Gregory Gay

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Research Interests:

Software engineering, automated software testing and analysis, search-based software engineering, automated test generation, requirements engineering, data analytics, optimization, information retrieval.

Teaching Interests:

Software engineering, software testing, software verification & validation, software architecture, software design principles, artificial intelligence.

Education:

- Docent, University of Gothenburg, Gothenburg, Sweden, 2021.
- Ph.D. Computer Science, University of Minnesota, Minneapolis, Minnesota, 2015.
  Advisor: Dr. Mats Heimdahl.
  Thesis title: *Steering Model-Based Oracles to Admit Real Program Behaviors.*
- M.S. Computer Science, West Virginia University, Morgantown, West Virginia, 2010.
  Advisor: Dr. Tim Menzies.
  Thesis title: *Robust Optimization of Non-Linear Requirements Models.*
- B.S. Computer Science, West Virginia University, Morgantown, West Virginia, 2008.

Professional Experience:

2023–Present Program Manager for Software Engineering and Technology M.Sc., Chalmers University of Technology, Gothenburg, Sweden.

2023–Present Program Manager for Software Engineering and Management M.Sc., University of Gothenburg, Gothenburg, Sweden.

2021–Present Associate Professor, Chalmers and the University of Gothenburg, Gothenburg, Sweden.
Interaction Design and Software Engineering Division,
Department of Computer Science & Engineering

2022 Program Manager (Temporary) for Software Engineering and Management B.Sc., University of Gothenburg, Gothenburg, Sweden.

2019–2021 Assistant Professor, Chalmers and the University of Gothenburg, Gothenburg, Sweden.
Interaction Design and Software Engineering Division,
Department of Computer Science & Engineering

2015–2019 Assistant Professor, University of South Carolina, Columbia, SC.
Department of Computer Science & Engineering

2010–2015 Research Assistant, University of Minnesota, Minneapolis, MN.
Critical Systems Group (under Mats Heimdahl)

2010 Visiting Researcher, Chinese Academy of Sciences, Beijing, PRC.
Lab for Internet Software Technologies, Institute of Software

2009 Intern, National Aeronautics and Space Administration (NASA), Mountain View, CA.
Robust Software Engineering Group, Ames Research Center

2007–2010 Research Assistant, West Virginia University, Morgantown, WV.
Modeling Intelligence Lab (under Tim Menzies)

2006–2007 Research Assistant, West Virginia University, Morgantown, WV.
Virtual Environments Lab (under Francis Van Scoy)

2005 SEAP Intern, National Aeronautics and Space Administration (NASA), Fairmont, WV.
Independent Verification & Validation Center

Teaching Experience:

2020–2024 Course Responsible, Software Quality and Testing (Bachelor, Chalmers and University of Gothenburg).
Course Materials (Newest): `https://greg4cr.github.io/courses/spring23dit635/index.html`

2023–2024 Course Responsible, Industrial Practice Project in Software Engineering (Master, Chalmers and University of Gothenburg).

2020-2022 Course Responsible, Software Engineering Principles for Complex Systems (Bachelor/Master, Chalmers and University of Gothenburg).
Course Materials (Newest): `https://greg4cr.github.io/courses/fall22tda594/index.html`

2019 Co-Teacher, Miniproject: Team Programming (Bachelor, University of Gothenburg).
Course Materials: `https://greg4cr.github.io/courses/misc/index.html`

2019 Co-Teacher, Mobile and Web Development (Bachelor, University of Gothenburg).
Course Materials: `https://greg4cr.github.io/courses/misc/index.html`

2019 Course Responsible, Software Engineering (Bachelor, University of South Carolina).
Course Materials: `https://greg4cr.github.io/courses/spring19csce247/index.html`

2018 Course Responsible, Software Architecture (Masters, University of South Carolina).
Course Materials: `https://greg4cr.github.io/courses/fall18csce742/index.html`

2016–2018 Course Responsible, Software Testing and Quality Assurance (Masters, University of South Carolina).
Course Materials (Newest): `https://greg4cr.github.io/courses/spring18csce747/index.html`

2016–2017 Course Responsible, Seminar on Advances in Computing (Masters, University of South Carolina).
Course Materials (Newest): `https://greg4cr.github.io/courses/fall17csce791/index.html`

2015–2017 Course Responsible, Software Engineering (Masters, University of South Carolina).
Course Materials (Newest): `https://greg4cr.github.io/courses/fall17csce740/index.html`

2015 Course Responsible, Software Engineering 1 (Bachelor/Master, University of Minnesota).

2012–2014 Teaching Assistant, Software Engineering 1 (Bachelor/Master, University of Minnesota).

2013 Teaching Assistant, Software Engineering 2 (Bachelor/Master, University of Minnesota).

2012 Participant, University of Minnesota Preparing Future Faculty Program.

Student Supervision:

Ph.D. Supervisor

2020–Ongoing Afonso Fontes, University of Gothenburg, estimated graduation: 2025.

2016–2022 Alireza Salahirad, University of South Carolina.

2016–2020 Hussein Almulla, University of South Carolina.

2018–2019 Ying Meng, University of South Carolina (transferred supervisor).

Ph.D. Co-Supervision

2020–Ongoing Khan Mohammad Habibullah, co-supervised with Jennifer Horkoff, University of Gothenburg, estimated graduation: 2025).

Ph.D. or Licentiate Examination/Opponent

2023 Andreas Bauer, Licentiate Opponent, Blekinge Institute of Technology.

2023 Milos Ojdanic, Ph.D. Examination, University of Luxembourg.

2022 Anjana Perera, Ph.D. Examination, Monash University.

2022 William Hoskins, Ph.D. Examination, University of South Carolina.

2022 Qunying Song, Licentiate Opponent, Lund University.

2021 Khouloud Gaaloul, Ph.D. Examination, University of Luxembourg.

2020 Mahshid Helali, Licentiate Opponent, Mälardalen University.

M.Sc. Supervisor

2024 Linnea Wahlgren and Ludvig Lemner, Chalmers University of Technology.

2023 Viktor Tu and Albin Lönnfalt, Chalmers University of Technology.

2022–2023 Haozhao Lyu, Chalmers University of Technology.

2022 Rohini Bisht and Selomie Kindu Ejigu, Chalmers University of Technology and University of Gothenburg.

2022 Teklit Berihu Gereziher and Selam Gebrekrstos, Chalmers University of Technology.

2020 Ashish Husain and Martin Tran, Chalmers University of Technology.

2020 Rasmus Jenth, Chalmers University of Technology.

2018–2019 Burl Kenner III, University of South Carolina.

2017–2018 Srujana Bollina, University of South Carolina.

2016–2017 Ying Meng, University of South Carolina.

M.Sc. Co-Supervision

2024 Stefan Alexander van Heijningen and Theo Wiik, co-supervised with Francisco Gomes de Oliveira Neto, Chalmers University of Technology.

2024 Henrik Johansson and Erik Blomberg, co-supervised with Afonso Fontes, Chalmers University of Technology.

2022 Jonathan Örgård, co-supervised with Francisco Gomes de Oliveira Neto, University of Gothenburg.

2022 Lukas Berglund and Tim Grube, co-supervised with Francisco Gomes de Oliveira Neto, Chalmers University of Technology and University of Gothenburg.

2017–2018 George Akhvlediani, co-supervised with Duncan Buell, University of South Carolina.

M.Sc. Examination

2020–Present Examined 22 theses, Chalmers and University of Gothenburg.

B.Sc. Supervisor

2024 Arash Amiry, Nils Bengtsson Svanstedt, Anton Börås, Julia Giaro, and Elin Ruud, Chalmers University of Technology

2023 Gregory Sastrawidjaya and Edvin Danielsson, University of Gothenburg.

2023 Zubeen Maruf, University of Gothenburg.

2022 Shonaigh Douglas, University of Gothenburg.

2022 Dia Istanbuly and Max Zimmer, University of Gothenburg.

2020 Fabian Daneshmand-Mehr and Daniel Salomons, University of Gothenburg.

2020 Sarkis George Sarkisian, University of Gothenburg.

B.Sc. Co-Supervision

2023 Karl Stahre and Malte Götharsson, co-supervised with Francisco Gomes de Oliveira Neto, University of Gothenburg.

B.Sc. Examination

2020–Present Examined 7 theses, University of Gothenburg.

Independent Study, Industrial Project, or Research Internship Supervisor[1]

2024 Nicole Andrea Quinstedt, University of Gothenburg (Research Assistant).

2023 Albin Landgren, Chalmers University of Technology (Industrial Practice Project).

2018 Hayley Lichtenfels, University of South Carolina (Independent Study).

2016 Allen Kanapala, University of South Carolina (Independent Study).

2016 Narasimha Chilukuri, University of South Carolina (Independent Study).

2016 Craig Sharp, University of South Carolina (Independent Study).

Funding:

2020–2025 Vetenskapsrådet (Swedish Research Council) Award 2019-05275, Context-Infused Automated Software Test Generation (Sole PI, 3,900,000 SEK).

2020–Present Software Center, Aspects of Automated Testing (15% of research hours funded on an ongoing basis).

2019–2020 South Carolina NASA EPSCoR, Robust Software Testing of Autonomous Aerospace Robotic Systems Using Transfer Learning (Co-PI, $25,000.00).

2018–2019 University of South Carolina ASPIRE-1, Investigating the Relationship between Real and Synthetic Software Faults (Sole PI, $14,959.00).

2017–2019 National Science Foundation Award CCF-1657299, CRII: SHF: Understanding The Role of Software Test Adequacy Criteria in Search-Based Test Generation (Sole PI, $173,528.00).

[1] An "Independent Study" in the US or an "Industrial Practice Project is similar to a Swedish Bachelor's Thesis in scope.

Awards:

2023 Best Paper Award, 35^{th} International Conference on Testing Software and Systems (ICTSS'23), *Understanding Problem Solving in Software Testing: An Exploration of Tester Routines and Behavior.*

2023 Distinguished Reviewer, 27^{th} International Conference on Evaluation and Assessment in Software Engineering (EASE'23).

2023 Distinguished Paper Award, 16^{th} International Conference on Software Testing, Verification, and Validation (ICST'23), *How Closely are Common Mutation Operators Coupled to Real Faults?.*

2020 Distinguished Reviewer, 35^{th} International Conference on Automated Software Engineering (ASE'20).

2019 2009-2019 Most Influential Paper Award, 35^{th} International Conference on Software Maintenance and Evolution (ICSME'19), *On the Use of Relevance Feedback in IR-based Concept Location.*

2019 Best Reviewer, Journal of Systems and Software.

2018 Graduate Teaching Award, University of South Carolina (Department of Computer Science & Engineering).

2018 Challenge Award Winner, 10^{th} Symposium on Search-Based Software Engineering (SSBSE'18), *Detecting Real Faults in the Gson Library Through Search-Based Unit Test Generation.*

2018 Best Presentation, 11^{th} International Workshop on Search-Based Software Testing (SBST'18), *Multifaceted Test Suite Generation Using Primary and Supporting Fitness Functions.*

2016 Challenge Award Winner, 8^{th} Symposium on Search-Based Software Engineering (SSBSE'16), *Challenges in Using Search-Based Test Generation to Identify Real Faults in Mockito.*

2014 Best Presentation, 7^{th} International Workshop on Search-Based Software Testing (SBST'14), *Moving the Goalposts: Coverage Satisfaction is Not Enough.*

2010–2013 National Science Foundation Graduate Research Fellowship.

Conference Steering Committees and Chairmanships:

2023–Present Steering Committee, International Conference on Software Testing, Verification, and Validation (ICST)

2024 Program Co-Chair, 17^{th} International Conference on Software Testing, Verification, and Validation (ICST'24)

2023–2024 Co-Chair, International Workshop on Artificial Intelligence in Software Testing (AIST)

2023 New Ideas and Emerging Results/Replications and Negative Results (NIER/RENE) Track Co-Chair, 15^{th} Symposium on Search-Based Software Engineering (SSBSE'23).

2023 Testing Tools/Tool Demonstrations Co-Chair, 16^{th} International Conference on Software Testing, Verification, and Validation (ICST'23)

2016–2022 Steering Committee, Symposium on Search-Based Software Engineering (SSBSE).

2022 Publicity and Social Media Co-Chair, 38^{th} International Conference on Software Maintenance and Evolution (ICSME'22)

2021 Artifact Evaluation Co-Chair, 37^{th} International Conference on Software Maintenance and Evolution (ICSME'21)

2021 Challenge Track Co-Chair, 13^{th} Symposium on Search-Based Software Engineering (SSBSE'21).

2020 New Ideas and Emerging Results (NIER) Track Co-Chair, 12^{th} Symposium on Search-Based Software Engineering (SSBSE'20).

2015–2020 Steering Committee, International Workshop on Search-Based Software Testing (SBST).

2019 Program Co-Chair, 11^{th} Symposium on Search-Based Software Engineering (SSBSE'19).

2019 Co-Chair, 3^{rd} ROSE Festival (Recognizing and Rewarding Open Science in Software Engineering, ESEC/FSE Special Track).

2019 General Chair, 6^{th} International Workshop on Requirements Engineering and Testing (RET'19)

2018 Workshop Co-Chair, 11^{th} International Conference on Software Testing, Verification, and Validation (ICST'18).

2018 Program Co-Chair, 5^{th} International Workshop on Requirements Engineering and Testing (RET'18)

2017–2018 Steering Committee Deputy Chair, International Workshop on Search-Based Software Testing (SBST).

2017 Publicity Co-Chair, 9^{th} Symposium on Search-Based Software Engineering (SSBSE'17).

2017 Co-Chair, 4^{th} International Workshop on Requirements Engineering and Testing (RET'17).

2016–2017 Steering Committee Chair, International Workshop on Search-Based Software Testing (SBST).

2016 Co-Chair, 9^{th} International Workshop on Search-Based Software Testing (SBST'16).

2016 Program Co-Chair, 3^{rd} International Workshop on Requirements Engineering and Testing (RET'16).

2015 Co-Chair, 8^{th} International Workshop on Search-Based Software Testing (SBST'15).

2012 North America Publicity Chair, 27^{th} IEEE /ACM International Conference on Automated Software Engineering (ASE'12).

2012 Web Chair, 20^{th} IEEE International Conference on Requirements Engineering (RE'12).

2008–2010 Web Chair, International Conference on Predictive Models in Software Engineering (PROMISE).

Conference Program Committees:

2023–Present Program Committee, International Conference on Evaluation and Assessment in Software Engineering (EASE).

2020, 2022–Present Program Committee, Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE) (Tool Demonstrations)

2020–Present Program Committee, Symposium on Search-Based Software Engineering (SSBSE) (Replications and Negative Results Track)

2019, 2022–Present Program Committee, International Symposium on Software Testing and Analysis (ISSTA) (Tool Demonstrations)

2018–Present Program Committee, Genetic and Evolutionary Computation Conference (GECCO)

2017–Present Program Committee, International Conference on Advances in System Testing and Validation Lifecycle (VALID).

2017–Present Program Committee, International Workshop on Search-Based Software Testing (SBST).

2016–2018, 2023 Program Committee, Symposium on Search-Based Software Engineering (SSBSE).

2024 Program Committee, ACM/IEEE International Conference on Automation of Software Test (AST)

2023 Program Committee, Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE) (Student Research Competition)

2020–2022 Program Committee, International Conference on Automated Software Engineering (ASE)

2020, 2022 Program Committee, Symposium on Search-Based Software Engineering (SSBSE) (Challenge Track)

2019–2022 Program Committee, International Conference on Automated Software Engineering (ASE) (Tool Demonstrations)

2023 Program Committee, Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE) (Student Research Competition)

2022 Program Committee, International Conference on Software Engineering (ICSE).

2022 Program Committee, International Workshop on Artificial Intelligence in Software Testing (AIST).

2021 Program Committee, International Conference on the Applications of Evolutionary Computing (EvoApplications)

2021 Program Committee, International Conference on Software Analysis, Evolution and Reengineering (SANER) (Tool Track)

2021 Program Committee, International Workshop on Test Oracles (TORACLE)

2020 Program Committee, International Conference on Software Engineering (ICSE) (Poster Track).

2017–2019 Program Committee, European Conference on the Applications of Evolutionary Computing (EvoSET Track—Nature-inspired algorithms in Software Engineering and Testing).

2019 Program Committee, International Workshop on Software Engineering Intelligence (SEI)

2018–2019 Program Committee, International Conference on Software Testing, Verification, and Validation (ICST)

2018–2019 Program Committee, International Conference on Software Engineering (ICSE) (Demonstrations Track).

2017–2018 Program Committee, International Workshop on Software Analytics (SWAN).

2015 Program Committee, International Workshop on Actionable Analytics for SE (ACTION).

2011–2012 Program Committee, International Conference on Predictive Models in Software Engineering (PROMISE).

Books and Chapters:

Names in **bold** are supervised students.

1. **Afonso Fontes**, Gregory Gay, Francisco Gomes de Oliveria Neto, Robert Feldt. Automated Support for Unit Test Generation. Book chapter, *Optimising the Software Development Process with Artificial Intelligence.* Springer, 2023. ISBN: 978-981-19-9948-2. Available at `http://greg4cr.github.io/pdf/21ai4se.pdf`.
2. Shiva Nejati and Gregory Gay, editors. Proceedings of the 11th International Symposium on Search-Based Software Engineering, SSBSE 2019, Talinn, Estonia, August 31-September 1, 2019. Vol. 11664. Lecture Notes in Computer Science. Springer, 2019. ISBN: 978-3-030-27455-9.

Journal Publications:

3. **Khan Mohammad Habibullah**, Hans-Martin Heyn, Gregory Gay, Jennifer Horkoff, Eric Knauss, Markus Borg, Alessia Knauss, Håkan Sivencrona, Polly Jing Li. Requirements and Software Engineering for Automotive Perception Systems: An Interview Study. *Requirements Engineering Journal.* To appear, 2024. Available at `http://greg4cr.github.io/pdf/24aps.pdf`.
4. **Afonso Fontes**, Gregory Gay. The Integration of Machine Learning into Automated Test Generation: A Systematic Mapping Study. *Wiley Software Testing, Verification and Reliability.* Volume 33, Issue 4. 2023. Available at `http://greg4cr.github.io/pdf/23mapping.pdf`.
5. **Khan Mohammad Habibullah**, Gregory Gay, Jennifer Horkoff. Non-Functional Requirements for Machine Learning: Understanding Current Use and Challenges Among Practitioners. *Requirements Engineering Journal.* Volume 28, Number 2. June 2023. Available at `http://greg4cr.github.io/pdf/23nfrsurvey.pdf`.
6. **Alireza Salahirad**, Gregory Gay, Ehsan Mohammadi. Mapping the Structure and Evolution of Software Testing Research Over the Past Three Decades. *Journal of Systems and Software.* Volume 195. 2023. Available at `http://greg4cr.github.io/pdf/22topics.pdf`.

7. **Hussein Almulla**, Gregory Gay. Learning How to Search: Generating Effective Test Cases Through Adaptive Fitness Function Selection. *Empirical Software Engineering Journal.* Volume 27, Article 38. 2022. Available at `http://greg4cr.github.io/pdf/21affs.pdf`.
8. **Alireza Salahirad**, **Hussein Almulla**, Gregory Gay. Choosing The Fitness Function for the Job: Automated Generation of Test Suites that Detect Real Faults. *Wiley Software Testing, Verification and Reliability.* Volume 29, Issue 4-5. June–August 2019. Available at `http://greg4cr.github.io/pdf/19fitness.pdf`.
9. **Ying Meng**, Gregory Gay, Michael Whalen. Ensuring the Observability of Structural Test Obligations. *IEEE Transactions on Software Engineering.* Volume 46, Issue 7, September 2018. Available at `http://greg4cr.github.io/pdf/18omcdc.pdf`.
10. Amanda Schwartz, Daniel Puckett, **Ying Meng**, Gregory Gay. Investigating Faults Missed by Test Suites Achieving High Code Coverage. *Journal of Systems and Software.* Volume 144. October 2018. Pages 106-120. Available at `http://greg4cr.github.io/pdf/18mutation.pdf`.
11. Gregory Gay, Sanjai Rayadurgam, Mats P.E. Heimdahl. Automated Steering of Model-Based Test Oracles to Admit Real Program Behaviors. *IEEE Transactions on Software Engineering.* Volume 43, Number 6. June 2017. Pages 531-555. Available at `http://greg4cr.github.io/pdf/16steering.pdf`.
12. Gregory Gay, Ajitha Rajan, Matt Staats, Michael Whalen, Mats P.E. Heimdahl. The Effect of Program and Model Structure on the Effectiveness of MC/DC Test Adequacy Coverage. *ACM Transactions on Software Engineering and Methodology.* Volume 25, Number 3, Article 25. August 2016. Available at `http://greg4cr.github.io/pdf/16mcdc.pdf`.
13. Gregory Gay, Matt Staats, Michael Whalen, Mats P.E. Heimdahl. Automated Oracle Data Selection Support. *IEEE Transactions on Software Engineering.* Volume 41, Number 11. November 2015. Pages 1119-1137. Available at `http://greg4cr.github.io/pdf/15oracles.pdf`.
14. Gregory Gay, Matt Staats, Michael Whalen, Mats P.E. Heimdahl. The Risks of Coverage-Directed Test Case Generation. *IEEE Transactions on Software Engineering.* Volume 41, Number 8. August 2015. Pages 803-819. Available at `http://greg4cr.github.io/pdf/15covrisks.pdf`.
15. Adam Nelson, Tim Menzies, Gregory Gay. Sharing Experiments Using Open-Source Software. *Software: Practice and Experience.* Volume 41, Number 3. March 2011. Pages 283–305. Available at `http://greg4cr.github.io/pdf/10ourmine.pdf`.
16. Gregory Gay, Tim Menzies, Misty Davies, and Karen Gundy-Burlet. Automatically Finding the Control Variables for Complex System Behavior. *Automated Software Engineering.* Volume 17, Number 4. December 2010. Pages 1–30. Available at `http://www.greg4cr.github.io/pdf/10tar3.pdf`.
17. Gregory Gay, Tim Menzies, Omid Jalali, Gregory Mundy, Beau Gilkerson, Martin Feather, and James Kiper. Finding Robust Solutions in Requirements Models. *Automated Software Engineering.* Volume 17, Number 1. March 2010. Pages 87–116. Available at `http://www.greg4cr.github.io/pdf/10keys.pdf`.

Conference Publications:

18. Gregory Gay. Improving the Readability of Generated Tests Using GPT-4 and ChatGPT Code Interpreter. *Proceedings of 15th Symposium on Search-Based Software Engineering, Challenge Track (SSBSE'23).* San Francisco, USA, December 2023. Available at `http://greg4cr.github.io/pdf/23readability.pdf`.
19. **Haozhou Lyu**, Gregory Gay, Maiko Sakamoto. Developer Views on Software Carbon Footprint and its Potential for Automated Reduction. *Proceedings of 15th Symposium on Search-Based Software Engineering (SSBSE'23).* San Francisco, USA, December 2023. Available at `http://greg4cr.github.io/pdf/23cfreq.pdf`.

20. **Haozhou Lyu**, Gregory Gay, Maiko Sakamoto. Exploring Genetic Improvement of the Carbon Footprint of Web Pages. *Proceedings of 15th Symposium on Search-Based Software Engineering (SSBSE'23).* San Francisco, USA, December 2023. Available at `http://greg4cr.github.io/pdf/23cfgi.pdf`.

21. Eduard Paul Enoiu, Gregory Gay, Jameel Esber, Robert Feldt. Understanding Problem Solving in Software Testing: An Exploration of Tester Routines and Behavior. *Proceedings of the 35th International Conference on Testing Software and Systems (IFIP-ICTSS'23).* Bergamo, Italy, September 2023. **Best Paper Award Winner**. Available at `http://greg4cr.github.io/pdf/23problemmodel.pdf`.

22. **Dia Istanbuly**, **Max Zimmer**, Gregory Gay. How Do Different Types of Testing Goals Affect Test Case Design? *Proceedings of the 35th International Conference on Testing Software and Systems (IFIP-ICTSS'23).* Bergamo, Italy, September 2023. Available at `http://greg4cr.github.io/pdf/23goals.pdf`.

23. **Teklit Berihu Gereziher**, **Selam Welu Gebrekrstos**, Gregory Gay. Search-Based Test Generation Targeting Non-Functional Quality Attributes of Android Apps. *Proceedings of the 24th ACM Genetic and Evolutionary Computation Conference (GECCO'23).* Lisbon, Portugal, July 2023. Available at `http://greg4cr.github.io/pdf/23searchnonfunc.pdf`.

24. **Khan Mohammad Habibullah**, Hans-Martin Heyn, Gregory Gay, Jennifer Horkoff, Eric Knauss, Markus Borg, Alessia Knauss, Håkan Sivencrona, Polly Jing Li. Requirements Engineering for Automotive Perception Systems: an Interview Study. *Proceedings of the 29th International Working Conference on Requirement Engineering: Foundation for Software Quality (REFSQ'23).* Barcelona, Spain, April 2023. Available at `http://greg4cr.github.io/pdf/23perception.pdf`.

25. Gregory Gay, **Alireza Salahirad**. How Closely are Common Mutation Operators Coupled to Real Faults?. *Proceedings of the 16th IEEE International Conference on Software Testing, Verification, and Validation (ICST'23).* Dublin, Ireland, April 2023. **Distinguished Paper Award Winner**. Available at `http://greg4cr.github.io/pdf/23coupling.pdf`.

26. **Lukas Berglund, Tim Grube**, Gregory Gay, Francisco Gomes de Oliveira Neto, Dimitrios Platis. Test Maintenance for Machine Learning Systems: A Case Study in the Automotive Industry. *Proceedings of the 16th IEEE International Conference on Software Testing, Verification, and Validation, Industry Track (ICST'23).* Dublin, Ireland, April 2023. Available at `http://greg4cr.github.io/pdf/23maintenance.pdf`.

27. Hamid Ebadi, Mahshid Helali Moghadam, Markus Borg, Gregory Gay, **Afonso Fontes**, Kasper Socha. Efficient and Effective Generation of Test Cases for Pedestrian Detection–Search-based Software Testing of Baidu Apollo in SVL. *Proceedings of 3rd IEEE International Conference on Artificial Intelligence Testing, Challenge Track (AITest'21).* Bari, Italy, August 2021. Available at `http://greg4cr.github.io/pdf/21aitest.pdf`.

28. Gregory Gay, René Just. Defects4J as a Challenge Case for the Search-Based Software Engineering Community. *Proceedings of 12th Symposium on Search-Based Software Engineering, Challenge Cases Track (SSBSE'20).* Bari, Italy, September 2020. Available at `http://greg4cr.github.io/pdf/20d4j.pdf`.

29. **Hussein Almulla**, Gregory Gay. Generating Diverse Test Suites for Gson Through Adaptive Fitness Function Selection. *Proceedings of 12th Symposium on Search-Based Software Engineering, Challenge Solutions Track (SSBSE'20).* Bari, Italy, September 2020. Available at `http://greg4cr.github.io/pdf/20rldiv.pdf`.

30. **Srujana Bollina**, Gregory Gay. Bytecode-based Multiple Condition Coverage: An Initial Investigation. *Proceedings of 12th Symposium on Search-Based Software Engineering, Replications and Negative Results Track (SSBSE'20).* Bari, Italy, September 2020. Available at `http://greg4cr.github.io/pdf/20bmcc.pdf`.

31. **Ying Meng**, Gregory Gay. Understanding The Impact of Solver Choice in Model-Based Test Generation. *Proceedings of the ACM/IEEE International Symposium on Empirical Software Engineering and Measurement (ESEM'20).* Bari, Italy, September 2020. Available at `http://greg4cr.github.io/pdf/20solvers.pdf`.

32. **Hussein Almulla**, Gregory Gay. Learning How to Search: Generating Exception-Triggering Tests Through Adaptive Fitness Function Selection. *Proceedings of the 13th IEEE International Conference on Software Testing, Verification, and Validation (ICST'20).* Porto, Portugal, March 2020. Available at `http://greg4cr.github.io/pdf/20icst.pdf`.

33. **Allen Kanapala**, Gregory Gay. Mapping Class Dependencies for Fun and Profit. *Proceedings of the 10th Symposium on Search-Based Software Engineering, Hot Off the Press Track (SSBSE'18).* Montpellier, France, September 2018. Available at `http://greg4cr.github.io/pdf/18coupling.pdf`.

34. Gregory Gay. Detecting Real Faults in the Gson Library Through Search-Based Unit Test Generation. *Proceedings of the 10th Symposium on Search-Based Software Engineering, Challenge Track (SSBSE'18).* Montpellier, France, September 2018. Available at `http://greg4cr.github.io/pdf/18gson.pdf`.

35. **Hussein Almulla**, **Alireza Salahirad**, Gregory Gay. Using Search-Based Test Generation to Discover Real Faults in Guava. *Proceedings of the 9th Symposium on Search-Based Software Engineering, Challenge Track (SSBSE'17).* Paderborn, Germany, September 2017. Available at `http://greg4cr.github.io/pdf/17guava.pdf`.

36. Gregory Gay. Generating Effective Test Suites by Combining Coverage Criteria. *Proceedings of the 9th Symposium on Search-Based Software Engineering (SSBSE'17).* Paderborn, Germany, September 2017. Available at `http://greg4cr.github.io/pdf/17ssbse.pdf`.

37. Gregory Gay. The Fitness Function for the Job: Search-Based Generation of Test Suites that Detect Real Faults. *Proceedings of the 10th IEEE International Conference on Software Testing, Verification, and Validation (ICST'17).* Tokyo, Japan, March 2017. **Best Paper Nominee**. Available at `http://greg4cr.github.io/pdf/17fitness.pdf`.

38. Gregory Gay. Challenges in Using Search-Based Test Generation to Identify Real Faults in Mockito. *Proceedings of the 8th Symposium on Search-Based Software Engineering, Challenge Track (SSBSE'16).* Raleigh, NC, USA, October 2016. **Best Paper Winner (Challenge Track)**. Available at `http://greg4cr.github.io/pdf/16mockito.pdf`.

39. Dongjiang You, Sanjai Rayadurgam, Michael Whalen, Mats P.E. Heimdahl, Gregory Gay. Efficient Observability-based Test Generation by Dynamic Symbolic Execution. *Proceedings of the 26th IEEE International Symposium on Software Reliability Engineering (ISSRE'15).* Gaithersburg, MD, USA, November 2015. Available at `http://greg4cr.github.io/pdf/15issre.pdf`.

40. Gregory Gay, Sanjai Rayadurgam, Mats P.E. Heimdahl. Improving the Accuracy of Oracle Verdicts Through Automated Model Steering. *Proceedings of the 29th ACM/IEEE International Conference on Automated Software Engineering (ASE'14).* Vasteras, Sweden, September 2014. Available at `http://greg4cr.github.io/pdf/14ase.pdf`.

41. Gregory Gay, Sanjai Rayadurgam, Mats P.E. Heimdahl. Steering Model-Based Oracles to Admit Real Program Behaviors. *Proceedings of the 36th ACM/IEEE International Conference on Software Engineering, NIER Track (ICSE'14-NIER).* Hyderabad, India, June 2014. Available at `\newlinehttp://greg4cr.github.io/pdf/14nier.pdf`.

42. Michael Whalen, Gregory Gay, Dongjiang You, and Mats P.E. Heimdahl. Observable Modified Condition/Decision Coverage. *Proceedings of the 35th ACM/IEEE International Conference on Software Engineering (ICSE'13).* San Francisco, United States, May 2013. Available at `http://greg4cr.github.io/pdf/13omcdc.pdf`.

43. Matt Staats, Gregory Gay, and Mats P.E. Heimdahl. Automated Oracle Creation Support, or: How I Learned to Stop Worrying About Fault Propagation and Love Mutation Testing. *Proceedings of the*

34th ACM/IEEE International Conference on Software Engineering (ICSE'12). Zurich, Switzerland, May 2012. Available at `http://greg4cr.github.io/pdf/12oracle.pdf`.

44. Matt Staats, Gregory Gay, Michael Whalen, and Mats P.E. Heimdahl. On the Danger of Coverage Directed Test Case Generation. *Proceedings of the 15th International Conference on Fundamental Approaches to Software Engineering (FASE'12)*. Talinn, Estonia, March 2012. Available at `http://greg4cr.github.io/pdf/12danger.pdf`.
45. Ekrem Kocaguneli, Gregory Gay, Tim Menzies, Ye Yang, and Jacky Keung. When to Use Data from Other Projects for Effort Estimation. Short Paper, *Proceedings of the 25th ACM/IEEE International Conference on Automated Software Engineering (ASE'10)*. Antwerp, Belguim, September 2010. Available at `http://greg4cr.github.io/pdf/10ccwc.pdf`.
46. Gregory Gay. A Baseline Method For Search-Based Software Engineering. *Proceedings of the 6th International Conference on Predictive Models in Software Engineering (PROMISE'10)*. Banff, Canada, September 2010. Available at `http://greg4cr.github.io/pdf/10baseline.pdf`.
47. Jia Chen, Ye Yang, Wen Zhang, Gregory Gay. Measuring the Heterogeneity of Crosscompany Datasets. *Proceedings of the 11th International Conference on Product Focused Software Development and Process Improvement (PROFES'10)*. Limerick, Ireland, June 2010. Available at `http://greg4cr.github.io/pdf/10profes.pdf`.
48. Gregory Gay, Sonia Haiduc, Andrian Marcus, Tim Menzies. On the Use of Relevance Feedback in IR-based Concept Location. *Proceedings of the 25th IEEE International Conference on Software Maintenance (ICSM'09)*. Alberta, Canada, September 2009. **2009–2019 Most Influential Paper Award**. Available at `http://greg4cr.github.io/pdf/09irrf.pdf`.
49. Gregory Gay, Tim Menzies, Bojan Cukic, Burak Turhan. How to Build Repeatable Experiments. *Proceedings of the 5th International Conference on Predictive Models in Software Engineering (PROMISE'09)*. Vancouver, Canada, May 2009. Available at `http://greg4cr.github.io/pdf/09ourmine.pdf`.

Workshop Publications:

50. **Rohini Bisht, Selomie Kindu Ejigu**, Gregory Gay, Predrag Filipovikj. Identifying Redundancies and Gaps Across Testing Levels During Verification of Automotive Software. *Proceedings of the 6th International Workshop on User Interface Test Automation and Testing Techniques for Event Based Software (INTUITESTBEDS'23)*. Dublin, Ireland, April 2023. Available at `http://greg4cr.github.io/pdf/23vmodel.pdf`.
51. **Jonathan Örgård**, Gregory Gay, Francisco Gomes de Oliveira Neto, Kim Viggedal. Mutation Testing in Continuous Integration: An Exploratory Industrial Case Study. *Proceedings of the 18th International Workshop on Mutation Analysis (MUTATION'23)*. Dublin, Ireland, April 2023. Available at `http://greg4cr.github.io/pdf/23mutationci.pdf`.
52. **Khan Mohammad Habibullah**, Gregory Gay, Jennifer Horkoff. Non-Functional Requirements for Machine Learning: An Exploration of System Scope and Interest. *Proceedings of the 1st Workshop on Software Engineering for Responsible AI (SE4RAI'22)*. Pittsburgh, USA, May 2022. Available at `http://greg4cr.github.io/pdf/22nfrexplore.pdf`.
53. **Afonso Fontes**, Gregory Gay. Using Machine Learning to Generate Test Oracles: A Systematic Literature Review. *Proceedings of the 1st International Workshop on Test Oracles (TORACLE'21)*. Athens, Greece, August 2021. Available at `http://greg4cr.github.io/pdf/21oracleslr.pdf`.
54. Gregory Gay. One-Size-Fits-None? Improving Test Generation Using Context-Optimized Fitness Functions. *Proceedings of the 12th International Workshop on Search-Based Software Testing (SBST'19)*. Montreal, Canada, May 2018. Available at `http://greg4cr.github.io/pdf/19sbst.pdf`.

55. Gregory Gay. To Call, or Not to Call: Contrasting Direct and Indirect Branch Coverage in Test Generation. *Proceedings of the 11th International Workshop on Search-Based Software Testing (SBST'18).* Gothenburg, Sweden, May 2018. Available at `http://greg4cr.github.io/pdf/18sbstdbc.pdf`.

56. Gregory Gay. Multifaceted Test Suite Generation Using Primary and Supporting Fitness Functions. *Proceedings of the 11th International Workshop on Search-Based Software Testing (SBST'18).* Gothenburg, Sweden, May 2018. Available at `http://greg4cr.github.io/pdf/18sbstposition.pdf`.

57. Gregory Gay, Matt Staats, Michael Whalen, and Mats P.E. Heimdahl. Moving the Goalposts: Coverage Satisfaction is Not Enough. *Proceedings of the 7th International Workshop on Search-Based Software Testing (SBST'14).* Hyderabad, India, June 2014. Available at `http://greg4cr.github.io/pdf/14sbst.pdf`.

58. Gregory Gay and Mats P.E. Heimdahl. Towards Community-Assisted Software Engineering Decision Making. *Proceedings of the 2^{nd} International Workshop on Realizing Artificial Intelligence Synergies in Software Engineering (RAISE 2013).* San Francisco, California, May 2013. Available at `http://greg4cr.github.io/pdf/13raise.pdf`.

59. Tim Menzies, Burak Turhan, Gregory Gay, Ayse Bener, Bojan Cukic and Yue Jiang. Implications of Ceiling Effects in Defect Predictors. *Proceedings of the 4^{th} International Workshop on Predictive Models in Software Engineering (PROMISE'08).* Leipzig, Germany, May 2008. Available at `http://greg4cr.github.io/pdf/08ceiling.pdf`.

Other Publications:

60. Paul Ralph, Nauman bin Ali, Sebastian Baltes, Domenico Bianculli, Jessica Diaz, Yvonne Dittrich, Neil Ernst, Michael Felderer, Robert Feldt, Antonio Filieri, Breno Bernard Nicolau de Frana, Carlo Alberto Furia, Gregory Gay, Nicolas Gold, Daniel Graziotin, Pinjia He, Rashina Hoda, Natalia Juristo, Barbara Kitchenham, Valentina Lenarduzzi, Jorge Martnez, Jorge Melegati, Daniel Mendez, Tim Menzies, Jefferson Molleri, Dietmar Pfahl, Romain Robbes, Daniel Russo, Nyyti Saarimki, Federica Sarro, Davide Taibi, Janet Siegmund, Diomidis Spinellis, Miroslaw Staron, Klaas Stol, Margaret-Anne Storey, Davide Taibi, Damian Tamburri, Marco Torchiano, Christoph Treude, Burak Turhan, Xiaofeng Wang, Sira Vegas. ACM SIGSOFT Empirical Standards for Software Engineering Research. *arXiv preprint arXiv:2010.03525.* March, 2021.

61. Michael Unterkalmsteiner, Tingting Yu, Gregory Gay, Elizabeth Bjarnason, Markus Borg, Michael Felderer. Summary of the 5th International Workshop on Requirements Engineering and Testing (RET 2018). *ACM SIGSOFT Software Engineering Notes.* Volume 44, Number 1, March, 2019. Pages 31–34..

62. Markus Borg, Elizabeth Bjarnason, Michael Unterkalmsteiner, Tingting Yu, Gregory Gay, Michael Felderer. Summary of the 4th International Workshop on Requirements Engineering and Testing (RET 2017). *ACM SIGSOFT Software Engineering Notes.* Volume 42, Number 4. January, 2018. Pages 28-31. Available at `http://greg4cr.github.io/pdf/18ret.pdf`.

63. Michael Unterkalmsteiner, Gregory Gay, Michael Felderer, Elizabeth Bjarnason, Markus Borg, Mirko Morandini. Summary of the 3rd International Workshop on Requirements Engineering and Testing (RET 2016). *ACM SIGSOFT Software Engineering Notes.* Volume 41, Number 3. May, 2016. Pages 31-33. Available at `http://greg4cr.github.io/pdf/16ret.pdf`.

64. Gregory Gay, Giuliano Antoniol. 8th International Workshop on Search-based Software Testing (SBST 2015). *Proceedings of the 37^{th} International Conference on Software Engineering (ICSE'15)—Workshop Summaries.* Florence, Italy, May 2015. Available at http://greg4cr.github.io/pdf/sbst-summary.pdf.

65. Gregory Gay. Automated Steering of Model-Based Test Oracles to Admit Real Program Behaviors. *Doctoral Dissertation, University of Minnesota.* Minneapolis, MN, May 2015. Available at `http://greg4cr.github.io/pdf/GregoryGayDissertation.pdf`.
66. Gregory Gay and Mats P.E. Heimdahl. Towards Community-Assisted Software Engineering Decision Making. *University of Minnesota Tech Report 13-015.* Minneapolis, MN, April 2013. Available at `http://greg4cr.github.io/pdf/13raise.pdf`.
67. Gregory Gay. The Robust Optimization of Non-Linear Requirements Models.*MS Thesis, West Virginia University.* Morgantown, WV, May 2010. Available at `http://greg4cr.github.io/pdf/thesis_v1.pdf`.

Invited Presentations:

1. International Conference on Software Testing (ICST). April 2023. Dublin, Ireland.
   Invited Panelist: Doctoral Symposium
2. Dagstuhl Seminar 23103: Testing and Debugging of Data Analysis Workflows. March 2023. Wadern, Germany. Invited Participant
3. International Workshop on Artificial Intelligence in Software Testing (AIST). April 2021. Online.
   Keynote: Learning How to Test - Generating Context-Infused Test Cases
4. International Conference on Software Engineering (ICSE). July 2020. Seoul, South Korea.
   Invited Panelist: Student Mentoring Workshop
5. Chalmers University of Technology (Machine Learning Seminar). March 2020. Gothenburg, Sweden.
   Invited Talk: Learning How to Search: Generating Exception-Triggering Tests Through Adaptive Fitness Function Selection
6. Jeppesen Systems AB. December 2019. Gothenburg, Sweden.
   Invited Talk: An Introduction to Search-Based Test Generation
7. SAST Vst. October 2019. Gothenburg, Sweden.
   Invited Talk: A Brief Introduction to Search-Based Test Generation
8. Shonan Seminar 160: Fuzzing and Symbolic Execution: Reflections, Challenges, and Opportunities. September 2019. Kanagawa, Japan.
   Invited Talk: A Brief Introduction to (Metaheuristic) Search-Based Test Generation
9. South Carolina Law Review 2016 Symposium. February 2016. Columbia, SC.
   Panelist: The Science of Cyber Attacks
10. University of Minnesota Graduate Student Colloquium. October 2011. Minneapolis, MN.
    Invited Talk: Software Test Oracles: How I Learned to Stop Worrying and Love Mutation Testing
11. Midwest Verification Day 2011. September 2011. Minneapolis, MN.
    Invited Talk: Towards Oracle Creation Support
12. Tsinghua University School of Software. March 2010. Beijing, PRC.
    Invited Talk: Finding Robust Solutions to Model Optimization Problems
13. Institute of Software, Chinese Academy of Sciences. January 2010. Beijing, PRC.
    Invited Talk: OURMINE: A Toolkit for Sharing Experiments
14. NASA Ames Research Center. August 2009. Mountain View, CA.
    Invited Talk: Automatically finding the control variables for complex system behavior
15. WVU/NETL/ERA Workshop on Digital Preservation of Complex Engineering Data. April 2009. Morgantown, WV. Poster Presentation: Information Retreival with HAMLET

Professional Activities:

2023–Present Deputy Editor-in-Chief, Automated Software Engineering Journal

2023–Present Member, ACM TOSEM Replicated Computational Results Distinguished Reviewers Board

2019–Present Member, ACM TOSEM Board of Distinguished Reviewers

2017–Present Member, Empirical Software Engineering Journal Review Board

2018–Present Reviewer, Information and Software Technology

2016–Present Reviewer, Journal of Systems and Software

2015–Present Reviewer, Empirical Software Engineering Journal

2015–Present Reviewer, ACM Transactions on Software Engineering and Methodology

2014–Present Reviewer, IEEE Transactions on Software Engineering

2024 Award Committee, ACM SIGSOFT

2023 Reviewer, CHIST-ERA Funding Call Open & Re-usable Research Data & Software

2023 Panelist, ICST 2023 Doctoral Symposium

2023 Invited Participant, Dagstuhl Seminar 23103: Testing and Debugging of Data Analysis Workflows

2010, 2021 Reviewer, Automated Software Engineering (journal)

2020 Panelist, ICSE Student Mentoring Workshop

2020 Reviewer, Software and Systems Modeling

2019–2020 Reviewer, IEEE Access

2017–2020 Reviewer, IET Software

2014, 2018, 2020 Reviewer, Software Testing, Verification and Reliability

2019 Invited Participant, Shonan Seminar 160: Fuzzing and Symbolic Execution: Reflections, Challenges, and Opportunities

2019 Reviewer, Software Practice and Experience

2019 Reviewer, Systems Engineering

2012, 2018 Reviewer, Software Quality Journal

2018 Panelist, NSF Panel P181594 (CRI-SW)

2018 Reviewer, Journal of Software: Evolution and Process

2018 Reviewer, IEEE Transactions on Reliability

2018 Reviewer, Applied Soft Computing Journal

2018 Reviewer, Traffic Injury Prevention

2017 Reviewer, The Computer Journal

2017 Reviewer, Formal Methods in System Design

2016–2017 Reviewer, IEEE Transactions on Evolutionary Computation

2016 Reviewer, Journal of Classification

2016 Reviewer, 2017 IFAC World Conference

2014 Reviewer, Journal of Aerospace Information Systems

2013 Reviewer, IEEE Software

2013 Student Volunteer, International Conference on Software Engineering

2012 Reviewer, Formal Methods for Industrial Critical System

2012 Student Volunteer, 2012 International Symposium on Software Testing and Analysis

2008–2009 President, ACM West Virginia University Student Chapter

2007–2008 Vice-President, ACM West Virginia University Student Chapter

2007–2010 Member, West Virginia University Engineering Student Advisory Council

Affiliate:

- Senior Member, IEEE.
- Member, ACM, Upsilon Pi Epsilon.