

Jonathan Bell

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RESEARCH INTERESTS	Software engineering: software quality, reliability and security, software testing, fault reproduction and privacy, program analysis, software systems, mobile computing	
EDUCATION	Columbia University , New York, NY USA Ph.D., Computer Science , May 2016 <ul style="list-style-type: none">• Advisor: Professor Gail Kaiser• Area of Study: Software Engineering and Software Systems• Thesis Topic: <i>Making Software More Reliable by Uncovering Hidden Dependencies</i> M.Phil., Computer Science , February 2014 M.S., Computer Science , May 2011 B.S., Computer Science , May 2010, <i>Cum Laude</i>	
AWARDS AND HONORS	Distinguished Paper Awards Awarded to the top papers at a conference. Received at ICPC 2016 and ICSE 2014. Distinguished Reviewer Awards Awarded to the top reviewers on a program conference committee. Received at ASE 2018. Paul Charles Michelman Memorial Award for Exemplary Service Columbia University Department of Computer Science. Given to a student in Computer Science who has performed exemplary service to the department, devoting time and effort beyond the call to further the department's goals. 2013, 2014 and 2016. Andrew P. Kosoresow Memorial Award for Excellence in Teaching and Service Columbia University Department of Computer Science. Given to a student in Computer Science who has made outstanding contributions to teaching in the Department and exemplary service to the Department and its mission. 2010.	
PUBLICATIONS	Conferences <ol style="list-style-type: none">1. Arora, N., Bell, Jonathan, F. Ivancic, G. Kaiser, and B. Ray. Replay without Recording of Production Bugs for Service Oriented Applications. In: <i>33rd IEEE/ACM International Conference on Automated Software Engineering</i>. ASE 2018. Acceptance rate: 20%. 2018. http://jonbell.net/publications/parikshan.2. Gambi, A., Bell, Jonathan, and A. Zeller. Practical Test Dependency Detection. In: <i>Proceedings of the 2018 IEEE Conference on Software Testing, Validation and Verification</i>. ICST 2018. Acceptance rate: 25%. 2018. http://jonbell.net/publications/pradet.3. Hilton, M., Bell, Jonathan, and D. Marinov. A Large-Scale, Longitudinal Study of Test Coverage Evolution. In: <i>33rd IEEE/ACM International Conference on Automated Software Engineering</i>. ASE 2018. Acceptance rate: 20%. 2018. http://jonbell.net/publications/coverage.4. Bell, Jonathan, O. Legunsen, M. Hilton, L. Eloussi, T. Yung, and D. Marinov. DeFlaker: Automatically Detecting Flaky Tests. In: <i>Proceedings of the 2018 International Conference on Software Engineering</i>. ICSE 2018. Acceptance rate: 21%. 2018. http://jonbell.net/publications/deflaker.5. Bell, Jonathan and L. Pina. CROCHET: Checkpoint and Rollback via Lightweight Heap Traversal on Stock JVMs. In: <i>Proceedings of the 2018 European Conference on Object-Oriented Programming</i>. ECOOP 2018. Acceptance rate: 39%. 2018. http://jonbell.net/publications/crochet.6. Su, F.-H., Bell, Jonathan, K. Harvey, G. Kaiser, S. Sethumadhavan, and T. Jebara. Code Relatives: Detecting Similarly Behaving Software. In: <i>Proceedings of the 2016 ACM SIGSOFT International Symposium on the Foundations of Software Engineering</i>. FSE 2016. Acceptance rate: 30%. 2016. http://jonbell.net/publications/dyclink.	

7. Su, F.-H., **Bell, Jonathan**, G. Kaiser, and S. Sethumadhavan. Identifying Functionally Similar Code in Complex Codebases. In: *Proceedings of the 24th IEEE International Conference on Program Comprehension*. ICPC 2016. Acceptance rate: 30%. **Distinguished Paper Award**. 2016. <http://jonbell.net/publications/hitoshiio>.
8. **Bell, Jonathan**, G. Kaiser, E. Melski, and M. Dattatreya. Efficient Dependency Detection for Safe Java Test Acceleration. In: *Proceedings of the 10th Joint Meeting of the European Software Engineering Conference and the ACM SIGSOFT Symposium on the Foundations of Software Engineering*. ESEC/FSE 2015. Acceptance rate: 25.4%. 2015. <http://jonbell.net/publications/electrictest>.
9. **Bell, Jonathan**, E. Melski, M. Dattatreya, and G. Kaiser. Vroom: Faster Build Processes for Java. In: *IEEE Software*. Vol. Special Issue: Release Engineering, March/April 2015. IEEE Computer Society, 2015.
10. Viennot, N., M. Lecuyer, **Bell, Jonathan**, R. Geambasu, and J. Nieh. Synapse: A Microservices Architecture for Heterogeneous-Database Web Applications. In: *Proceedings of The 2015 European Conference on Computer Systems (EuroSys)*. Acceptance rate: 21%. 2015. <http://jonbell.net/publications/synapse>.
11. Spahn, R., **Bell, Jonathan**, M. Lee, S. Bhamidipati, R. Geambasu, and G. Kaiser. Pebbles: Fine-Grained Data Management Abstractions for Modern Operating Systems. In: *Proceedings of the 11th USENIX Symposium on Operating Systems Design and Implementation*. OSDI 2014. Acceptance rate: 18.4%. 2014. <http://jonbell.net/publications/pebbles>.
12. **Bell, Jonathan** and G. Kaiser. Phosphor: Illuminating Dynamic Data Flow in Off-The Shelf JVMs. In: *Proceeding of the 29th ACM SIGPLAN Conference on Object Oriented Programming Systems Languages and Applications*. OOPSLA 2014. Acceptance rate: 28%. Artifact accepted as meeting reviewer expectations. 2014. <http://jonbell.net/publications/phosphor>.
13. **Bell, Jonathan** and G. Kaiser. Unit Test Virtualization with VMVM. In: *Proceedings of the 2014 International Conference on Software Engineering*. ICSE 2014. Acceptance rate: 20%. **ACM SIGSOFT Distinguished Paper Award**. 2014. <http://jonbell.net/publications/vmvm>.
14. **Bell, Jonathan**, N. Sarda, and G. Kaiser. Chronicler: Lightweight Recording to Reproduce Field Failures. In: *Proceedings of the 2013 International Conference on Software Engineering*. ICSE 2013. Acceptance rate: 18.5%. 2013. <http://jonbell.net/publications/chronicler>.

Journals

1. **Bell, Jonathan**, C. Murphy, and G. Kaiser. Metamorphic Runtime Checking of Applications Without Test Oracles. In: *CrossTalk, the Journal of Defense Software Engineering*. Vol. March 2015. 2015. <http://jonbell.net/publications/columbus>.

CS Education

1. Sheth, S., **Bell, Jonathan**, and G. Kaiser. A Competitive-Collaborative Approach for Introducing Software Engineering in a CS2 Class. In: *Proceedings of the 2013 Conference on Software Engineering Education and Training*. CSEET 2013. 2013. <http://jonbell.net/publications/cseet2013>.
2. **Bell, Jonathan**, S. Sheth, and G. Kaiser. Secret ninja testing with HALO software engineering. In: *Proceedings of the 4th international workshop on Social software engineering*. SSE '11. 2011. <http://jonbell.net/publications/halo-sse>.
3. Sheth, S., **Bell, Jonathan**, and G. Kaiser. HALO (Highly Addictive, socialLly Optimized) Software Engineering. In: *Proceeding of the 1st international workshop on Games and software engineering*. GAS '11. 2011. <http://jonbell.net/publications/halo>.

Other Short Papers

1. Su, F.-H., **Bell, Jonathan**, G. Kaiser, and B. Ray. Obfuscation Resilient Search through Executable Classification. In: *Proceedings of the 2nd ACM SIGPLAN International Workshop on Machine Learning and Programming Languages*. MAPL 2018. 2018. <http://jonbell.net/publications/macneto>.
2. Su, F.-H., **Bell, Jonathan**, and G. Kaiser. Challenges in Behavioral Code Clone Detection. In: *Proceedings of the 10th International Workshop on Software Clones*. IWSC 2016. 2016. <http://jonbell.net/publications/iwsc16>.
3. Su, F.-H., **Bell, Jonathan**, C. Murphy, and G. Kaiser. Dynamic Inference of Likely Metamorphic Properties to Support Differential Testing. In: *Proceedings of the 10th International Workshop on Automation of Software Test*. AST 2015. 2015. <http://jonbell.net/publications/mt-inference>.
4. **Bell, Jonathan** and G. Kaiser. Dynamic Taint Tracking for Java with Phosphor (Demo). In: *Proceedings of the 2015 International Symposium on Software Testing and Analysis*. ISSTA 2015. 2015. <http://jonbell.net/publications/phosphor-demo>.
5. **Bell, Jonathan**. Detecting, Isolating and Enforcing Dependencies Between and Within Test Cases. In: *Proceedings of the 22nd ACM SIGSOFT International Symposium on Foundations of Software Engineering Doctoral Symposium*. SIGSOFT/FSE 2014. 2014. <http://jonbell.net/publications/fse-docsym>.
6. **Bell, Jonathan** and G. Kaiser. VMVM: Unit Test Virtualization for Java (Formal Tool Demonstration). In: *Proceedings of the 2014 International Conference on Software Engineering*. ICSE 2014. Acceptance rate: 36%. 2014. <http://jonbell.net/publications/vmvm-demo>.
7. **Bell, Jonathan**, S. Sheth, and G. Kaiser. A Large-Scale, Longitudinal Study of User Profiles in World of Warcraft. In: *Proceedings of the 5th international workshop on web intelligence and communities*. WiC '13. 2013. <http://jonbell.net/publications/wow>.

RESEARCH
GRANTS

Total: 3 grants, \$679,591 to GMU, my share: \$512,924

Currently Pending Review

- "CAREER: Amplifying Developer-Written Tests for Code Injection Vulnerability Detection," PI: Jonathan Bell. *National Science Foundation*, \$500,000. 8/19-7/24.

Funded:

1. "SHF: Medium: Collaborative Research: Enhancing Continuous Integration Testing for the Open-Source Ecosystem," PI: Jonathan Bell, also non-GMU PIs Darko Marinov (UIUC) and Lingming Zhang (UT Dallas). *National Science Foundation*, \$1.2 million, GMU Portion: \$399,591. 10/18-9/22.
2. "NSF Student Travel Grant for 2018 ACM SIGPLAN Conference on Systems, Programming, Languages and Applications: Software for Humanity (SPLASH)," PI: Jonathan Bell. *National Science Foundation*, \$30,000 to support undergraduate student attendance at the PL/SE mentoring workshop. 8/18-1/19.
3. "Science of Security Principles of Trustworthy Systems Design, Modeling and Analysis for Security and Privacy," PI: Jonathan Bell. *National Security Agency*, subcontract from *Carnegie Mellon University*, \$250,000 to GMU, \$83,333 to me. 5/18-5/23.

INVITED TALKS

- "DeFlaker: Automatically Detecting Flaky Tests," Google Journal Club Paper Series, April 2018.
- "Detecting and Debugging Flaky Tests," Swedish Association for Software Testing Quarterly Meeting, April 2018.
- "Practical Dynamic Data Flow Analysis in the JVM," University of Maryland, May 2017.
- "Practical Dynamic Data Flow Analysis in the JVM," Virginia Tech Arlington Campus, March 2017.
- "Making Software More Reliable by Uncovering Hidden Dependencies," University of Washington, November 2016.
- "Making Software More Reliable by Uncovering Hidden Dependencies," University of

Delaware, September 2016.

“Making Software More Reliable by Uncovering Hidden Dependencies,” Carnegie Mellon, April 2016.

“Making Software More Reliable by Uncovering Hidden Dependencies,” George Mason University, March 2016.

“Making Software More Reliable by Uncovering Hidden Dependencies,” Georgia Tech, February 2016.

“Making Software More Reliable by Uncovering Hidden Dependencies,” IBM TJ Watson, January 2016.

“Faster, More Reliable Builds,” University of Illinois at Urbana-Champaign, December 2015.

“Practical Dynamic Taint Tracking in the JVM,” University of Illinois at Urbana-Champaign, December 2015.

“Practical Dynamic Taint Tracking in the JVM,” IBM Programming Languages Day, November 2015.

“Test Dependencies and the Future of Build Acceleration,” CUNY City Tech Computer Systems Colloquium, September 2015.

“Accelerating Software Testing”, Georgia Tech Software Engineering Group Seminar, November 2014.

“Accelerating Software Testing”, Electric Cloud, inc. internal all-hands meeting, November 2014.

TEACHING **George Mason University**, Fairfax, VA USA

“Q15” refers to student evaluation question 15, “My overall rating of the teaching;” “Q16” refers to student evaluation question 16 “My overall rating of this course;” “avg” refers to the overall department average that semester on that question.

- Fall 2019: Undergrad: “Web App Development.”
- Spring 2018: Undergrad: “Distributed and Concurrent Systems.” Q15: 5.00/5 (avg. 4.32), Q16: 4.56/5 (avg. 4.12). <http://www.jonbell.net/gmu-cs-475-spring-2018/>
- Fall 2017: Grad: “Program Analysis for Software Testing.” <http://www.jonbell.net/swe-795-fall-17-program-analysis-for-software-testing/> (Small seminars do not receive course evaluations)
- Spring 2017: Grad: “Distributed Software Engineering.” Q15: 4.38/5 (avg 4.21), Q16: 4.13/5 (avg 4.05). <http://www.jonbell.net/swe-622-spring-2017/>
- Fall 2016: Undergrad: “Design and Implementation of Software for the Web.” Q15: 4.71/5 (avg 4.23), Q16: 4.52/5 (avg 4.08). <http://www.jonbell.net/swe-432-fall-2016/>

PROFESSIONAL AND RESEARCH EXPERIENCE **George Mason University**, Fairfax, VA USA
Assistant Professor, Department of Computer Science

August 2016 to Present

Electric Cloud, Inc, San Jose, CA USA
Consulting Research Scientist

July 2014 to November 2014

Programming Systems Laboratory, Columbia University, New York, NY USA
Graduate Research Assistant

January 2011 to August 2016

RentPost, LLC, Atlanta, GA USA
Co-Founder and Advisor

May 2010 to Present

SERVICE **Conference/Workshop Organization**

	2018
SPLASH	Co-chair for conference publicity Co-chair, PL/SE Mentoring Workshop
	2017
SPLASH	Co-chair for posters track PL/SE Mentoring Workshop organizing committee member
	2015, 2014 and 2013
SPLASH	Co-Chair for student volunteers track
	2012
GAS	Workshop co-organizer at the International Workshop on Games and Software Engineering, Co-Located with ICSE 2012

Conference/Workshop Program Committee Membership

	2019
ICST	International Conference on Software Testing PC
	2018
FSE/NIER	Foundations of Software Engineering NIER Track PC
ASE	Automated Software Engineering PC
MSR/Challenge	Mining Software Repositories Mining Challenge Track PC
	2017
ICSME/Artifacts	Artifacts track at the IEEE ICSME conference
MSR/Challenge	Mining Software Repositories Mining Challenge Track PC
	2016
RELENG	Release Engineering Workshop co-located with FSE
OOPSLA/Artifacts	Artifacts track at the ACM OOPSLA conference
ICST/Tools	Tool papers track at the IEEE ICST conference
	2015
OOPSLA/Artifacts	Artifacts track at the ACM OOPSLA conference
ISSTA/Artifacts	Artifacts track at the ACM ISSTA conference

Journal Reviewing

	2018
EMSE	Springer's Empirical Software Engineering
	2017
EMSE	Springer's Empirical Software Engineering
JSS	Elsevier's Journal of Systems and Software
IEEE SW	IEEE Software Magazine
	2016
JSS	Elsevier's Journal of Systems and Software
EMSE	Springer's Empirical Software Engineering

Other

	2018
NSF	Panelist
	2017
NSF	Panelist on two panels

Within George Mason University CS Department

	2018-2019
SRCT Student Group Faculty Advisor	
Advisory, computing, PhD, teaching track recruitment, SWE MS admissions committees	
	2017-2018
Computing, PhD, teaching track recruitment, SWE MS admissions committees	
	2016-2017
Computing, SWE MS Admissions committees	

THESIS
COMMITTEES

Committee Member:

Chong Tang (UVA PhD CS, advisors Kevin Sullivan and Baishakhi Ray), “Improving System Performance via Design and Configuration Space Exploration.”

David Gonzalez (GMU PhD IT, advisor Thomas LaToza), “Direct Manipulation of Code through Idiomatic Views”

Fernando Boccanera (GMU PhD IT, advisor Alex Brodsky), “Decision Guidance on Software Feature Selection to Maximize the Benefit to Organizational Processes.”

MENTORING &
ADVISING

At George Mason:

Sarah Alhozaimy (PhD), “Amplifying Developer-Provided Tests to Detect Injection Vulnerabilities,” Fall 2018-Present

Hayder Al Haddad (BS), “Detecting and Visualizing Changes in Code Coverage,” Summer 2018.

Luís Pina (Postdoctoral Scholar), “JVM Systems for Intrusion Detection and Vulnerability Detection,” Fall 2017-Present.

Okhaifo Oikeh (MS, PhD), “Exploiting Dynamic Dataflow Information to Improve Software Testing,” Fall 2017-Fall 2018.

Jeffrey Currence (BS), with Thomas LaToza, “Mining API invocations in JavaScript,” Summer 2017.

Monica Jeyasankar (BS), “Detecting Code Relatives in JavaScript,” Spring 2017. Now at Capital One.

Sravva Kalva (BS), “Detecting Code Relatives in JavaScript,” Spring 2017. Now at Geico.

Pakeezha Arfany (BS), “Detecting Code Relatives in JavaScript,” Spring 2017. Now at CACI.

At Columbia:

Mandi Wang (MS), “Extending Test Suite Minimization,” Fall 2014, Spring 2015. Now at Google.

Emilia Pakulski (BS), “Automating Test Suite Minimization,” Fall 2014. Now at Segovia.

Alana Ramjit (BS), “Optimizing Scala Test Suites,” Fall 2014. Now at UCLA.

Jennifer Lam (BS), “Analyzing Regression Testing Practices in OSS,” Spring 2014. Interned at Citi and Bloomberg.

Xingzhou Derek He (BS), “Symbolic String Analysis for Java,” Spring 2014, Fall 2014, Spring 2015. Interned at Dropbox and D.E. Shaw.

Sidharth Shanker (BS), “Comparing test suite minimization techniques,” Fall 2013. Now at Counsyl.

Winnie Narang (MS), “Reproducing Java application field-failures with limited user information,” Fall 2013. Now at Amazon.

Nikhil Sarda (MS), “Creating an efficient and robust Java *in-vivo* testing framework,” Summer 2012. Now at Mattermark.

Miriam Melnick (BS), “Detecting state-based metamorphic properties with *in-vivo* testing,” Spring 2012. “HALO-SE web portal,” Fall 2011. Now at Google.

Ethan Hann (MS), “Visualizing World of Warcraft player data,” Spring 2012. Now at Columbia Medical Center.

Alison Yang (BS), “Research notebook for *genSpace*,” Spring 2012.

Jason Halpern (MS), “Understanding user retention in *genSpace*,” Fall 2011. Now at SecondMarket.

Evgeny Fedetov (MS), “Towards social diversity in tool recommendations with *genSpace*,” Summer 2011. Now at JP Morgan.

Aditya Bir (MS), “Managing complex datasets in *genSpace*,” Spring 2011. Now at UBS.