

August Shi

Curriculum Vitae

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Research Interests

My research interests are in Software Engineering, with a focus on Software Testing

Employment

2020 – Now Assistant Professor, Department of Electrical and Computer Engineering, The University of Texas at Austin (UT Austin)

Education

2013 – 2020 **Ph.D. Computer Science**, *University of Illinois at Urbana-Champaign (UIUC)*
Advisor: Darko Marinov

2009 – 2013 **B.S. Computer Science**, *UT Austin*

2009 – 2013 **B.S. Electrical and Computer Engineering**, *UT Austin*

Honors and Awards

2019 – 2020 **Mavis Future Faculty Fellowship**, College of Engineering, UIUC

2019 Huawei Midwest Research Summit Best Poster Award

2018 ISSTA/ECOOP 2018 Summer School Scholarship

2017 **ACM SIGSOFT Distinguished Paper Award** at ICSE 2017

2014 NSF Travel Grant for FSE

2014 Conference Travel Grant, UIUC

2013 – 2014 Ray Ozzie Computer Science Fellowship, UIUC

2009 – 2013 Turing Scholars Honors Computer Science Program, UT Austin

2009 – 2013 Engineering Honors Program, UT Austin

2009 – 2013 Virginia and Ernest Cockrell, Jr. Scholarship in Engineering, UT Austin

2009 – 2013 The University of Texas at Austin College Scholar, UT Austin

Publications

20 full conference papers and 7 short papers (1 new idea track, 4 tool demo track, 2 workshop).

- ISSTA'20 [27] Saikat Dutta, **August Shi**, Rutvik Choudhary, Zhekun Zhang, Aryaman Jain, and Sasa Misailovic. Detecting Flaky Tests in Probabilistic and Machine Learning Applications. *International Symposium on Software Testing and Analysis (ISSTA 2020)*, pages 211–224, Virtual Event, July 2020. Acceptance rate: 27% (43/162)
- ISSTA'20 [26] Qianyang Peng, **August Shi**, and Lingming Zhang. Empirically Revisiting and Enhancing IR-Based Test-Case Prioritization. *International Symposium on Software Testing and Analysis (ISSTA 2020)*, pages 324–336, Virtual Event, July 2020. Acceptance rate: 27% (43/162)
- ISSTA'20 [25] Wing Lam, **August Shi**, Reed Oei, Sai Zhang, Michael D. Ernst, and Tao Xie. Dependent-Test-Aware Regression Testing Techniques. *International Symposium on Software Testing and Analysis (ISSTA 2020)*, pages 298–311, Virtual Event, July 2020. Acceptance rate: 27% (43/162)
- OOPSLA'19 [24] **August Shi**, Milica Hadzi-Tanovic, Lingming Zhang, Darko Marinov, and Owolabi Legunsen. Reflection-Aware Static Regression Test Selection. *ACM Conference on Object-Oriented Programming, Systems, Languages & Applications (OOPSLA 2019)*, pages 187:1–187:29, Athens, Greece, October 2019. Acceptance rate: 36% (72/201)

- ISSRE'19 [23] **August Shi**, Peiyuan Zhao, and Darko Marinov. Understanding and Improving Regression Test Selection in Continuous Integration. *IEEE International Symposium on Software Reliability Engineering (ISSRE 2019)*, pages 228–238, Berlin, Germany, October 2019. Acceptance rate: 31% (42/134)
- ESEC/FSE'19 [22] **August Shi**, Wing Lam, Reed Oei, Tao Xie, and Darko Marinov. iFixFlakies: A Framework for Automatically Fixing Order-Dependent Flaky Tests. *ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE 2019)*, pages 545–555, Tallinn, Estonia, August 2019. Acceptance rate: 24% (74/303)
- ISSTA'19 [21] **August Shi**, Jonathan Bell, and Darko Marinov. Mitigating the Effects of Flaky Tests on Mutation Testing. *International Symposium on Software Testing and Analysis (ISSTA 2019)*, pages 112–122, Beijing, China, July 2019. Acceptance rate: 20% (29/142)
- P-RECS'19 [20] Matthew Krafczyk, **August Shi**, Adhithya Bhaskar, Darko Marinov, and Victoria Stodden. Scientific Tests and Continuous Integration Strategies to Enhance Reproducibility in the Scientific Software Context. *International Workshop on Practical Reproducible Evaluation of Computer Systems (P-RECS 2019)*, pages 23–28, Phoenix, Arizona, June 2019.
- ICSE'19 [19] Chenguang Zhu, Owolabi Legunsen, **August Shi**, and Milos Gligoric. A Framework for Checking Regression Test Selection Tools. *International Conference on Software Engineering (ICSE 2019)*, pages 430–441, Montreal, Canada, May 2019. Acceptance rate: 21% (109/529)
- ICST'19 [18] Wing Lam, Reed Oei, **August Shi**, Darko Marinov, and Tao Xie. iDFlakies: A Framework for Detecting and Partially Classifying Flaky Tests. *IEEE International Conference on Software Testing, Verification and Validation (ICST 2019)*, pages 312–322, Xi'an, China, April 2019. Acceptance rate: 28% (31/110)
- ICST'19 [17] Farah Hariri, **August Shi**, Vimuth Fernando, Suleman Mahmood, and Darko Marinov. Comparing Mutation Testing at the Levels of Source Code and Compiler Intermediate Representation. *IEEE International Conference on Software Testing, Verification and Validation (ICST 2019)*, pages 114–124, Xi'an, China, April 2019. Acceptance rate: 28% (31/110)
- ASE Demo'18 [16] Farah Hariri and **August Shi**. SRCIROR: A Toolset for Mutation Testing of C Source Code and LLVM Intermediate Representation. *IEEE/ACM Conference on Automated Software Engineering, Tool Demo (ASE Demo 2018)*, pages 860–863, Montpellier, France, September 2018. Acceptance rate: 36% (16/44)
- ISSTA'18 [15] **August Shi**, Alex Gyori, Suleman Mahmood, Peiyuan Zhao, and Darko Marinov. Evaluating Test-Suite Reduction in Real Software Evolution. *International Symposium on Software Testing and Analysis (ISSTA 2018)*, pages 84–94, Amsterdam, Netherlands, July 2018. Acceptance rate: 24% (31/130)
- ICSE Demo'18 [14] Alex Groce, Josie Holmes, Darko Marinov, **August Shi**, and Lingming Zhang. An Extensible, Regular-Expression-Based Tool for Multi-Language Mutant Generation. *International Conference on Software Engineering, Tool Demo (ICSE Demo 2018)*, pages 25–28, Gothenburg, Sweden, May–June 2018. Acceptance rate: 42% (30/72)
- ICST'18 [13] Farah Hariri, **August Shi**, Owolabi Legunsen, Milos Gligoric, Sarfraz Khurshid, and Sasa Misailovic. Approximate Transformations as Mutation Operators. *IEEE International Conference on Software Testing, Verification and Validation (ICST 2018)*, pages 285–296, Västerås, Sweden, April 2018. Acceptance rate: 25% (30/119)
- ASE Demo'17 [12] Owolabi Legunsen, **August Shi**, and Darko Marinov. STARTS: STATic Regression Test Selection. *IEEE/ACM International Conference on Automated Software Engineering, Tool Demo (ASE Demo 2017)*, pages 949–954, Urbana-Champaign, Illinois, October–November 2017. Acceptance rate: 63% (20/32)
- ICSE'17 [11] **August Shi**, Suresh Thummalapenta, Shuvendu Lahiri, Nikolaj Bjørner, and Jacek Czerwonka. Optimizing Test Placement for Module-Level Regression Testing. *International Conference on Software Engineering (ICSE 2017)*, pages 689–699, Buenos Aires, Argentina, May 2017. Acceptance rate: 16% (68/415)

This paper won an ACM SIGSOFT Distinguished Paper Award

- ICSE NIER'17 [10] Milos Gligoric, Sarfraz Khurshid, Sasa Misailovic, and **August Shi**. Mutation Testing Meets Approximate Computing. *International Conference on Software Engineering, New Ideas and Emerging Results Track (ICSE NIER 2017)*, pages 3–6, Buenos Aires, Argentina, May 2017. Acceptance rate: 16% (14/85)
- FSE'16 [9] Owolabi Legunsen, Farah Hariri, **August Shi**, Yafeng Lu, Lingming Zhang, and Darko Marinov. An Extensive Study of Static Regression Test Selection in Modern Software Evolution. *ACM SIGSOFT International Symposium on the Foundations of Software Engineering (FSE 2016)*, pages 583–594, Seattle, Washington, November 2016. Acceptance rate: 27% (74/273)
- FSE Demo'16 [8] Alex Gyori, Ben Lambeth, **August Shi**, Owolabi Legunsen, and Darko Marinov. Non-Dex: A tool for detecting and debugging wrong assumptions on Java API specifications. *ACM SIGSOFT International Symposium on the Foundations of Software Engineering, Tool Demo (FSE Demo 2016)*, pages 993–997, Seattle, Washington, November 2016. Acceptance rate: 41% (13/32)
- ISSRE'16 [7] Farah Hariri, **August Shi**, Hayes Converse, Darko Marinov, and Sarfraz Khurshid. Evaluating the Effects of Compiler Optimizations on Mutation Testing at the Compiler IR Level. *IEEE International Symposium on Software Reliability Engineering (ISSRE 2016)*, pages 105–115, Ottawa, Canada, October 2016. Acceptance rate: 35% (45/130)
- ASE'16 [6] Mohammad Amin Alipour, **August Shi**, Rahul Gopinath, Darko Marinov, and Alex Groce. Evaluating Non-adequate Test-Case Reduction. *IEEE/ACM Conference on Automated Software Engineering (ASE 2016)*, pages 16–26, Singapore, Singapore, September 2016. Acceptance rate: 19% (57/298)
- ICST'16 [5] **August Shi**, Alex Gyori, Owolabi Legunsen, and Darko Marinov. Detecting Assumptions on Deterministic Implementations of Non-deterministic Specifications. *IEEE International Conference on Software Testing, Verification and Validation (ICST 2016)*, pages 80–90, Chicago, Illinois, April 2016. Acceptance rate: 26% (34/130)
- ESEC/FSE'15 [4] **August Shi**, Tiffany Yung, Alex Gyori, and Darko Marinov. Comparing and Combining Test-Suite Reduction and Regression Test Selection. *Joint Meeting of the European Software Engineering Conference and the ACM SIGSOFT Symposium on the Foundations of Software Engineering (ESEC/FSE 2015)*, pages 237–247, Bergamo, Italy, September 2015. Acceptance rate: 25% (74/291)
- ISSTA'15 [3] Alex Gyori, **August Shi**, Farah Hariri, and Darko Marinov. Reliable Testing: Detecting State-Polluting Tests to Prevent Test Dependency. *International Symposium on Software Testing and Analysis (ISSTA 2015)*, pages 223–233, Baltimore, Maryland, July 2015. Acceptance rate: 28% (33/119)
- FSE'14 [2] **August Shi**, Alex Gyori, Milos Gligoric, Andrey Zaytsev, and Darko Marinov. Balancing Trade-Offs in Test-Suite Reduction. *ACM SIGSOFT Symposium on the Foundations of Software Engineering (FSE 2014)*, pages 246–256, Hong Kong, November 2014. Acceptance rate: 22% (61/273)
- SBAC-PAD'14 [1] Ruben Gran Tejero, **August Shi**, Ehsan Totoni, and María Jesús Garzarán. Evaluation of a Feature Tracking Vision Application on a Heterogeneous Chip. *IEEE International Symposium on Computer Architecture and High Performance Computing (SBAC-PAD 2014)*, pages 246–253, Paris, France, October 2014. Acceptance rate: 33% (43/132)

Research Mentoring

*Mentored and co-advised the research of **five** graduate students and **four** undergraduate students.*

- James Gao (BS, UIUC)
- Milica Hadzi-Tanovic (MS, UIUC; co-authored [24])
- Ben Lambert (BS, UIUC; co-authored [8])
- Reed Oei (BS, UIUC; co-authored [18], [22], [25])
- Qianyang Peng (MS, UIUC; co-authored [26])
- Tiffany Yung (MCS, UIUC; co-authored [4])
- Andrey Zaytsev (BS, UIUC; co-authored [2])
- Peilun Zhang (MS, UIUC)
- Peiyuan Zhao (MS, UIUC; co-authored [15], [23])

Teaching Experience

UIUC, Fall 2015 Teaching Assistant for CS 427: Software Engineering I (176 students)

Open-Source Software Contributions and Patents

My GitHub ID <https://github.com/august782>

iFixFlakies iFixFlakies is a framework for automatically fixing order-dependent flaky tests [19]. iFixFlakies finds tests in the test suite that contain logic for resetting/setting state for order-dependent tests to pass. Once iFixFlakies finds these tests, it minimizes the code from those tests to generate a patch to apply to the order-dependent test such that it passes when run in the failing order. iFixFlakies automatically fixed 58 of 110 order-dependent flaky tests from open-source GitHub projects. Developers have accepted pull requests with the fixes for 21 of these tests; the rest are still pending. iFixFlakies is at <https://github.com/TestingResearchIllinois/iFixFlakies>. The dataset of patches and pull requests we sent concerning the fixed order-dependent tests is at <https://sites.google.com/view/ifixflakies>.

iDFlakies iDFlakies is a framework for detecting and partially classifying flaky tests [17]. iDFlakies reruns tests in different orders and considers any tests that fail (but did pass in a previous run) as flaky. iDFlakies further classifies each detected flaky test as order-dependent or non-order-dependent flaky tests. iDFlakies found 422 flaky tests in open-source GitHub projects, where 50.5% of these flaky tests are order-dependent and 49.5% are non-order-dependent. iDFlakies is at <https://github.com/idflakies/iDFlakies>. The dataset of flaky tests we detected is at <https://sites.google.com/view/flakytestdataset>.

NonDex NonDex detects flaky tests caused by developers' wrong assumptions about under-determined specification [2],[16]. Flaky tests non-deterministically pass or fail for the same code. NonDex found 60 flaky tests in open-source GitHub projects. NonDex was adopted by CheckStyle. NonDex is at <https://github.com/TestingResearchIllinois/nondex>.

STARTS (STAtic Regression Test Selection) STARTS is a tool to reduce regression testing costs by rerunning only tests that can change behavior due to code changes. STARTS saves up to 80% of testing time on medium-sized open-source projects [4],[11],[12],[14]. STARTS is at <https://github.com/TestingResearchIllinois/starts>.

SRCIROR SRCIROR is a mutation testing tool for both the src and IR levels for C [4],[8],[10]. SRCIROR implements conceptually the same mutation operators at both levels, allowing for fairer comparisons of mutation testing between the two levels. SRCIROR is at <https://github.com/TestingResearchIllinois/srciror>.

Patent US20180293159A1 A patent for a technique to move tests into different components iteratively, with the goal to improve the performance of component-level regression testing when run through a build system [23].

Experience with Research Grants

Assisted in the preparation of the proposals for the following research grants/gifts:

- 2018 – 2020 *EAGER: Preserve/Destroy Decisions for Simulation Data in Computational Physics and Beyond*, National Science Foundation. Funded amount: \$300,000
- 2016 *Improving Regression Testing Efficiency*, Qualcomm. Funded amount: \$50,000
- 2015 *Combating Flaky Tests*, Google Faculty Research Awards. Funded amount: \$51,000
- 2014 – 2017 *SHF: Medium: Collaborative Research: Improved Performance Testing and Debugging*, National Science Foundation. Funded amount: \$616,000

Service to Professional Community

- PC Member ISSA 2021 Program Committee
- PC Member ICST 2021 Industry Track Committee
- Reviewer/Judge SPLASH 2020 Student Research Competition Program Committee
- PC Member LANGETI 2020 Program Committee
- PC Member ICST 2020 Industry Track Committee
- PC Member PLDI 2017 Artifact Evaluation Committee
- Reviewer TOSEM 2020, TSE 2020, ESE 2020, STVR 2020, STVR 2018, ICSE SEIP 2018, STVR 2017
- Co-reviewer ASE 2020, ASE 2017, TACAS 2017, ASE 2016, ICST 2016, ASE 2015, CAV 2015, HVC 2014, ICSE 2014
- Student Volunteer ASE 2017, ICST 2016, FSE 2014
- Co-organizer Brett Daniel Software Engineering Seminar, UIUC, Fall 2016
- Co-teacher Taught one class on “Software Testing for Fun, Fame, and Maybe Even Profit” to 19 high school students, UIUC, Spring 2015

Presentations

18 conference talks, 6 invited talks, 3 guest talks, 5 guest lectures, and 4 poster presentations

- Conference Talk *Empirically Revisiting and Enhancing IR-Based Test-Case Prioritization*, ISSA 2020, July 2020, Virtual Event
- Invited Talk *Mitigating Flaky Tests*, University of Wisconsin-Madison, April 2020
- Invited Talk *Mitigating Flaky Tests*, Microsoft Research, March 2020
- Invited Talk *Mitigating Flaky Tests*, Pennsylvania State University, March 2020
- Invited Talk *Mitigating Flaky Tests*, The University of Texas at Austin, March 2020
- Invited Talk *Mitigating Flaky Tests*, University of Minnesota, Twin Cities, February 2020
- Invited Talk *Mitigating Flaky Tests*, Iowa State University, February 2020
- Conference Talk *Reflection-Aware Static Regression Test Selection*, OOPSLA 2019, October 2019, Athens, Greece
- Conference Talk *Understanding and Improving Regression Test Selection in Continuous Integration*, ISSRE 2019, October 2019, Berlin, Germany
- Conference Talk *iFixFlakies: A Framework for Automatically Fixing Order-Dependent Flaky Tests*, ESEC/FSE 2019, August 2019, Tallinn, Estonia
- Conference Talk *Mitigating the Effects of Flaky Tests on Mutation Testing*, ISSA 2019, July 2019, Beijing, China
- Conference Talk *A Framework for Checking Regression Test Selection Tools*, ICSE 2019, May 2019, Montreal, Canada
- Conference Talk *Techniques for Evolution-Aware Runtime Verification*, ICST 2019, April 2019, Xi'an, China
- Conference Talk *Comparing Mutation Testing at the Levels of Source Code and Compiler Intermediate Representation*, ICST 2019, April 2019, Xi'an, China

- Poster Presentation *Optimizing Test Placement for Module-Level Regression Testing*, Huawei Midwest Research Summit, March 2019, Champaign, Illinois
- Poster Presentation *SRCIROR: A Toolset for Mutation Testing of C Source Code and LLVM Intermediate Representation*, ASE 2018, September 2018, Montpellier, France
- Conference Talk *TRIMMER: Application Specialization for Code Debloating*, ASE 2018, September 2018, Montpellier, France
- Conference Talk *SRCIROR: A Toolset for Mutation Testing of C Source Code and LLVM Intermediate Representation*, ASE 2018, September 2018, Montpellier, France
- Guest Lecture *Mutation Testing*, CS 598DM (Software Testing for All), UIUC, September 2018
- Conference Talk *Evaluating Test-Suite Reduction in Real Software Evolution*, ISSA 2018, July 2018, Amsterdam, Netherlands
- Conference Talk *An Extensible, Regular-Expression-Based Tool for Multi-Language Mutant Generation*, ICSE Demo 2018, May 2018, Gothenburg, Sweden
- Guest Talk *Optimizing Test Placement for Module-Level Regression Testing*, Beihang University, December 2017, Beijing, China
- Poster Presentation *Approximate Transformations as Mutation Operators*, Huawei Research, October 2017, Urbana-Champaign, Illinois
- Guest Lecture *Optimizing Test Placement for Module-Level Regression Testing*, CS 527 (Topics in Software Engineering), UIUC, September 2017
- Guest Lecture *Regression Testing*, CS 498ST (Software Testing), UIUC, September 2017
- Conference Talk *Optimizing Test Placement for Module-Level Regression Testing*, ICSE 2017, May 2017, Buenos Aires, Argentina
- Guest Talk *Optimizing Test Placement for Module-Level Regression Testing*, UT Austin, January 2017, Austin, Texas
- Poster Presentation *NonDex: A tool for detecting and debugging wrong assumptions on Java API specifications*, FSE Demo 2016, November 2016, Seattle, Washington
- Conference Talk *NonDex: A tool for detecting and debugging wrong assumptions on Java API specifications*, FSE Demo 2016, November 2016, Seattle, Washington
- Conference Talk *Evaluating Non-adequate Test-Case Reduction*, ASE 2016, September 2016, Singapore, Singapore
- Conference Talk *Detecting Assumptions on Deterministic Implementations of Non-deterministic Specifications*, ICST 2016, April 2016, Chicago, Illinois
- Conference Talk *Comparing and Combining Test-Suite Reduction and Regression Test Selection*, FSE 2015, September 2015, Bergamo, Italy
- Guest Lecture *Jenkins Demonstration*, CS 427 (Software Engineering I), UIUC, September 2015
- Guest Talk *Comparing and Combining Test-Suite Reduction and Regression Test Selection*, Microsoft, August 2015, Redmond, Washington
- Conference Talk *Balancing Trade-Offs in Test-Suite Reduction*, FSE 2014, November 2014, Hong Kong
- Guest Lecture *Balancing Trade-Offs in Test-Suite Reduction*, CS 527 (Topics in Software Engineering), UIUC, October 2014

Industry Experience

- 2015 Research Intern, Microsoft and Microsoft Research
- 2014 Software Development Intern, Google
- 2013 Software Development Intern, Amazon
- 2011 and 2012 Software Development Intern, Intel
- 2010 Software Development Intern, USAA