fall   | 2009 | CS 736  | Advanced Operating Systems        | 29   | 4.56 out of 5 |
| Spring | 2009 | CS 736  | Advanced Operating Systems        | 14   | 4.77 out of 5 |

### Past Ph.D. Students

1. Wei Zhang, 2009 – 2013

Publications: C17, C21, C22, C25, C26, C31, J5, J7, W6

Thesis: Improving concurrent software reliability via an effect-oriented approach

Employment: Researcher at IBM Research T.J. Watson

2. Adrian Nistor, 2012 – 2014 (co-advised with Prof. Darko Marinov)

Publications: C28, C35

Thesis: Understanding, detecting, and repairing performance bugs

Employment: Tenure-track assistant professor at Florida State University

3. Guoliang Jin, 2009 – 2014

Publications: C20, C21, C22, C24, C25, C27, C30, C32, C36, J7

Thesis: Diagnosing and Fixing Concurrency Bugs

Employment: Tenure-track assistant professor at North Carolina State University

4. Linhai song, 2010 – 2015

Publications: C22, C24, C28, C33, C36, C45, J7

Thesis: Understanding, Detecting and Diagnosing Real-World Performance Bugs

Employment: Tenure-track assistant professor at Penn State University

5. Haopeng Liu, 2014 – 2019

Publications: C39, C46, C50, C55, C60, W7

Thesis: MODELING AND TACKLING TIMING BUGS IN MULTI-THREADED SYSTEMS AND DISTRIBUTED SYSTEMS

Employment: Google (Google Brain)

6. Yuxi Chen, 2014 – 2019

Publications: C39, C50, C51, J10

Thesis: PERFORMANCE-FRIENDLY CONCURRENCY BUG FAILURE RECOVERY ANDFIXING

Employment: Facebook

#### **Past Master Students Advised**

1. Joy James Prabhu Arulraj, 2011 -- 2013

Publications: C27, C32

Employment: Carnegie Mellon University for Ph.D.; Tenure-track assistant professor at Georgia Tech University

2. Aaron Gravesdale (Master), 2010 – 2011

Employment: PDFTron

3. Joel Scherpelz (Master), 2009 – 2010

Publications: C21, C24, W5

Employment: Nvidia

4. Po-Chun Chang, 2012 – 2013

Publications: C27, C35

5. Dongdong Deng, 2012 – 2014

Publications: C25, C31, J7, W6

Employment: VMWare

6. Rui Gu, 2013 – 2014

Publications: C36

Employment: Columbia University for Ph.D.

7. Chi Li, 2016 – 2019

Publications: C54, C65

#### **Undergraduate Students Advised**

1. Peisen Zhao, Univ. of Wisconsin, 2011 -- 2012

Winner of the 2011 Dewitt Undergraduate Scholarships; Publications: W6; Employment: Facebook

2. Borui Wang, Univ. of Wisconsin, 2011 – 2012

Publications: W6; Employment: Stanford for Master

3. Linjie Zhu, Univ. of Wisconsin, 2013

Publications: C36

4. Sophia Yang, Univ. of Chicago, 2015

5. Johanna Goergen, Washington & Lee University, 2015

6. Michelle Tocora, Kean University, 2015

7. Grace Lu, University of Chicago, 2016

8. Pranav Subramaniam, University of Chicago, 2017 & 2018

Winner of NSF Graduate Research Fellowship; Publications: C51, C54

9. Woorin Jang, University of Chicago, 2018—2019

10. Erin Rogers, University of Chicago, 2019; Publication: C66
11. Christian Hill, University of Chicago, 2019
12. George Liu, University of Chicago, 2020

## OUTREACH

16. Member of ACM SIGARCH/SIGMICRO CARES Committee 2018  
Committee to Aid Reporting on discrimination and harassment policy violations
15. Co-organizer of Diversity Workshop at SOSP 2017 2017
14. Panelist for the Collegiate Scholars Program at University of Chicago 2017  
*A program that helps high-school students, particularly those from underrepresented groups, from all over the city of Chicago to get prepared for colleges;*
13. Advisor in the Student Inquiry and Research program of Illinois Mathematics & Science Academy 2017  
*Advising a female high-school student for a 4-month research project*
12. Panelist at NSF REU Panel event "Women in Computing" 2016  
*DePaul University, Chicago, IL*
11. Presenter at ACM SIGPLAN Programming Languages Mentoring Workshop @ PLDI 2016
10. CRA-W DREU advisor 2015  
*Hosting two female undergraduate students for summer research*
9. Member of The Women in the Physical Sciences Committee 2015
8. Presenter at USENIX's Women In Advanced Computing Summit (WiAC) 2014
7. Panelist at CRA-W/SOSP Diversity Workshop 2013  
*I was a panelist in the "Demystifying career planning, elevator speeches, and picking good research topics" panel during CRA-W/SOSP Diversity Workshop 2013.*
6. Program committee member of GHC (Grace Hopper Celebration of Women in Computing) Panels, Workshops, and Presentations 2012
5. Volunteers at EYH (Expanding Your Horizons – Young Women Exploring Math and Science Careers), an event for middle-school aged (6-8th grade) girls from south-central Wisconsin 2010, 2011  
*Offering "Computers in Sciences" career sessions to middle-school girls.*
4. Member of ACM-W in University of Wisconsin, Madison 2009--2014  
*Regular dinners/breakfasts with female (prospective) students in our department.*
3. Guest at the freshmen seminar of Women in Science and Engineering (WISE) residential learning community in University of Wisconsin 2009--2013  
*Discussing with freshmen girls who are interested in STEM fields about academics, career planning, etc.*
2. Presenter at CRA-W/SOSP Diversity Workshop 2009  
*I gave a talk on "Hot Topics in Systems" during CRA-W/SOSP Diversity Workshop 2009.*
1. Help supervise female undergraduate students in CRA-W DMP (Computing Research Association - Women Distributed Mentor Project) 2006  
*One of the students (Raluca A. Popa) won the CRA's Outstanding Undergraduate Award in 2009*

## FEDERAL GRANTS

CNS-1956180, CNS Core: Medium: Accurate Anytime Learning for Energy and Timeliness in Software Systems  
National Science Foundation  
Investigator: Shan Lu (PI), Charles E Catlett, Henry Hoffmann, Michael Maire  
Period: 2020 -- 2024  
Amount: \$1,200,000

CCF-1837120, FMitF: Collaborative Research: User-Centered Verification and Repair of Trigger-Action Programs  
National Science Foundation  
Investigator: Blasé Ur (PI), Shan Lu  
Period: 2018 -- 2022  
Amount: \$666,666

CNS-1764039, CSR:Medium:Understanding and Automatically Adjusting Performance Sensitive Software Configurations  
National Science Foundation  
Investigator: Henry Hoffmann (PI), Shan Lu  
Period: 2018 -- 2022  
Amount: \$1,149,113

CNS-1563956, CSR:Medium:DCRUGS:Combating Distributed Concurrency Bugs in Cloud Systems  
National Science Foundation  
Investigator: Haryadi Gunawi (PI), Shan Lu  
Period: 2016 -- 2020  
Amount: \$799,977

IIS-1546543, BIGDATA: Collaborative Research: F: Holistic Optimization of Data-Driven Applications  
National Science Foundation  
Investigator: Shan Lu (PI), Alvin Cheung  
Period: 2015 -- 2018  
Amount: \$1,200,000

CNS-1514256, CSR: Medium:Collaborative Research:Holistic, Cross-Site, Hybrid System Anomaly Debugging for Large Scale Hosting Infrastructures  
National Science Foundation  
Investigator: Xiaohui Gu (PI), Shan Lu  
Period: 2015 -- 2019  
Amount: \$800,000

CCF-1439091, XPS: FULL: CCA: Production-Run Failure Recovery Based Approach to Reliable Parallel Software  
National Science Foundation  
Investigator: Shan Lu (PI), Karthikeyan Sankaralingam  
Period: 2014 -- 2017  
Amount: \$750,000

CCF-1217582, A Framework for Self-Healing Multi-Threaded Software  
National Science Foundation  
Investigator: Shan Lu (PI), Benjamin R. Liblit  
Period: 2012 -- 2015  
Amount: \$499,999

CCF- 1054616, Combating Performance Bugs in Software Systems  
National Science Foundation  
Investigator: Shan Lu (PI)  
Period: 2011 -- 2016  
Amount: \$449,680

CCF- 1018180, Fighting Concurrency Bugs through Effect-Oriented Approaches  
National Science Foundation  
Investigator: Shan Lu (PI)  
Period: 2010 -- 2013  
Amount: \$469,488