Claire Le Goues

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Research Interests and Approach

My research interests span software engineering and programming languages, and especially in how to construct, maintain, evolve, improve/debug, and assure high-quality software systems.

Appointments

Carnegie Mellon University ..... Pittsburgh, PA, USA

2019 – present	Associate Professor
2013 – 2019	Assistant Professor
	School of Computer Science (SCS)
	Institute for Software Research (ISR)

Education

University of Virginia ..... Charlottesville, VA, USA

2013	**Doctor of Philosophy in Computer Science**
	Dissertation: Automatic Program Repair Using Genetic Programming
	Advisor: Westley Weimer
2009	**Master of Science in Computer Science**
	Thesis: Specification Mining With Few False Positives
	Advisor: Westley Weimer

Harvard University ..... Cambridge, MA, USA

2006	**Bachelor of Arts in Computer Science**
	Thesis: Algebraic Type Isomorphisms
	Advisor: Greg Morrisett

Industrial Employment

Microsoft Research ..... Redmond, WA, USA

2009	**Research Intern**, Research in Software Engineering (RiSE) group	

IBM ..... *(various)*

2006–2007	**Software Engineer**, XML Technologies/Compilation	Cambridge, MA, USA
2005	**Research Intern**, Collaborative User Experience (CUE)	Cambridge, MA, USA
2004	**Research Intern**, Architect's Workbench	Hawthorne, NY, USA

Honors and Awards

2020	ACM SIGSOFT Early Career Researcher Award
2020–2023	SCS Faculty Fellowship Recognizing Diversity and Inclusion
2019	ICSE Most Influential Paper (N-10)
2019	SIGEVO Impact Award
2018	ACM Distinguished Paper, Intl. Conference on Software Engineering
2018	Reliable Rapid Response Reviewer, Intl. Conference on Software Engineering
2018	National Science Foundation CAREER Award
2016	Best Reviewer Award, Intl. Symposium on Search-Based Software Engineering
2015	Featured Article, IEEE Transactions on Software Engineering

2015	Distinguished Reviewer, Intl. Conference on Automated Software Engineering (ASE)
2013	Google Faculty Research Award
2012	Bronze, ACM SIGEVO "Humies" for Human-Competitive Results Produced by Genetic and Evolutionary Computation
2012	Featured Article, IEEE Transactions on Software Engineering
2009	Gold, ACM SIGEVO "Humies" for Human-Competitive Results Produced by Genetic and Evolutionary Computation
2009	IFIP TC2 Manfred Paul Award, Intl. Conference on Software Engineering
2009	ACM Distinguished Paper, Intl. Conference on Software Engineering
2009	Best Paper, Genetic and Evolutionary Computation Conference
2009	Best Short Paper, Workshop on Search-Based Software Testing
2009–2012	Graduate Research Fellowship, National Science Foundation

Professional Service and Affiliations

Local Service at Carnegie Mellon University

Chair, ISR Tenure Track Hiring Committee 2019–present
Member, SCS Dean Search Committee 2018–2019
Member, Cylab Director Search Committee 2018
Member, SCS Undergraduate Review Committee 2016–2019
Co-Director, REUSE@CMU 2016–present
Director, Undergraduate Minor in Software Engineering 2014–2018
Member, SE Teaching/Tenure Track Faculty Hiring Committees 2015–present
Member, SE PhD Graduate Admissions Committee 2013–present

International Service

Boards, Organization, and Memberships

2020	PC Co-Chair, 35th IEEE/ACM Intl. Conference on Automated Software Engineering (ASE)
2019	PC Co-Chair, Tool Demonstration Track, 34th Intl. Conference on Automated Software Engineering (ASE Demo)
2019	Test of Time Award Selection Committee, ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE)
2018	PC Co-chair, Foundations of Software Engineering, New Ideas and Emerging Results Track (FSE-NIER)
2018	Co-organizer, Dagstuhl Seminar 18052, Genetic Improvement of Software
2017–2020	IEEE Transactions on Software Engineering (TSE) Review Board
2017–present	DARPA ISAT study group member
2017	Co-organizer, Dagstuhl Seminar 17022, Automated Program Repair
2017	Graduate Track Program Chair, Symposium on Search Based Software Engineering (SSBSE)
2016	Review Process Co-Chair, Automated Software Engineering (ASE)
2015	Local Arrangements Chair, Systems, Programming, Languages and Applications: Software for Humanity (SPLASH)
2014–2017	Steering Commitee Member, Symposium on Search Based Software Engineering (SSBSE)
2014	PC Co-chair, Symposium on Search Based Software Engineering (SSBSE)

Associate Editor

GPEM, Genetic Programming and Evolvable Machines (Area Editor for Software Engineering) 2019–present

Program Committee Membership

..... 2019 .....

ICSE	Intl. Conference on Software Engineering (Program Board)
ASE	IEEE/ACM Intl. Conference on Automated Software Engineering

	2018
ICSE	Intl. Conference on Software Engineering (Rapid Response Reliable Reviewer)
ASE	IEEE/ACM Intl. Conference on Automated Software Engineering
SSBSE	Intl. Symposium on Search Based Software Engineering
FairWare	Intl. Workshop on Software Fairness
GI	Intl. Workshop on Genetic Improvement
	2017
ICSE	Intl. Conference on Software Engineering
ESEC/FSE	European Software Engineering Conference/Foundations of Software Engineering
ISSTA/Tools	Demonstrations Track, Intl. Symposium on Software Testing and Analysis.
	2016
ICSE	Intl. Conference on Software Engineering
ISSTA	Intl. Symposium on Software Testing and Analysis
MSR	Working Conference on Mining Software Repositories
SSBSE	Intl. Symposium on Search-Based Software Engineering
GECCO-GI	GECCO Workshop on Genetic Improvement
	2015
ASE	IEEE/ACM Intl. Conference on Automated Software Engineering
Onward!	Onward! Essays
SSBSE	Intl. Symposium on Search-Based Software Engineering
ICST/Tools	Tools Track, Intl. Conference on Software Testing
ICSME/Tools	Tools Track, Intl. Conference on Software Maintenance and Evolution
ICSME	Intl. Conference on Software Maintenance and Evolution
NasBASE	North American Conference on Search-Based Software Engineering
ICSE/Tools	Tools Track, Intl. Conference on Software Engineering
ICSE NIER	New Ideas and Emerging Results, Intl. Conference on Software Engineering
GECCO-GI	GECCO Workshop on Genetic Improvement
	2014
ICSME	Intl. Conference on Software Maintenance and Evolution
ICSE NIER	New Ideas and Emerging Results, Intl. Conference on Software Engineering

Guest reviewing and refereeing

	2017
IEEE TSE	IEEE Transactions on Software Engineering
JARS	Journal of Automated Reasoning
ESEM	Empirical Software Engineering
	2016
IEEE TSE	IEEE Transactions on Software Engineering
JARS	Journal of Automated Reasoning
ESEM	Empirical Software Engineering
	2015
ACM TOSEM	ACM Transactions on Software Engineering and Methodology
JSEP	Journal of Software: Evolution and Process
IEEE TSE	IEEE Transactions on Software Engineering
Computing	Journal of Computing
	2014
IEEE SW	IEEE Software
JSS	Journal of Systems and Software
JSEP	Journal of Software: Evolution and Process
TOSEM	Transactions on Software Engineering and Methodology

Research Funding

Listed amounts denote the CMU portion of multi-institutional awards.

SHF: Small: Idiomatic Decompilation
NSF: The National Science Foundation
Duration: September, 2019–September, 2022
With: Graham Neubig (CMU)
Amount: $425,000

Improving Search-Based and Semantic Automated Program Repair
AFRL: Air Force Research Lab
Duration: November, 2018 – November, 2019
With: Stephanie Forrest (ASU)
Westley Weimer (UMich)
Amount: $239,952

Trusted and Resilient Mission Operation (Phase 3)
AFRL: Air Force Research Lab
Duration: November, 2018 – November, 2019
With: Stephanie Forrest (ASU)
Westley Weimer (UMich)
Jack Davidson (UVA)
Amount: $247,252

CMU REU Site in Interdisciplinary Software Engineering (renewed)
NSF: The National Science Foundation
Duration: March, 2019 – February, 2022
With: Joshua Sunshine (CMU)
Amount: $375,402

Improving analysis via automated program transformation
Facebook:Testing and Verification Research Award
Duration: September, 2018 – August, 2019
With: *Sole PI*
Amount: $50,000

Modeling Observability in Adaptive Systems to Improve their Security
Cylab: Seed Funding@CyLab
Duration: September, 2018 – August, 2019
With: Fei Fang (CMU)
David Garlan (CMU)
Amount: $110,000

CAREER: Quality Matters: Dynamic, Static and Proactive Analyses for Automated Program Repair
NSF: The National Science Foundation
Duration: March, 2018 – February, 2023
With: *Sole PI*
Amount: $525,000
REU Supplements:
2018 $9352
2019 $16,000
2020 $16,000

Trusted and Resilient Mission Operation
AFRL: Air Force Research Lab
Duration: June, 2017 – September, 2018
With: Stephanie Forrest (ASU)
Westley Weimer (UMich)
Jack Davidson (UVA)
Amount: $210,000

SHF: Small: Evolution of Self-adaptive Systems using Stochastic Search
NSF: The National Science Foundation
Duration: July, 2016–June, 2020
With: David Garlan (CMU)
Amount: $499,948
REU Supplements
2017 $9,525
2018 $19,050
2019 $8,000
2020 $16,000

SHF: Medium: Semi and fully automated program repair and synthesis via semantic code search
NSF: The National Science Foundation
Duration: July, 2016–June, 2020
With: Yuriy Brun (UMass-Amherst)
Kathryn Stolee (NCSU)
Amount: $411,996
REU Supplements
2017 $9,525
2018 $9,525

Robust Inside Out Testing (RIOT)
Army Test Resource Management Center
TRMC:
Duration: February, 2016 – Dec 2020, 2019
With: Phil Koopman (CMU/NREC)
Michael Wagner (NREC)
Amount: $617,798

CMU REU Site in Interdisciplinary Software Engineering
NSF: The National Science Foundation
Duration: January, 2016 – December, 2018
With: Joshua Sunshine (CMU)
Amount: $360,000

Intelligent Model-Based Adaptation for Mobile Robotics
DARPA: The Defense Advanced Research Projects Agency
Duration: November 2015 – September 2019
With: Jonathan Aldrich (CMU)
Joydeep Biswass (UMass-Amherst)
David Garlan (CMU)
Christian Kaestner (CMU)
Manuela Velosa (CMU)
Amount: $7,996,519

Cooperative, Trusted Repair for Cyber Physical System Resiliency
AFRL: Air Force Research Lab
Duration: April, 2015–November, 2017
With: Stephanie Forrest (UNM)
Miryung Kim (UCLA)
Westley Weimer (UVA)
Amount: $185,202

Automated Code Repair
SEI: Software Engineering Institute
Duration: October 1, 2015 – September 30, 2016
With: Christian Kaestner (CMU)
Will Klieber (SEI)
Amount: $50,000

EAGER: Demonstrating the Feasibility of Automatic Program Repair Guided by Semantic Code Search
NSF: National Science Foundation
Duration: July 2014 – August, 2016
With: Yuriy Brun (UMass-Amherst)
Kathryn Stolee (Iowa State)
Amount: $111,864

Human-friendly automatic bug repair via source code and repository mining
Google: Faculty Research Award
Duration: January, 2014–January, 2015
With: *Sole PI*
Amount: $81,924

Publications

Books and chapters

[B2] Claire Le Goues and Shin Yoo, eds. *Proceedings of the 6th International Symposium on Search-Based Software Engineering, SSBSE 2014, Fortaleza, Brazil, August 26-29, 2014*. Vol. 8636. Lecture Notes in Computer Science. Springer, 2014. ISBN: 978-3-319-09939-2. DOI: 10.1007/978-3-319-09940-8.

[B1] Claire Le Goues, Anh Nguyen-Tuong, Hao Chen, Jack W. Davidson, Stephanie Forrest, Jason Hiser, John C. Knight, and Matthew Van Gundy. "Moving Target Defenses in the Helix Self-Regenerative Architecture". In: *Moving Target Defense II - Application of Game Theory and Adversarial Modeling*. Springer, 2013, pp. 117–149. DOI: 10.1007/978-1-4614-5416-8_7.

Refereed Journal Articles

[J13] Manish Motwani, Mauricio Soto, Yuriy Brun, René Just, and Claire Le Goues. "Quality of Automated Program Repair on Real-World Defects". In: *IEEE Transactions on Software Engineering (TSE)* (2020). ISSN: 0098-5589.

[J12] Afsoon Afzal, Manish Motwani, Kathryn T. Stolee, Yuriy Brun, and Claire Le Goues. "SOSRepair: Expressive Semantic Search for Real-World Program Repair". In: *IEEE Transactions on Software Engineering (TSE)* (2020). ISSN: 0098-5589. DOI: 10.1109/TSE.2019.2944914.

[J11] Claire Le Goues, Michael Pradel, and Abhik Roychoudhury. "Automated Program Repair". In: *Commun. ACM* 62.12 (Nov. 2019), pp. 56–65. ISSN: 0001-0782. DOI: 10.1145/3318162.

[J10] Jonathan Aldrich, David Garlan, Christian Kästner, Claire Le Goues, Anahita Mohseni-Kabir, Ivan Ruchkin, Selva Samuel, Bradley R. Schmerl, Christopher Steven Timperley, Manuela Veloso, Ian Voysey, Joydeep Biswas, Arjun Guha, Jarrett Holtz, Javier Cámara, and Pooyan Jamshidi. "Model-Based Adaptation for Robotics Software". In: *IEEE Software* 36.2 (2019), pp. 83–90. DOI: 10.1109/MS.2018.2885058.

[J9] Claire Le Goues, Ciera Jaspan, Ipek Ozkaya, Mary Shaw, and Kathryn T. Stolee. "Bridging the Gap: From Research to Practical Advice". In: *IEEE Software* 35.5 (2018), pp. 50–57. DOI: 10.1109/MS.2018.3571235.

[J8] Claire Le Goues, Yuriy Brun, Sven Apel, Emery Berger, Sarfraz Khurshid, and Yannis Smaragdakis. "Effectiveness of Anonymization in Double-Blind Review". In: *Commun. ACM* 61.6 (June 2018), pp. 30–33. DOI: 10.1145/3208157.

[J7] Xuan-Bach D. Le, Ferdian Thung, David Lo, and Claire Le Goues. "Overfitting in semantics-based automated program repair". In: *Empirical Software Engineering* 23.5 (2018), pp. 3007–3033. DOI: 10.1007/s10664-017-9577-2.

[J6] Vinicius Paulo L. Oliveira, Eduardo F. Souza, Claire Le Goues, and Celso G. Camilo-Junior. "Improved representation and genetic operators for linear genetic programming for automated program repair". In: *Empirical Software Engineering* 23.5 (2018), pp. 2980–3006. DOI: 10.1007/s10664-017-9562-9.

[J5] Claire Le Goues, Neal Holtschulte, Edward K. Smith, Yuriy Brun, Premkumar T. Devanbu, Stephanie Forrest, and Westley Weimer. "The ManyBugs and IntroClass Benchmarks for Automated Repair of C Programs". In: *IEEE Trans. Software Eng.* 41.12 (2015), pp. 1236–1256. DOI: 10.1109/TSE.2015.2454513.

[J4] Claire Le Goues, Stephanie Forrest, and Westley Weimer. “Current challenges in automatic software repair”. In: *Software Quality Journal* 21.3 (2013), pp. 421–443. DOI: 10.1007/s11219-013-9208-0.

[J3] Claire Le Goues, ThanhVu Nguyen, Stephanie Forrest, and Westley Weimer. “GenProg: A Generic Method for Automatic Software Repair”. In: *IEEE Trans. Software Eng.* 38.1 (2012), pp. 54–72. DOI: 10.1109/TSE.2011.104.

[J2] Claire Le Goues and Westley Weimer. “Measuring Code Quality to Improve Specification Mining”. In: *IEEE Trans. Software Eng.* 38.1 (2012), pp. 175–190. DOI: 10.1109/TSE.2011.5.

[J1] Westley Weimer, Stephanie Forrest, Claire Le Goues, and ThanhVu Nguyen. “Automatic program repair with evolutionary computation”. In: *Communications of the ACM Research Highlight* 53.5 (May 2010), pp. 109–116. DOI: 10.1145/1735223.1735249.

Refereed Conference Publications

[C34] Thomas Durieux, Claire Le Goues, Michael Hilton, and Rui Abreu. “Empirical Study of Restarted and Flaky Builds on Travis CI”. In: *IEEE/ACM 17th International Conference on Mining Software Repositories (MSR)*. 2020, (to appear).

[C33] Deborah S. Katz, Casidhe Hutchison, Milda Zizyte, and Claire Le Goues. “Detecting Execution Anomalies as an Oracle for Autonomy Software Robustness”. In: *Proceedings of the 2020 International Conference on Robotics and Automation*. ICRA ’20. 2020, (to appear).

[C32] Rijnard van Tonder and Claire Le Goues. “Tailoring Programs for Static Analysis via Program Transformation”. In: *Proceedings of the 42nd IEEE/ACM International Conference on Software Engineering*. ICSE ’20. 2020, (to appear).

[C31] Afsoon Afzal, Claire Le Goues, Michael Hilton, and Christopher Steven Timperley. “A Study on Challenges of Testing Robotic Systems”. In: *2020 IEEE International Conference on Software Testing, Verification and Validation (ICST)*. 2020, (to appear).

[C30] Cody Kinneer, Ryan Wagner, Fei Fang, Claire Le Goues, and David Garlan. “Modeling Observability in Adaptive Systems to Defend against Advanced Persistent Threats”. In: *Proceedings of the 17th ACM-IEEE International Conference on Formal Methods and Models for System Design*. MEMOCODE ’19. New York, NY, USA: Association for Computing Machinery, 2019. ISBN: 9781450369978. DOI: 10.1145/3359986.3361208.

[C29] Zack Coker, David G. Widder, Claire Le Goues, Christopher Bogart, and Joshua Sunshine. “A Qualitative Study on Framework Debugging”. In: *2019 IEEE International Conference on Software Maintenance and Evolution (ICSME)*. Sept. 2019, pp. 568–579. DOI: 10.1109/ICSME.2019.00091.

[C28] Jeremy Lacomis, Pengcheng Yin, Edward Schwarts, Miltiadis Allamanis, Claire Le Goues, Graham Neubig, and Bogdan Vasilescu. “DIRE: A Neural Approach to Decompiled Identifier Naming”. In: *Proceedings of the 34th IEEE/ACM International Conference on Automated Software Engineering (ASE)*. 2019, pp. 628–639. DOI: 10.1109/ASE.2019.00064.

[C27] Rijnard van Tonder and Claire Le Goues. “Lightweight Multi-language Syntax Transformation with Parser Parser Combinators”. In: *Proceedings of the 40th ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI)*. New York, NY, USA: ACM, 2019, pp. 363–378. ISBN: 978-1-4503-6712-7. DOI: 10.1145/3314221.3314589.

[C26] Rijnard van Tonder, John Kotheimer, and Claire Le Goues. “Semantic crash bucketing”. In: *Proceedings of the 33rd ACM/IEEE International Conference on Automated Software Engineering (ASE)*. Montpellier, France, 2018, pp. 612–622. DOI: 10.1145/3238147.3238200.

[C25] Rijnard van Tonder and Claire Le Goues. “Cross-Architecture Lifter Synthesis”. In: *Proceedings of the 16th International Conference on Software Engineering and Formal Methods (SEFM) Held as part of STAF 2018*. Vol. 10886. Lecture Notes in Computer Science. Springer, 2018, pp. 155–170. DOI: 10.1007/978-3-319-92970-5_10.

[C24] Eduardo Faria de Souza, Claire Le Goues, and Celso Goncalves Camilo-Junior. "A Novel Fitness Function for Automated Program Repair Based on Source Code Checkpoints". In: *Proceedings of the Genetic and Evolutionary Computation Conference (GECCO)*. Kyoto, Japan: ACM, July 2018, pp. 1443–1450. DOI: 10.1145/3205455.3205566.

[C23] Alan Jaffe, Jeremy Lacomis, Edward Schwartz, Claire Le Goues, and Bogdan Vasilescu. "Meaningful Variable Names for Decompiled Code: A Machine Translation Approach". In: *Proceedings of the 26th IEEE International Conference on Program Comprehension (ICPC)*. Gothenburg, Sweden: ACM, May 2018, pp. 20–30. DOI: 10.1145/3196321.3196330.

[C22] Rijnard van Tonder and Claire Le Goues. "Static Automated Program Repair for Heap Properties". In: *Proceedings of the 40th IEEE/ACM International Conference on Software Engineering (ICSE)*. Gothenburg, Sweden: ACM, May 2018, pp. 151–162. DOI: 10.1145/3180155.3180250.

[C21] Casidhe Hutchison, Milda Zizyte, Patrick E. Lanigan, David Guttendorf, Michael Wagner, Claire Le Goues, and Philip Koopman. "Robustness Testing of Autonomy Software". In: *Proceedings of the 40th International Conference on Software Engineering: Software Engineering in Practice (ICSE SEIP)*. Gothenburg, Sweden: ACM, May 2018, pp. 276–285. DOI: 10.1145/3183519.3183534.

[C20] Cody Kinneer, Zack Coker, Jiacheng Wang, David Garlan, and Claire Le Goues. "Managing Uncertainty in Self-Adaptive Systems with Plan Reuse and Stochastic Search". In: *Proceedings of the 12th IEEE/ACM International Symposium on Software Engineering for Adaptive and Self-Managing Systems (SEAMS)*. Gothenburg, Sweden: ACM, May 2018, pp. 40–50. DOI: 10.1145/3194133.3194145.

[C19] Mauricio Soto and Claire Le Goues. "Using a probabilistic model to predict bug fixes". In: *Proceedings of the 25th IEEE International Conference on Software Analysis, Evolution, and Reengineering (SANER)*. Campobasso, Italy, Mar. 2018, pp. 221–231. DOI: 10.1109/SANER.2018.8330211.

[C18] Christopher Steven Timperley, Afsoon Afzal, Deborah Katz, Jam Marcos Hernandez, and Claire Le Goues. "Crashing simulated planes is cheap: Can simulation detect robotics bugs early?" In: *Proceedings of the 11th IEEE Conference on Software Testing, Validation and Verification (ICST)*. Västerås, Sweden, Apr. 2018, pp. 331–342. DOI: 10.1109/ICST.2018.00040.

[C17] Zack Coker, Kostadin Damevski, Claire Le Goues, Nicholas A. Kraft, David Shepherd, and Lori Pollock. "Behavior Metrics for Prioritizing Investigations of Exceptions". In: *Proceedings of the 2017 IEEE International Conference on Software Maintenance and Evolution (ICSME, Industry Track)*. Shanghai, China: IEEE Computer Society, Sept. 2017, pp. 554–563. DOI: 10.1109/ICSME.2017.62.

[C16] Christopher Steven Timperley, Susan Stepney, and Claire Le Goues. "An investigation into the use of mutation analysis for automated program repair". In: *Proceedings of the 9th International Symposium on Search Based Software Engineering (SSBSE)*. Vol. 10452. Lecture Notes in Computer Science. Paderborn, Germany: Springer, Sept. 2017, pp. 99–114. DOI: 10.1007/978-3-319-66299-2_7.

[C15] Xuan-Bach D. Le, Duc Hiep Chu, David Lo, Claire Le Goues, and Willem Visser. "S3: Syntax- and Semantic-Guided Repair Synthesis via Programming by Examples". In: *Proceedings of the 11th Joint Meeting of the European Software Engineering Conference and ACM SIGSOFT Symposium on the Foundations of Software Engineering (ESEC/FSE)*. Paderborn, Germany: ACM, Sept. 2017, pp. 593–604. DOI: 10.1145/3106237.3106309.

[C14] Cyrus Omar, Ian Voysey, Michael Hilton, Joshua Sunshine, Claire Le Goues, Jonathan Aldrich, and Matthew Hammer. "Toward Semantic Foundations for Program Editors". In: *Proceedings of the 2nd Summit on Advances in Programming Languages (SNAPL)*. Asilomar, CA, USA: Schloss Dagstuhl - Leibniz-Zentrum fuer Informatik, May 2017, 11:1–11:12. DOI: 10.4230/LIPIcs.SNAPL.2017.11.

[C13] Vinicius Paulo L. Oliveira, Eduardo F. D. Souza, Claire Le Goues, and Celso G. Camilo-Junior. "Improved Crossover Operators for Genetic Programming for Program Repair". In: *Proceedings of the 8th International Symposium on Search Based Software Engineering (SSBSE)*. Vol. 9962. Lecture Notes in Computer Science. Raleigh, NC, USA, Oct. 2016, pp. 112–127. DOI: 10.1007/978-3-319-47106-8_8.

[C12] Tien-Duy B. Le, David Lo, Claire Le Goues, and Lars Grunske. "A Learning-to-rank Based Fault Localization Approach Using Likely Invariants". In: *Proceedings of the 25th International Symposium on Software Testing and Analysis (ISSTA)*. Saarbrücken, Germany: ACM, July 2016, pp. 177–188. DOI: 10.1145/2931037.2931049.

[C11] Yuan Tian, Dinusha Wijedasa, David Lo, and Claire Le Goues. "Learning to rank for bug report assignee recommendation". In: *Proceedings of the 24th IEEE International Conference on Program Comprehension (ICPC)*. Austin, TX, USA: IEEE Computer Society, May 2016, pp. 1–10. DOI: 10.1109/ICPC.2016.7503715.

[C10] Xuan-Bach D. Le, David Lo, and Claire Le Goues. "History Driven Program Repair". In: *Proceedings of the 23rd IEEE International Conference on Software Analysis, Evolution, and Reengineering (SANER)*. Vol. 1. Osaka, Japan: IEEE Computer Society, Mar. 2016, pp. 213–224. DOI: 10.1109/SANER.2016.76.

[C9] Zack Coker, Michael Maass, Tianyuan Ding, Claire Le Goues, and Joshua Sunshine. "Evaluating the Flexibility of the Java Sandbox". In: *Proceedings of the 31st Annual Computer Security Applications Conference (ACSAC)*. Los Angeles, CA, USA: ACM, Dec. 2015, pp. 1–10. DOI: 10.1145/2818000.2818003.

[C8] Yalin Ke, Kathryn T. Stolee, Claire Le Goues, and Yuriy Brun. "Repairing Programs with Semantic Code Search". In: *Proceedings of the 30th IEEE/ACM International Conference on Automated Software Engineering (ASE)*. Lincoln, NE, USA: IEEE Computer Society, Nov. 2015, pp. 295–306. DOI: 10.1109/ASE.2015.60.

[C7] Edward K. Smith, Earl Barr, Claire Le Goues, and Yuriy Brun. "Is the Cure Worse than the Disease? Overfitting in Automated Program Repair". In: *Proceedings of the 10th Joint Meeting of the European Software Engineering Conference and ACM SIGSOFT Symposium on the Foundations of Software Engineering (ESEC/FSE)*. Bergamo, Italy: ACM, Sept. 2015, pp. 532–543. DOI: 10.1145/2786805.2786825.

[C6] Claire Le Goues, Stephanie Forrest, and Westley Weimer. "Representations and Operators for Improving Evolutionary Software Repair". In: *Proceedings of the Genetic and Evolutionary Computation Conference (GECCO)*. Philadelphia, PA, USA: ACM, July 2012, pp. 959–966. DOI: 10.1145/2330163.2330296.

[C5] Claire Le Goues, Michael Dewey-Vogt, Stephanie Forrest, and Westley Weimer. "A Systematic Study of Automated Program Repair: Fixing 55 out of 105 bugs for $8 Each". In: *Proceedings of the 34th International Conference on Software Engineering (ICSE)*. Zurich, Switzerland: IEEE Computer Society, June 2012, pp. 3–13. DOI: 10.1109/ICSE.2012.6227211.

[C4] Ethan Fast, Claire Le Goues, Stephanie Forrest, and Westley Weimer. "Designing better fitness functions for automated program repair". In: *Proceedings of the Genetic and Evolutionary Computation Conference (GECCO)*. Portland, OR, USA: ACM, July 2010, pp. 965–972. DOI: 10.1145/1830483.1830654.

[C3] Stephanie Forrest, Westley Weimer, ThanhVu Nguyen, and Claire Le Goues. "A genetic programming approach to automated software repair". In: *Proceedings of the Genetic and Evolutionary Computation Conference (GECCO)*. Montreal, Québec, Canada: ACM, July 2009, pp. 947–954. DOI: 10.1145/1569901.1570031.

[C2] Westley Weimer, ThanhVu Nguyen, Claire Le Goues, and Stephanie Forrest. "Automatically Finding Patches Using Genetic Programming". In: *Proceedings of the 31st International Conference on Software Engineering (ICSE)*. Vancouver, Canada: IEEE, May 2009, pp. 364–374. DOI: 10.1109/ICSE.2009.5070536.

[C1] Claire Le Goues and Westley Weimer. "Specification Mining with Few False Positives." In: *Proceedings of the 15th Annual Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS), Held as Part of the Joint European Conferences on Theory and Practice of Software (ETAPS)*. Vol. 5505. Lecture Notes in Computer Science. York, UK: Springer, Mar. 2009, pp. 292–306. DOI: 10.1007/978-3-642-00768-2_26.

Refereed Short Publications

[S15] Deborah Katz, Milda Zizyte, Casidhe Hutchison, David Guttendorf, Patrick Lanigan, Eric Sample, Philip Koopman, Michael Wagner, and Claire Le Goues. "Robustness Inside Out Testing". In: *Proceedings of the 50th IEEE/IFIP International Conference on Dependable Systems and Networks (DSN 2020) – Industry Track*. 2020, (to appear).

[S14] Rijnard van Tonder, Asher Trockman, and Claire Le Goues. "A Panel Data Set of Cryptocurrency Development Activity on GitHub". In: *2019 IEEE/ACM 16th International Conference on Mining Software Repositories (MSR)*. May 2019, pp. 186–190. DOI: 10.1109/MSR.2019.00037.

[S13] Christopher Steven Timperley, Susan Stepney, and Claire Le Goues. "Poster: BugZoo: A Platform for Studying Software Bugs". In: *Proceedings of the 40th International Conference on Software Engineering: Companion Proceedings (ICSE Poster)*. Gothenburg, Sweden: ACM, May 2018, pp. 446–447. DOI: 10.1145/3183440.3195050.

[S12] Mauricio Soto and Claire Le Goues. "Common Statement Kind Changes to Inform Automatic Program Repair". In: *Proceedings of the 15th International Conference on Mining Software Repositories (MSR Challenge)*. Gothenburg, Sweden, May 2018, pp. 102–105. DOI: 10.1145/3196398.3196472.

[S11] Afsoon Afzal and Claire Le Goues. "A Study on the Use of IDE Features for Debugging". In: *Proceedings of the 15th International Conference on Mining Software Repositories (MSR Challenge)*. Gothenburg, Sweden, May 2018, pp. 114–117. DOI: 10.1145/3196398.3196468.

[S10] Claire Le Goues, Yuriy Brun, Stephanie Forrest, and Westley Weimer. "Clarifications on the Construction and Use of the ManyBugs Benchmark (Comment Paper)". In: *IEEE Trans. Software Eng.* 43.11 (2017), pp. 1089–1090. DOI: 10.1109/TSE.2017.2755651.

[S9] Xuan-Bach D. Le, Duc Hiep Chu, David Lo, Claire Le Goues, and Willem Visser. "JFix: Semantics-based repair of Java programs via Symbolic PathFinder". In: *Proceedings of the 26th ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA Tools)*. Santa Barbara, CA, USA: ACM, July 2017, pp. 376–379. DOI: 10.1145/3092703.3098225.

[S8] Mauricio Soto, Zack Coker, and Claire Le Goues. "Analyzing the Impact of Social Attributes on Commit Integration Success". In: *Proceedings of the 14th International Conference on Mining Software Repositories (MSR Challenge)*. Buenos Aires, Argentina: IEEE Computer Society, May 2017, pp. 483–486. DOI: 10.1109/MSR.2017.34.

[S7] Xuan-Bach D. Le, David Lo, and Claire Le Goues. "Empirical Study on Synthesis Engines for Semantics-based Program Repair". In: *Proceedings of the 32nd IEEE International Conference on Software Maintenance and Evolution (ICSME ERA)*. Raleigh, NC, USA: IEEE Computer Society, Oct. 2016, pp. 423–427. DOI: 10.1109/ICSME.2016.68.

[S6] Xuan-Bach D. Le, Quang Loc Le, David Lo, and Claire Le Goues. "Enhancing Automated Program Repair with Deductive Verification". In: *Proceedings of the 32nd IEEE International Conference on Software Maintenance and Evolution (ICSME ERA)*. Raleigh, NC, USA: IEEE Computer Society, Oct. 2016, pp. 428–432. DOI: 10.1109/ICSME.2016.66.

[S5] Rijnard van Tonder and Claire Le Goues. "Defending against the attack of the micro-clones". In: *Proceedings of the 24th IEEE International Conference on Program Comprehension (ICPC Short)*. Austin, TX, USA: IEEE Computer Society, May 2016, pp. 1–4. DOI: 10.1109/ICPC.2016.7503736.

[S4] Mary Beth Kery, Claire Le Goues, and Brad A. Myers. "Examining Programmer Practices for Locally Handling Exceptions". In: *Proceedings of the 13th International Conference on Mining Software Repositories (MSR Challenge)*. Austin, TX, USA: ACM, May 2016, pp. 484–487. DOI: 10.1145/2901739.2903497.

[S3] Mauricio Soto, Ferdian Thung, Chu-Pan Wong, Claire Le Goues, and David Lo. "A Deeper Look into Bug Fixes: Patterns, Replacements, Deletions, and Additions". In: *Proceedings of the 13th International Conference on Mining Software Repositories (MSR Challenge)*. Austin, TX, USA: ACM, May 2016, pp. 512–515. DOI: 10.1145/2901739.2903495.

[S2] Zack Coker, David Garlan, and Claire Le Goues. "SASS: Self-Adaptation Using Stochastic Search". In: *Proceedings of the 10th IEEE/ACM International Symposium on Software Engineering for Adaptive and Self-Managing Systems (SEAMS)*. Florence, Italy: IEEE Computer Society, May 2015, pp. 168–174. DOI: 10.1109/SEAMS.2015.16.

[S1] Claire Le Goues, K. Rustan M. Leino, and Michal Moskal. "The Boogie Verification Debugger (Tool Paper)". In: *Proceedings of the 9th International Conference on Software Engineering and Formal Methods (SEFM)*. Vol. 7041. Lecture Notes in Computer Science. Montevideo, Uruguay: Springer, Nov. 2011, pp. 407–414. DOI: 10.1007/978-3-642-24690-6_28.

Refereed Workshop Publications

[W6] Z. Y. Ding, Y. Lyu, C. Timperley, and C. Le Goues. "Leveraging Program Invariants to Promote Population Diversity in Search-Based Automatic Program Repair". In: *2019 IEEE/ACM International Workshop on Genetic Improvement (GI)*. May 2019, pp. 2–9. DOI: 10.1109/GI.2019.00011.

[W5] R. van Tonder and C. Le Goues. "Towards s/engineer/bot: Principles for Program Repair Bots". In: *2019 IEEE/ACM 1st International Workshop on Bots in Software Engineering (BotSE)*. May 2019, pp. 43–47. DOI: 10.1109/BotSE.2019.00019.

[W4] Afsoon Afzal, Jeremy Lacomis, Claire Le Goues, and Christopher S. Timperley. "A Turing Test for Genetic Improvement (Position Paper)". In: *Proceedings of the 4th International Genetic Improvement Workshop*. GI '18. Gothenburg, Sweden: ACM, 2018, pp. 17–18. DOI: 10.1145/3194810.3194817.

[W3] Westley Weimer, Stephanie Forrest, Miryung Kim, Claire Le Goues, and Patrick Hurley. "Trusted Software Repair for System Resiliency". In: *Proceedings of the 46th Annual IEEE/IFIP International Conference on Dependable Systems and Networks Workshops (DSN Workshops)*. Toulouse, France: IEEE Computer Society, July 2016, pp. 238–241. DOI: 10.1109/DSN-W.2016.64.

[W2] Claire Le Goues, Stephanie Forrest, and Westley Weimer. "The case for software evolution". In: *Proceedings of the Workshop on Future of Software Engineering Research (FoSER), at the 18th ACM SIGSOFT International Symposium on Foundations of Software Engineering*. Santa Fe, NM, USA: ACM, Nov. 2010, pp. 205–210. DOI: 10.1145/1882362.1882406.

[W1] ThanhVu Nguyen, Westley Weimer, Claire Le Goues, and Stephanie Forrest. "Using Execution Paths to Evolve Software Patches". In: *Second International Conference on Software Testing Verification and Validation, Workshops Proceedings*. Denver, CO, USA: IEEE Computer Society, Apr. 2009, pp. 152–153. DOI: 10.1109/ICSTW.2009.35.

Unconventional and Non-Refereed Publications

[N4] Justyna Petke, Claire Le Goues, Stephanie Forrest, and William B. Langdon. "Genetic Improvement of Software (Dagstuhl Seminar 18052)". In: *Dagstuhl Reports* 8.1 (2018). Ed. by Justyna Petke, Claire Le Goues, Stephanie Forrest, and William B. Langdon, pp. 158–182. ISSN: 2192-5283. DOI: 10.4230/DagRep.8.1.158.

[N3] Xuan-Bach D. Le, Ferdian Thung, David Lo, and Claire Le Goues. "Overfitting in semantics-based automated program repair". In: *Proceedings of the 40th International Conference on Software Engineering (Journal First)*. ICSE (Journal First) 2018. Gothenburg, Sweden: ACM, May 2018, p. 163. DOI: 10.1145/3180155.3182536.

[N2] Claire Le Goues and Shin Yoo. "Guest editorial for special section on research in search-based software engineering". In: *Empirical Software Engineering* 22.2 (2017), pp. 849–851. DOI: 10.1007/s10664-017-9504-6.

[N1] Sunghun Kim, Claire Le Goues, Michael Pradel, and Abhik Roychoudhury. "Automated Program Repair (Dagstuhl Seminar 17022)". In: *Dagstuhl Reports* 7.1 (2017). Ed. by Sunghun Kim, Claire Le Goues, Michael Pradel, and Abhik Roychoudhury, pp. 19–31. ISSN: 2192-5283. DOI: 10.4230/DagRep.7.1.19.

Invited Tutorials

[T1] Stephanie Forrest and Claire Le Goues. "Evolutionary software repair (Invited Tutorial)". In: *Genetic and Evolutionary Computation Conference (GECCO): Companion Material Proceedings*. Philadelpha, PA, USA: ACM, July 2012, pp. 1345–1348. DOI: 10.1145/2330784.2330943.

Formal Presentations

It Does What You Say, Not What You Mean: Lessons from 10 Years of Program Repair
–Plenary Session, N-10 Award, 41st ACM/IEEE International Conference on Software Engineering (ICSE)
Montreal, Canada, May 2019
–University of Virginia, *Charlottesville, VA*, Sep 2019

Fault Localization and Program Repair
–Lorentz Center Workshop, In-Vivo Analytics for Big Software Quality
Leiden, Netherlands, Sept 2018

Fixed That For You: Scalable Semantic Code Search for High-Quality Program Repair
–Williams College, *Williamstown, MA*, Sept 2018

Evolving Software Quality (keynote)
–4th Intl. Genetic Improvement Workshop (GI), co-located with ICSE 2018
Gothenburg, Sweden, June 2018

From PhD Candidate to Early-Career Researcher: Reflections on Science and Other Useful Stuff (keynote)
–Doctoral Symposium, 32nd IEEE/ACM Symposium on Automated Software Engineering (ASE)
Urbana Champaign, IL, USA, Nov 2017

Advances in automated software repair
–FaceTAV 2017 Symposium, Facebook, *London, UK*, Nov 2017
Video available: `https://facetavlondon2017.splashthat.com/`

FTFY: Research Advances in Automatic Bug Repair (keynote)
–O'Reilly Velocity NY, *NYC, NY*, Sep 2017

Research Advances in Automatic Program Repair
–Amazon, *Seattle, WA*, Sep 2017

Scalable Semantic Code Search for High-Quality Program Repair
–University of Washington, *Seattle, WA*, Jan 2017
–Microsoft Research, *Redmond, WA*, Jan 2017
–Dagstuhl Seminar 17022, Automated Program Repair, *Wadern, Germany*, Jan 2017

Overview on Search-based Program Patching
–Dagstuhl Seminar 17022, Automated Program Repair, *Wadern, Germany*, Jan 2017

Automatic patch generation (keynote)
–PWLConf, co-located with StrangeLoop 2016
St. Louis, MO, Sep 2016
Video available: `https://www.youtube.com/watch?v=sRkfMe0_5cA`

Passing tests is easy: when full coverage isn't enough (keynote)
–9th Intl. Workshop on Search Based Software Testing (SBST), co-located with ICSE 2016
Austin, TX, May 2016

Automatic Program Repair Using Genetic Programming
–University of Massachusetts, Amherst, *Amherst, MA*, Jan 2014
–Virginia Polytechnic Institute and State University (Virginia Tech), *Blacksburg, VA*, Sep 2012

Bloat vs. overfitting in test-driven GP for program repair
–28th Crest Open Workshop, Genetic Programming for Software Engineering
University College London, *London, UK*, Oct 2013

Question your assumptions: the bleeding edge of search-based program repair
–Lille 1 University/INRIA Lille Norde-Europe, *Lille, France*, Oct 2013

Specification Mining with few false positives
–King's College London, Nov 2009

Invited Panels

New Faculty Symposium
–40th Intl. Conference on Software Engineering (ICSE)
Gothenburg, Sweden, May 2018

Thirty Years of Automated Software Engineering (ASE)
–30th IEEE/ACM Intl. Conference on Automated Software Engineering (ASE)
Lincoln, NE, Nov 2015
Moderated by Lars Grunske

Student Supervision

Postdoctoral Advisor

2020–present	Milda Zizyte
2016–2017	Christopher Timperley (now a Systems Scientist at CMU)

PhD Advisor

current	Deborah Katz	Ph.D. in Computer Science, entered 2012
	Afsoon Afzal	Ph.D. in Software Engineering, entered 2015
	Cody Kinneer	Ph.D. in Software Engineering, entered 2016
	Jeremy Lacomis	Ph.D. in Software Engineering, entered 2017
	Leo Chen	Ph.D. in Software Engineering, entered 2019
ABD	Mauricio Soto	Research Scientist, ABB
2020	Zack Coker	Research Scientist, Sandia National Labs
2019	Rijnard van Tonder	Research Scientist, Sourcegraph

PhD Dissertation Committee Member

current	Paulo Casanova	School of Computer Science, CMU
	Chu-Pan Wong	School of Computer Science, CMU
2020	Milda Zizyte	College of Engineering, CMU
2019	Xuechen (Jerry) Lei	College of Engineering, CMU
2017	Gabriel Moreno	School of Computer Science, CMU
	Jason Tsay	School of Computer Science, CMU
2014	David Kelk	University of Ontario Institute of Technology

Masters Advisor

2017	Jon Kotheimer	Heinz College of Public Policy, CMU
2016	Ted Smith	University of Massachusetts - Amherst

Teaching

Instructor of Record *Carnegie Mellon University*

17-355	Program Analysis (cross-listed, 17-655, 17-819) (undergraduate, graduate)	Spring 2020
17-313	Foundations of Software Engineering (undergraduate)	Fall 2019
17-355	Program Analysis (cross-listed, 17-655, 17-819) (undergraduate, graduate)	Spring 2018
17-356	Software Engineering for Startups (undergraduate)	Spring 2018
15-313	Foundations of Software Engineering (undergraduate)	Fall 2017
17-654	Analysis of Software Systems (Masters)	Spring 2017
15-313	Foundations of Software Engineering (undergraduate)	Fall 2016
17-808	Software Engeering Research (Ph.D.)	Fall 2016
15-819O	Special Topics in Programming Languages: Program Analysis (Ph.D)	Spring 2016
15-313	Foundations of Software Engineering (undergraduate)	Fall 2015
17-808	Software Engeering Research (Ph.D.)	Fall 2015
17-654	Analysis of Software Systems (Masters)	Spring 2015
15-313	Foundations of Software Engineering (undergraduate)	Fall 2014
17-808	Software Engeering Research (Ph.D.)	Fall 2014
17-654	Analysis of Software Systems (Masters)	Spring 2014
17-808	Software Engeering Research (Ph.D.)	Fall 2013

University of Virginia

CS4444/6444	High Performance and Parallel Computation (undergraduate/graduate)	Spring 2013

Software and Software Artifacts

Other code and data can be found at `https://github.com/squaresLab` and `http://squareslab.github.io`.

JFix: Semantics-based repair for Java programs. Implements S3.
`https://xuanbachle.github.io/semanticsrepair/`
BugZoo: A framework for performing empirical studies on automated repair of C programs.
`https://github.com/squaresLab/BugZoo`
SearchRepair: A semantic-search-based automated program repair technique.
`https://github.com/ProgramRepair/SearchRepair`
ManyBugs and IntroClass: benchmarks for research in automated repair of C programs.
`http://repairbenchmarks.cs.umass.edu`
GenProg: framework for search-and evolutionary-computation-based repair of C programs.
`https://squareslab.github.io/genprog-code/`
Boogie Verification Debugger (BVD): tool to assist in debugging failed program verification activities.
`http://boogie.codeplex.com/`

Professional Associations

ACM	Association for Computing Machinery
ACM SIGSOFT	ACM Special Interest Group on Software Engineering
IEEE	The Institute of Electrical and Electronics Engineers
IEEE Women	IEEE Women in Engineering

Selected Media

- Software Engineering Radio, Episode 379: Automatic Program Repair (https://www.se-radio.net/2019/09/episode-379-claire-le-goues-on-automated-program-repair/), 2019
- Times Higher Ed, "Objections to double-blind peer review unfounded" (https://www.timeshighereducation.com/news/objections-double-blind-peer-review-unfounded), 2018