

## Sebastian Elbaum

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### Professional Preparation

Ph.D. in Computer Science, University of Idaho, 1999.  
M.S. in Computer Science, University of Idaho, 1997.  
Systems Engineer, Universidad Catolica de Cordoba, Argentina, 1995.

### Appointments

2010 - Present: Professor, Department of CSE, University of Nebraska - Lincoln.  
2013: Research Scientist, Google, Mountain View, California, USA.  
2005 - 2010: Associate Professor, Department of CSE, University of Nebraska - Lincoln.  
2007 Visiting Researcher, Italian National Research Council, Pisa, Italy (sabbatical from UNL).  
2006 Academic Fellow, University College London, London, UK (sabbatical from UNL).  
1999 - 2005: Assistant Professor, Department of CSE, University of Nebraska - Lincoln.  
1996 - 1999: Research and Teaching Assistant, Department of CS, University of Idaho.  
1993 - 1995: Programmer at Mercado de Valores de Cordoba, INTI Coca Cola, Estancias del Sur.

### Honors and Awards

1. Distinguished Paper Award, International Conference in Software Engineering, 2016.
2. UNL Bessey Professorship, 2015.
3. Foundations of Software Engineering Blue Sky Ideas Visions Track, Second Prize, 2014.
4. Distinguished Paper Award, International Symposium in Software Testing and Analysis, 2013.
5. Distinguished Paper Award, International Conference in Software Engineering, 2012.
6. Google Faculty Research Award, 2012.
7. Distinguished Paper Award, Empirical Software Engineering and Measurement Symposium, 2011.
8. Dean's Award for Excellence in Graduate Education, UNL Graduate Studies, 2009.
9. Distinguished Paper Award, International Conference on Software Engineering, 2008.
10. CSE Department Recognition Award for overall commitment and dedication to Department, 2009.
11. Student Choice Outstanding Teaching Award, CSE Department at UNL, 2004-05, 2005-06, and 2007-08.  
Outstanding Educator Award, Beta Theta PI, 2009.

12. Distinguished Visitor, Universidad Catolica de Cordoba, 2007.
13. Academic Fellowship, University College London, 2007.
14. Distinguished Paper Award, International Symposium on Foundations of Software Engineering, 2006.
15. IBM Eclipse Innovation Award, 2006.
16. National Science Foundation CAREER Award, 2004 - 2009.
17. Harold and Esther Edgerton Research and Teaching Award for Junior Faculty at UN, 2002 - 2004.
18. J. D. Edwards Honors Program, Professorship at UNL, 1999 - 2006.
19. Layman Award, Junior Faculty Research Award at UNL, 2000.
20. Best Student Paper Award, USENIX Workshop on Intrusion Detection and Monitoring, 1999.

### **Funding as Principal or Co-Principal Investigator <sup>1</sup>**

1. National Science Foundation, Award: 1526652, Testing in the Presence of Continuous Change, 2015-2018, \$425,000, PI.
2. National Science Foundation, Award: 1526253, Systematically and Scalably Testing Network Programs through Symbolic Exploration of Packet Dynamics, 2015-2018, \$499,800, Co-PI.
3. National Robotic Initiative, National Science Foundation and USDA, Co-Aerial-Ecologist: Robotic Water Sampling and Sensing in the Wild, 2013-2016, \$956,210, Co-PI.
4. National Science Foundation, Award: 1218265, Searching for Code in Large Repositories with Lightweight Specifications, 2012-2015, \$449,033, PI.
5. (Internal) UNL Office of Research and Economic Development, 2012-2013, \$108,000. PI with Dr. Dettweiler.
6. Air Force Office for Scientific Research, Award #FA9550-10-1-0406, Safeguarding End-User Military Software, 2010-2014, \$3,955,000, Co-PI.
7. Air Force Office for Scientific Research, Award #FA9550-09-1-0687, Enhancing the Dependability of Complex Missions through Automated Analysis, 2009-2013, \$600,000, PI.
8. National Science Foundation, Award: 0915526, T2T: A Framework for Amplifying Testing Resources, 2009-2012, \$492,000. PI.
9. National Aeronautics and Space Administration, Award: NNX08AV20A, Differential Symbolic Execution: Supporting Evolution of High-Assurance Software, 2008-2011, \$750,000. Co-PI.
10. National Science Foundation, Award: 0720654, Predictable Adaptive Residual Monitoring for Real-time Embedded Systems, 2007-2011, \$500,000. Co-PI.
11. Lockheed Martin, Integrated Software Quality, 2007, \$60,000. Co-PI.

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<sup>1</sup>Amounts are approximated and include supplements when available.

12. EPSRC, UK, Testing Techniques for Context-Aware Ubiquitous Systems, 2006, \$87,270. Co-PI.
13. IBM, Eclipse Innovation Award, Carving and Replaying Differential Unit Test Cases, 2006, \$22,000. PI.
14. National Science Foundation, Award: 0347518, CAREER: Leveraging Field Data to Test Highly-Configurable and Rapidly-Evolving Pervasive Systems, 2004 - 2009, \$425,000. PI.
15. National Science Foundation, Award: 0454203, Computer and Network Systems and CRI Program, Collaborative Research : A Community Resource to Support Controlled Experimentation with Program Analysis and Software Testing Techniques, 2005-2009, \$1,200,000. Co-PI.
16. National Science Foundation, Collaborative Research: Program Analysis Techniques to Support Dependable RTSJ Applications, 2004-2007, \$210,000. Co-PI.
17. National Science Foundation, Award: 0411043, Building Scalable and Adaptive Garbage Collector for Server Systems, 2004-2007, \$275,000. Co-PI.
18. National Science Foundation, Award: 0324861, ITR: Collaborative Research: Dependable End-User Software, 2003 - 2009, UNL Portion: \$280,000. PI.
19. (Internal) Research Council Faculty Seed Grant, Dependable End-User Web Applications, 2003, \$10,000. PI.
20. (Internal) University of Nebraska, Undergraduate Creative Activity and Research Experience (UCARE), 2001 - 2004, \$6000. PI.
21. National Science Foundation, Award: 0080898, ITR: Collaborative Research: a New Generation of Scalable, Cost-Effective Regression Testing Techniques, 2000 - 2003, UNL portion: \$240,000. PI.
22. NASA-EPSCoR, Extending the Software Black Box Recorder to a Distributed Environment, 2000 - 2001, \$15,000. PI.

## **Research and Creative Activities**

### **Refereed Journal Papers**

1. K. Stolee, S. Elbaum, and M. Dwyer, Code search with input/output queries: Generalizing, ranking, and assessment *Journal of Systems and Software*, Elsevier, 2016.
2. J.P. Ore, S. Elbaum, A. Burgin, and C. Detweiler, Autonomous Aerial Water Sampling. *J. Field Robotics* 32(8): 1095-1113, 2015.
3. P. Zhang and S. Elbaum, Amplifying Tests to Validate Exception Handling Code: an Extended Study, *ACM Trans. Softw. Eng. Methodol.* 23(4): 32:1-32:28, 2014.
4. K. Stolee, S. Elbaum, and D. Dobos, Solving the Search for Source Code *ACM Trans. Softw. Eng. Methodol.* 23(3): 26, 2014.
5. K. Stolee and S. Elbaum, Identification, Impact, and Refactoring of Smells in Pipe-like Web Mashups *IEEE Trans. Software Eng.* 39(12): 1654-1679, 2013.
6. K. Stolee, S. Elbaum, and A. Sarma, Discovering How End-User Programmers and their Communities use Public Repositories, *Information Software Technology Journal*, 55(7): 1289-1303, 2013.

7. M. Fisher, S. Elbaum, and G. Rothermel, An Automated Analysis Methodology to Detect Inconsistencies in Web Services with WSDL Interfaces, *Journal of Software Verification, Testing, and Reliability*, 23(1): 27-51 2013.
8. C. Bartolini, A. Bertolino, S. Elbaum, and E. Marchetti, Bringing White-Box Testing to Service Oriented Architectures through a Service Oriented Approach, *Journal of Systems and Software*, 84(4): 655-668, 2011.
9. M. Diep, M. Dwyer, and S. Elbaum, Lattice-based Sampling for Path Property Monitoring, *ACM Transactions of Software Engineering Methodologies*, 21(1), May 2011.
10. M. Sama, S. Elbaum, F. Raimondi, D. Rosenblum and Z. Wang, Context-Aware Adaptive Applications: Fault Patterns and Their Automated Identification, *IEEE Transactions on Software Engineering*, 36(5):644-661, September/October 2010.
11. M. Sama, D. Rosenblum, Z. Wang, and S. Elbaum, Multi-Layer Faults in the Architectures of Mobile, Context-Aware Adaptive Applications, *Journal of Systems and Software*, 83(6):906-914, June 2010.
12. J. Ruthruff, S. Elbaum, and G. Rothermel, Experimental Program Analysis, *Information Software Technology Journal*, 52(4): 359-379, April 2010.
13. S. Elbaum, H. Chin, M. Dwyer, and M. Jorde, Carving and Replaying Differential Unit Test Cases from System Test Cases, *IEEE Transactions on Software Engineering*, 35(1):29-45, January 2009. <sup>2</sup>
14. C. Scaffidi, A. Cypher, S. Elbaum, A. Koesnandar and B. Myers, Using Scenario-Based Requirements to Direct Research on Web Macro Tools, *Journal of Visual Languages and Computing*, Elsevier, 19(4):485-498, August 2008.
15. S. Elbaum, S. Kanduri, and A. Andrews, On the Potential of Anomalies as Precursors of Field Failures: An Empirical Study, 12(5):447-469, *Empirical Software Engineering Journal*, 2007.
16. K. Chilakamarri and S. Elbaum, Leveraging Disposable Instrumentation to Reduce Coverage Collection Overhead, *Journal of Software Testing, Reliability, and Verification*, 16(4):267-288, April 2006.
17. S. Elbaum and M. Diep, Profiling Deployed Software: Assessing Strategies and Testing Opportunities, *IEEE Transactions on Software Engineering*, 31(4):312-327, April 2005.
18. H. Do, S. Elbaum, and G. Rothermel, Controlled Experimentation with Software Testing Techniques: Infrastructure Support and its Potential Impact, *Empirical Software Engineering Journal*, 10(4):405-435, 2005.
19. S. Elbaum, G. Rothermel, S. Karre and M. Fisher, Leveraging User Session Data to Support Web Application Testing, *IEEE Transactions of Software Engineering*, 31(3):187-202, March 2005.
20. G. Rothermel, S. Elbaum, A. Malishevsky, and P. Kallakuri, On Test Suite Composition and Cost-Effective Regression Testing, *ACM Transactions of Software Engineering and Methodologies*, 13(3):277-331, July 2004.
21. S. Elbaum, G. Rothermel, S. Kanduri, and A. Malishevsky, Selecting a Cost-Effective Test Case Prioritization Technique, *Software Quality Journal*, 12(3):185-210, September 2004.

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<sup>2</sup>Invited paper presentation to the TSE/TOSEM Special Journal Session at ICSE 2009, Vancouver, Canada, May 2009.

22. S. Elbaum, P. Kallakuri, A. Malishevsky, G. Rothermel, and S.Kanduri, Understanding the Effects of Changes on the Cost-Effectiveness of Regression Testing Techniques, *Journal of Software Testing, Verification, and Reliability*, 13(2):65-83, June 2003.
23. L. Zhao and S. Elbaum, Quality Assurance under the Open Source Development Model, *Journal of Systems and Software*, 66(1):65-75, April 2003.
24. W. Chen, R. Untch, G. Rothermel, S. Elbaum, and J. von Ronne, Can Fault-Exposure-Potential Estimates Improve the Fault Detection Abilities of Test Suites?, *Journal of Software Testing, Verification, and Reliability*, 4(2):197-218, December 2002.
25. S. Elbaum, A. Malishevsky, and G. Rothermel, Test Case Prioritization: A Family of Empirical Studies, *IEEE Transactions on Software Engineering*, 28(2):159-182, February 2002.
26. S. Elbaum and J. Munson, Evaluating Regression Test Suites Based on Their Fault Exposure Capability, *Journal of Software Maintenance - Research and Practice*, 12(3):171-184, 2000.
27. S. Elbaum and J. Munson, Software Evolution and the Code Fault Introduction Process, *Empirical Software Engineering Journal*, 4(3):241-262, 1999.

### **Rigorously Refereed Conference Papers**

1. C. Sadowski, K. Stolee, and S. Elbaum, How developers search for code: a case study. *ESEC/SIGSOFT FSE*, 191-201, 2015.
2. Matias Waterloo, Suzette Person, Sebastian G. Elbaum: Test Analysis: Searching for Faults in Tests, *NIER Track*,. *ASE*, 149-154, 2015.
3. S. Elbaum, G. Rothermel, and J. Penix: Techniques for improving regression testing in continuous integration development environments. *SIGSOFT FSE 2014*: 235-245.
4. S. Elbaum and D. Rosenblum: Known unknowns: testing in the presence of uncertainty. *SIGSOFT FSE 2014: Vision Track*, 833-836. (also Great Innovative Ideas under the CCC).
5. D. Anthony, S. Elbaum, A. Lorenz, and C. Detweiler: On crop height estimation with UAVs. *IROS 2014*: 4805-4812.
6. H. Seo, C. Sadowski, S. Elbaum, E. Aftandilian, R. Bowdidge: Programmers' build errors: a case study (at google). *ICSE 2014*: 724-734.
7. Y. Wang, S. Person, S. Elbaum, M. Dwyer: A framework to advise tests using tests. *ICSE NIER 2014*: 440-443.
8. John-Paul Ore, Sebastian G. Elbaum, Amy Burgin, Baoliang Zhao, Carrick Detweiler: Autonomous Aerial Water Sampling. *FSR 2013*: 137-151.
9. Hengle Jiang, Sebastian G. Elbaum, Carrick Detweiler: Reducing failure rates of robotic systems through inferred invariants monitoring. *IROS 2013*: 1899-1906.
10. Rahul Purandare, Matthew B. Dwyer, Sebastian G. Elbaum: Optimizing monitoring of finite state properties through monitor compaction. *ISSTA 2013*: 280-290. **Distinguished paper award.**

11. Fokion Zervoudakis, David S. Rosenblum, Sebastian G. Elbaum, Anthony Finkelstein: Cascading verification: an integrated method for domain-specific model checking. ESEC/SIGSOFT FSE 2013: 400-410.
12. K. Stolee and S. Elbaum, Toward semantic search via SMT solver, New Ideas and Emerging Results Track of the Foundations of Software Engineering Symposium, 2012.
13. S. Anthony, W. Bennett, M. Vuran, M. Dwyer, S. Elbaum, A. Lacy, M. Engels, and W. Wehtje, Sensing through the continent: towards monitoring migratory birds using cellular sensor networks, International Conference on Information Processing in Sensor Networks, 329-340, 2012.
14. P. Zhang, S. Elbaum and M. Dwyer, Compositional load test generation for software pipelines, International Symposium on Software Testing and Analysis, 89-99, 2012.
15. C. Lucas, S. Elbaum, and D. Rosenblum, Detecting problematic message sequences and frequencies in distributed systems, Object Oriented Programming Systems, Languages, and Applications, 915-926, 2012.
16. R. Purandare, J. Darsie, S. Elbaum, M. Dwyer: Extracting conditional component dependence for distributed robotic systems, International Conference on Robotics and Systems, 1533-1540, 2012.
17. P. Zhang and S. Elbaum, Amplifying tests to validate exception handling code, International Conference in Software Engineering, 595-605, 2012. **Distinguished paper award.**
18. P. Zhang, S. Elbaum, and M. Dwyer, Automatic generation of load tests, Automated Software Engineering Conference, 43-52, 2011.
19. K. Stolee, S. Elbaum, and A. Sarma, End-User Programmers and their Communities: An Artifact-based Analysis, Symposium of Empirical Software Engineering and Measurement, 147-156, 2011. **Distinguished paper award.**
20. R. Purandare, M. Dwyer, and S. Elbaum, Monitoring Finite State Properties: Algorithmic Approaches and Their Relative Strengths, Run-time Verification Conference, 381-395, 2011.
21. K. Stolee and S. Elbaum, Refactoring Pipe-like Mashups for End-User Programmers, International Conference on Software Engineering, 81-90, May 2011. (14%)
22. R. Purandare, M. Dwyer, and S. Elbaum, Monitor optimization via stutter-equivalent loop transformation, Conference on Object-Oriented Programming, Systems, Languages, and Applications, 270-285, October 2010. (27%)
23. K. Stolee, S. Elbaum, and G. Rothermel, Revealing the Copy and Paste Habits of End Users, Visual Languages and Human-Centric Computing, September 2009. (Not available)
24. E. Sherman, M. Dwyer, S. Elbaum, Saturation-based Testing of Concurrent Programs, European Software Engineering Conference and Symposium on the Foundations of Software Engineering, 53-62, August 2009. (15%)
25. C. Bartolini, A. Bertolino, S. Elbaum, E. Marchetti, Whitening SOA Testing, European Software Engineering Conference and Symposium on the Foundations of Software Engineering, 161-170, August 2009. (15%)
26. M. Diep, S. Elbaum, and M. Dwyer, Trace Normalization, International Symposium of Software Reliability Engineering, 67-76, November 2008. (Not available)

27. S. Person, M. Dwyer, S. Elbaum, and C. Pasareanu, Differential Symbolic Execution, International Symposium on Foundations of Software Engineering, 226-237, November 2008. (20%)
28. M. Sama, D. Rosenblum, Z. Wang, and S. Elbaum, Model-Based Fault Detection in Context-Aware Adaptive Applications, 261-271, International Symposium on Foundations of Software Engineering, November 2008. (20%)
29. A. Koesnandar, S. Elbaum, G. Rothermel, L. Hochstein, K. Stolee, and C. Scaffidi, Using Assertions to Help End-User Programmers Create Dependable Web Macros, International Symposium on Foundations of Software Engineering, 124-134, November 2008. (20%)
30. M. Jorde, S. Elbaum, and M. Dwyer, Increasing Test Granularity by Aggregating Unit Tests, International Conference on Automated Software Engineering, 9-18, September 2008. (12%)
31. M. Dwyer, M. Diep, and S. Elbaum, Reducing the Cost of Path Property Monitoring by Sampling the Lattice of sub-Alphabet Properties, International Conference on Automated Software Engineering, 228-237, September 2008. (12%)
32. J. Ruthruff, J. Penix, J. Morgenthaler, S. Elbaum, and G. Rothermel, Predicting Accurate and Actionable Static Analysis Warnings: An Experimental Approach, International Conference on Software Engineering, 341-350, May 2008. (15%) **Distinguished paper award.**
33. M. Diep, S. Elbaum and M.B. Dwyer, Reducing Irrelevant Trace Variations, International Conference on Automated Software Engineering, 477-480, November 2007. (12%)
34. C. Scaffidi, A. Cypher, S. Elbaum, A. Koesnandar and B. Myers, Scenario-Based Requirements for Web Macro Tools, Symposium on Visual Languages and Human Centric Computing, 197-204, September 2007. (Not available)
35. S. Lingham and S. Elbaum, Supporting End-Users in the Creation of Dependable Web Clips, International World Wide Web Conference, 953-962, May 2007. (15%)
36. M. Dwyer, A. Kinneer, and S. Elbaum, Adaptive Online Program Analysis, International Conference on Software Engineering, 220-229, May 2007. (15%)
37. M. Dwyer, S. Elbaum, S. Person, and R. Purandare, Parallel Randomized State-Space Search, International Conference on Software Engineering, 3-12, May 2007. (15%)
38. S. Elbaum, S. Person, J. Dokulil, and M. Jorde, Bug Hunt: Making Early Software Testing Lessons Engaging and Affordable, International Conference on Software Engineering, Educational Track, 688-697, May 2007. (Not available)
39. Z. Wang, S. Elbaum and D. Rosenblum, Automated Generation of Context-Aware Tests, International Conference on Software Engineering, 406-415, May 2007. (15%)
40. M. Fisher, S. Elbaum and G. Rothermel Dynamic Characterization of Web Application Interfaces, Fundamental Approaches to Software Engineering, 260-275, January 2007. (21%)
41. M. Dwyer, S. Person, and S. Elbaum, Controlling Factors in Evaluating Path-sensitive Error Detection Techniques, International Symposium of Foundations of Software Engineering, 92-104, November 2006. (20%) **Distinguished paper award.**

42. S. Elbaum, H. Chin, M. Dwyer and J. Dokulil, Carving Differential Unit Test Cases from System Test Cases, International Symposium of Foundations of Software Engineering, 253-264, November 2006. (20%)
43. M. Diep, M. Cohen, and S. Elbaum, Probe Distribution Techniques to Profile Events in Deployed Software, International Symposium of Software Reliability Engineering, 395-406, November 2006. (37%)
44. J. Ruthruff, S. Elbaum, and G. Rothermel, Experimental Program Analysis: A New Program Analysis Paradigm, International Symposium of Software Testing and Analysis, Big-idea Track, June 2006. (33%)
45. S. Elbaum, R. Chilakamarri, M. Fisher, and G. Rothermel Web Application Characterization through Directed Requests, Workshop on Dynamic Analysis, 49-56, May 2006. (Not available)
46. S. Elbaum, R. Chilakamarri, B. Gopal, and G. Rothermel, Helping end-users engineer dependable web application, International Symposium of Software Reliability Engineering, 22-31, November 2005. (33%)
47. W. Srisa-an, M. Oey, and S. Elbaum, Garbage Collection in the Presence of Remote Objects: A Case Study, International Symposium on Distributed Objects and Applications, October 2005. (Not available)
48. K. Chilakamarri and S. Elbaum, Reducing Coverage Collection Overhead with Disposable Instrumentation, International Symposium of Software Reliability Engineering, 233-244, November 2004. (33%)
49. H. Do, S. Elbaum, and G. Rothermel, Infrastructure Support for Controlled Experimentation with Software Testing and Regression Testing Techniques, International Symposium on Empirical Software Engineering, 60-70, September 2004. (51%)
50. S. Elbaum and M. Hardojo, An Empirical Study of Profiling Strategies for Released Software and Their Impact on Testing Activities, International Symposium on Software Testing and Analysis, 65-75, July 2004. (28%)
51. S. Elbaum, S. Kanduri and A. Andrews, Anomalies as Precursors of Field Failures, International Symposium of Software Reliability Engineering, 108-118, November 2003. (21%)
52. S. Elbaum, S. Karre, and G. Rothermel, Improving Web Application Testing with User Session Data, International Conference on Software Engineering, 49-59, May 2003. (13%)
53. S. Kanduri and S. Elbaum, An Empirical Study of Tracing Techniques from a Failure Analysis Perspective, , International Symposium of Software Reliability Engineering, pages 280-291, November 2002. (45%)
54. A. Malishevsky, G. Rothermel, and S. Elbaum, Modeling the Cost-Benefits Tradeoffs for Regression Testing Techniques, International Conference on Software Maintenance, October, 2002, pages 204 - 213. (48%)
55. G. Rothermel, S. Elbaum, A. Malishevsky, P. Kallakuri, B. Davia, The Impact of Test Suite Granularity on the Cost-Effectiveness of Regression Testing, International Conference on Software Engineering, 130-140, May 2002. (15%)
56. S. Elbaum, D. Gable, and G. Rothermel, The Impact of Evolution on Code Coverage Information, International Conference on Software Maintenance, 170-179, November 2001. (42%)
57. S. Elbaum, A. Malishevsky, and G. Rothermel, Incorporating varying test costs and fault severities into test case prioritization, International Conference on Software Engineering, 329-338, May 2001. (18%)



58. S. Elbaum and J. Munson, Software Black Box: An Alternative Mechanism for Failure Analysis, International Symposium on Software Reliability Engineering, 365-376, October 2000. (*Not available*)
59. S. Elbaum, D. Gable, and G. Rothermel, Understanding and Measuring Source of Variation in the Prioritization of Regression Test Suites, International Software Metrics Symposium, 169-179, April 2001. (*Not applicable.*)
60. S. Elbaum, A. Malichevsky and G. Rothermel, Prioritizing Test Cases for Regression Testing, International Symposium of Software Testing and Analysis, 102-112, August 2000. (23%)
61. J. Munson and S. Elbaum, Code Churn: A Measure for Estimating the Impact of Code Change, International Conference Software Maintenance, 24-31, November 1998. (34%)
62. S. Elbaum and J. Munson. Getting a handle on the fault injection process: Validation of Measurement Tools, International Symposium of Software Metrics, 133-143, November 1998. (*Not available*)

### **Other Refereed Conference, Articles, and Workshop Papers**

1. Eric F. Rizzi, Matthew B. Dwyer, Sebastian G. Elbaum: Safely reducing the cost of unit level symbolic execution through read/write analysis. ACM SIGSOFT Software Engineering Notes 39(1): 1-5 (2014).
2. Kathryn T. Stolee, Sebastian G. Elbaum: On the Use of Input/Output Queries for Code Search. ESEM 2013: 251-254.
3. K. Stolee and S. Elbaum, Exploring the use of crowdsourcing to support empirical studies in software engineering, Short paper at the Empirical Software Engineering and Metrics Symposium, 2010.
4. M. Sama, D. Rosenblum, Z. Wang, and S. Elbaum, Multi-Layer Faults in the Architectures of Mobile Context-Aware Adaptive Applications International Workshop on Software Architectures and Mobility, May 2008.
5. C. Scaffidi, A. Cypher, S. Elbaum, A. Koesnandar, J. Lin, B. Myers, and M. Shaw. Using Topes to Validate and Reformat Data in End-User Programming Tools, Workshop on End-User Software Engineering, May 2008,
6. A. Bertolino, G. De Angelis, S. Elbaum, A. Sabetta, Scaling up SLA Monitoring in Pervasive Environments, International Workshop on the Engineering of Software Services for Pervasive Environment, 65-68, September 2007.
7. S. Elbaum, M. Fisher II, and G. Rothermel, Dependability in Web Software, End-User Software Engineering, Dagstuhl, 2007.
8. Z. Wang and S. Elbaum, Localizing Faults that Caused Field Failures, Fast Abstract at the International Symposium of Software Reliability Engineering, November 2005.
9. M. Cohen, M. Dwyer, S. Elbaum and J. Hatcliff and G. Rothermel, Behavior Coverage for High-Confidence Medical Software, High Confidence Medical Device Software and Systems Workshop, June 2005.
10. F. Nkwocha and S. Elbaum, Fault Patterns in Matlab, Workshop on End-User Software Engineering, 17-20, May 2005.

11. M. Oey, W. Srisa-an, and S. Elbaum, Remote Objects: The Next Garbage Collection Challenge, Workshop on Managed Runtime Environments, March 2005.
12. H. Do, S. Elbaum, G. Rothermel, Building an Infrastructure to Support Experimentation with Software Testing Techniques, Workshop on Empirical Research in Software Testing, July 2004.
13. M. Hardojo, S. Elbaum, and Z. Wang, The Effect of Field Data Integrity on the Potential of Failure Reproduction and Fault Isolation, Workshop on Remote Analysis and Monitoring of Software Systems, 41-44, May 2004.
14. G. Rothermel and S. Elbaum, Putting Your Best Tests Forward, IEEE Software - Quality Time, 74-77, August/September 2003.
15. S. Elbaum and M. Hardojo, Deploying Instrumented Software to Assist the Testing Activity, Workshop on Remote Analysis and Monitoring of Software Systems, 13-15, May 2003.
16. X. Liu and S. Elbaum, On the Use of Empirical Studies to Compare Failure Analysis Techniques, IEEE Workshop of Empirical Studies of Software Maintenance, November 2002.
17. S. Karre and S. Elbaum, An Empirical Assessment of XML Parsers, Sixth Workshop on Web Engineering, 39-46, May 2002.
18. S. Elbaum, An Experimental Infrastructure for Evaluating Failure Analysis Techniques for Released Software, IEEE Workshop of Empirical Studies of Software Maintenance, 2-6, November 2001.
19. S. Dunbar, S. Goddard, S. Henninger, and S. Elbaum, Bootstrapping the Software Design Studio, Creativity and Innovation in Higher Education, NCIIA, 179-188, March 2001.
20. S. Elbaum and S. Narla, A Methodology for Operational Profile Refinement, IEEE Annual Reliability and Maintainability Symposium, 142-147, January 2001.
21. S. Elbaum and J. Munson, Investigating Software Failures with a Software Black Box, IEEE Aerospace Conference, March 2000.
22. S. Elbaum and J. Munson, Intrusion Detection through Dynamic Software Measurement, USENIX Workshop on Intrusion Detection and Network Monitoring, 41-50, April 1999. <sup>3</sup>
23. J. Munson and S. Elbaum, Software Reliability as a Function of the Execution Patterns, Hawaiian International Conference on System Sciences, January 1999.
24. J. Munson, S. Elbaum, R. Karcich, J. Wilcox, Software Risk Assessment through Software Measuring and Modeling, IEEE Aerospace Conference, March 1998.
25. S. Elbaum, Object Oriented Traceability, Annual Oregon Workshop on Software Metrics, May 1997.
26. S. Elbaum, A Conceptual Framework for a Software Black Box, Dissertation, Computer Science Department, University of Idaho, July 1999.

## Patents

Searching for code by specifying its behavior. Elbaum, S. and Stolee, K. . Sebastian Elbaum, Kathryn Stolee, and UNL. U.S. Pat. Application No: PCT/US2013/036967. Apr 17, 2013.

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<sup>3</sup>Best Student Paper Award.

## Invited Research Presentations

1. Crowdsourcing Software Engineering Empirical Studies: Opportunities and Perils, First International Workshop on CrowdSourcing in Software Engineering, Invited Talk, ICSE, 2014.
2. Searching for programs with inputs/outputs, Invited Tec Talk, Google, 2013.
3. On the search for programs and faults, Department of Computer Science Colloquium, University of Alabama, 2013.
4. Seminar at the Software Engineering Educators Symposium (co-located with FSE 2010), Making Software Testing Engaging and Affordable in Early Programming Classes, November 2010.
5. A New Breed of Dynamic Program Analysis Techniques, University of Costa Rica, October 2010.
6. Test Transformation, University of Stellenbosch, South Africa, May 2010.
7. Group lead of Empirical Research and Program Analysis at Dagstuhl Perspectives Workshop: New Frontiers for Empirical Software Engineering, March 2010.
8. Carving and Replaying Differential Unit Test Cases from System Test Cases, Invited paper presentation to the TSE/TOSEM Journal Session at ICSE 2009, Vancouver, Canada, May 2009.
9. T2T: A Test Case Transformation Framework, Accenture, Chicago, February 2008.
10. Carving: Supporting Testing Efforts at LM, Lockheed Martin - Progress Report and Future Collaborations, October 2007.
11. Emerging Breed of Dynamic Analysis Techniques, CNR, Pisa, Italy April 2007.
12. Continuous Analysis and Testing of Evolving Systems, Kings College, London, UK, December 2006.
13. Continuous Analysis and Testing of Evolving Systems, Imperial, London, UK, November 2006.
14. Continuous Analysis and Testing of Evolving Systems, Brunel University, London, UK, October 2006.
15. Testing of Evolving Systems, Intel Testing Seminar Series, Folsom, June 2006.
16. Better Empirical Science for Software Engineering, International Conference on Software Engineering, Invited Plenary Talk with Vic Basili, Shanghai, May 2006.
17. Leveraging Deployed Software Instances for QA, Workshop on High-Confidence Embedded Systems, Lincoln, Nebraska, May 2005.
18. Advanced Testing Techniques, Seminar Series at the Escuela de Ciencias Informáticas, Departamento de Computación, Universidad de Buenos Aires, Argentina, July 2004.
19. Techniques for Profiling Released Software, Seminar on Understanding Program Dynamics, Dagstuhl, Germany, November 2003.

## **Infrastructure Made Available to Community**

1. SIR - Infrastructure to Support Controlled Experimentation with Testing Techniques. This repository provides Java and C programs for use in experimentation with testing and analysis techniques, and materials facilitating that use. The repository is co-created with Dr. Rothermel.  
Access: <http://sir.unl.edu>
2. The Google Dataset of Testing Results. This data repository was prepared during my sabbatical at Google, and it provides the software testing and analysis community with a sample of 3.5 Million test suite execution results from a fast and large scale continuous testing infrastructure.  
Access: <https://code.google.com/p/google-shared-dataset-of-test-suite-results/>
3. Educational Testing Tutorial: “Bug Hunt”. This web-based tutorial provides hand-on lessons to engage students in the application of techniques that assist in the development of dependable software.  
Access: <http://obelisk.unl.edu/BugHunt> (retired)
4. Carving and Replay Unit Tests from System Tests. This tool enables the automated transformation from system tests to unit tests that are focused efficient but encode some of the power of system tests. (retired)
5. Robofox, a web browser extension that enables the automation of repetitive browsing tasks such as extracting information from a site, integrating data across sites and application, and formatting the collected information. Robofox provides support for the generation and execution of more dependable web macros. (retired)

## **Service and Synergetic Activities**

### **Editorial Boards and Conference Organization**

- Steering Committee Chair for ICSE (2015-2017)
- Program Co-Chair of the Technical Track at ICSE (2015)
- Associate Editor of the ACM Transactions of Software Engineering and Methodologies (2010-2015)
- Program Co-Chair of the New and Emerging Results Track at ICSE (2013)
- Steering Committee Member of the Empirical Software Engineering and Measurement Symposium (2008-2010)
- Program Co-Chair of the Empirical Software Engineering and Measurement Symposium (2008)
- Founder and Executive Committee Member of the End-User Shaping Effective Software Consortium (2004-Present)
- Invited Editor to the TSE Special Issue of the Best Papers of ISSTA 2007 (2008)
- Steering Committee Member of the International Symposium of Software Testing and Analysis (2007-2012)
- Program Chair of the International Symposium of Software Testing and Analysis (2007)
- Co-Editor in Chief of the Information and Software Technology Journal (2005 - 2007)
- Editorial Board Member of the Information and Software Technology Journal (2008 - present)
- Editorial Board, Software Quality Journal (2004 - 2006)
- Program Co-Chair of the Workshop on End User Software Engineering (2005)

- Proceedings Chair, International Symposium on Empirical Software Engineering (2004)
- Student Papers Chair, International Symposium on Software Reliability Engineering (2004)

### **Program Committees**

- International Symposium on Foundations of Software Engineering and the European Conference in Software Engineering (2006, 2007, 2009, 2010,2012)
- International Conference on Fundamental Approaches to Software Engineering (2010)
- International Conference of Software Engineering (2004, 2009, 2011,2014,2016)
- International Symposium on Software Testing and Analysis (2004, 2007, 2008, 2011)
- International Symposium on Software Reliability Engineering (2000, 2003-2005, 2008, 2009)
- International Conference on Software Testing (2008)
- International Conference on Software Maintenance (2004, 2005)
- International Symposium on Empirical Software Engineering // Symposium on Empirical Software Engineering and Measurement (2003, 2007, 2009, 2011, 2013)
- Workshop for End User Software Engineering (2005)
- International Workshop on Quality Assurance and Testing of Web-Based Applications (2004)
- Workshop on Empirical Research in Software Testing (2004)
- Workshop for Remote Analysis and Measurement of Software Systems (2003, 2004)
- Workshop on Empirical Studies in Software Maintenance (2001, 2002)

### **University and Departmental activities**

- Chair of Faculty Search Committee - 4 hires (2014-2015)
- Promotion and Tenure Committee of College of Engineering (2010-2013), Chair (2012-2013)
- Director of Innovation Lab Faculty Committee and Search Committee (2012-2013)
- UNL Workshop on UAVs, co-organized with Dr. Detweiler, +60 attendees (2012)
- Tenure champion for Can Vuran (2012)
- Research Development Fellows Program, mentor of Carrick Detweiler (2010-2012)
- Research Development Fellows Program, mentor of Can Vuran (2008-2010)
- Graduate Admissions Committee (2010 - 2012)
- Search Committee for Dean of College of Engineering (2010-2011)
- Panel for UNL Associate Professors planning their promotion (2010)
- Graduate Student Recruiting trip to Costa Rica (2010)
- UNL Research Office: Research Advisory Board (2009-2012)
- Arts and Science College Executive Committee (2009 - 2010)
- CSCE Advisory Committee (2004-2006, 2008-2010)
- CSCE Colloquium Chair (2004, 2005, 2008, 2009)
- Software Engineering Track, Phd. Qualifier Committee (2002 - 2008)
- Colloquium Series for Prospective Honor Students (2002, 2004, 2005)
- CSCE Graduate Student Committee (2003)

- J. D. Edwards Honors Program (now Raikes School) Student Selection Committee (1999-2004)
- J. D. Edwards Honors Program (now Raikes School) Design Studio Search Committee (2005)
- J. D. Edwards Honors Program (now Raikes School) Curriculum Committee (2001-2004)
- Mentor for McNair Program (2002, 2003)
- Endowed Faculty Search Committee (2002, 2003)
- Faculty Search Committee (2000, 2001, 2003, 2006)
- ITA Panelist (2001)
- Facilities Committee (2000-2001).
- Service Committee (1999, 2000, 2001)
- Judge CSCE Programming Contests (1999, 2000)
- Undergraduate Certification Committee - ABET(1999)

### **Affiliations**

Founder and Co-director of the NIMBUS (Nebraska Intelligent MoBile Unmanned Systems) Lab at UNL, Co-founder of the E2: Software Engineering Laboratory at UNL, Co-founder and former Executed Board Member of EUSES (End Users Shaping Effective Software) Research Group, Association for Computer Machinery (ACM), ACM Sigsoft, Institute for Electrical and Electronic Engineering (IEEE).

### **Teaching**

#### **Courses**

- CSCE 467/468, 487/488: Senior Design
- CSCE 990: Analysis of Software Artifacts
- CSCE 962: Advanced Software Engineering
- CSCE 496/896: Empirical Software Engineering
- CSCE 156/156J: Introduction to Data Structures
- CSCE 183: Software Development Essentials
- CSCE 322: Programming Languages Concepts
- CSCE 361/383: Software Engineering
- CSCE 467/867: Software Quality
- CSCE 897: Master Project
- CSCE 899: Master Thesis
- CSCE 996: Research other than Thesis
- CSCE 999: Dissertation

#### **Innovations**

- 2015: Contributed to curriculum and course development for Software Engineering Major.
- 2012: New CSCE990 course merging the bounds of program analysis techniques and tools with the challenges found in the development of robotic systems.

- 2010: Incorporation of students' short videos conveying the value of their favorite programming language in CSCE322. We used them to reflect on the class lessons at the end of the semester.
- 2010: First broad assessment of Bug-Hunt effectiveness in CS1/CS2 sequence.
- 2008: Design and implementation of new course on *Analysis of Software Artifacts*.
- 2007: Incorporation of programming languages comparative assessment assignments into the *Programming Languages Concepts* course.
- 2007: Incorporation of design patterns and advanced development environments into the *Software Engineering* course.
- 2004-2009: *Bug Hunt*: Web Tutorial to Assist the Learning of Software Testing in CS1 and CS2. *Bug Hunt* has been used in tens of institutions and thousands of students worldwide.
- 2003-2004: Design of first 900 level course on *Software Quality, Testing, and Analysis*.
- 2002-2003: Design of *Software Development Essentials* for the JDE Honors Program (now Raikes School).
- 2001-2002: Incorporation of maintenance experience into *Software Engineering* course.
- 2001-2002: Design and implementation of new course on *Empirical Software Engineering*.
- 2000-2003: Review and enhancement of JDE Honors Program (now Raikes School) undergraduate curriculum.
- 1999-2000: Design and implementation of new course on *Software Quality*.

## **Mentoring and Advising**

### **Ph.D. Graduate Advisor or Co-Advisor**

1. John Paul Ore (co-advised with Dr. Detweiler), Topic: Testing and Analysis of Co-Robotic Systems (PhD, in progress)
2. Ajay Shankar (co-advised with Dr. Detweiler), Estimation amplification (PhD, in progress)
3. Rahul Purandare (co-advised with Dr. Dwyer), Run-time Verification (Post-doc, 2013)
4. Katie Stolee, Topic: Searching for Semantics with Solvers (PhD, 2013)
5. Pingyu Yang, Topic: Test Transformation (PhD, 2013)
6. Madeline Hardojo, Topic: Profiling and Analyzing Deployed Software (PhD, 2009)
7. Mark Fisher, Topic: Analysis and Validation of Web Applications and Services (Ph.D, co-advised with G. Rothermel, 2008)
8. Zhimin Wang, Topic: Validating Context Aware and Mobile Applications (Ph.D., 2008)
9. Joe Ruthruff, Topic: Experimental Program Analysis (Ph.D - co-advised with G. Rothermel, 2008)

### **M.S. Graduate Advisor or Co-Advisor**

1. Evan Beachly (co-advised with Dr. Detweiler), UAS-FF (MS, in progress)
2. Nishant Sharma (co-advised with Dr. Detweiler), Impact Analysis of Robotic Systems (MS, in progress)
3. Matias Waterloo, Topic: Test Analysis (MS, in progress)
4. Adam Taylor: Configuration Support for Co-Robotic Systems (MS, 2015)
5. Eric Rizzi (co-advised with Dr. Dwyer), Topic: Challenging in Building on Existing Infrastructure (MS, 2015)

6. Hengle Jiang, Invariants for Robotic Systems, (MS, 2014)
7. Andrew Mittleider (co-advised with Dr. Detweiler), Topic: UAV's efficiency (MS, 2013)
8. Heath Roehr (co-advised with Dr. Cohen), topic: Program behavioral differences (MS, 2013)
9. Yurong Wang (co-advised with Dr. Dwyer), Test Advices (MS,2012)
10. Javier Darsie, Topic: Statistical Properties (MS, 2012)
11. Katie Stolee, Topic: Refactoring Pipe Mashups (MS, 2010)
12. Matthew Jorde, Topic: Analysis of Program States (MS-Thesis, 2008)
13. Padmapriya Ashokkumar, Topic: Design by Contract (MS-Project, 2007 - co-advised with Lorin Hochstein)
14. Andhy Koesnandar, Topic: End-User Engineering of Web Applications (MS-Thesis - co-advised with G. Rothermel, 2007)
15. Hui Nee Chin, Topic: Test Carving (MS-Project, 2007)
16. Sandeep Lingham, Topic: End-User Engineering of Web Applications (MS-Project, 2006)
17. Bhuvana Gopal, Topic: End-User Engineering of Web Applications (Ms-Thesis, 2005)
18. Sameera Reddy, Topic: Regression Testing (MS-Thesis, 2004)
19. Fidel Knowcha, Topic: End-User Software Engineering with Matlab (MS-Thesis, 2004)
20. Ram Chilakamarri, Topic: Software Instrumentation and Profiling (MS-Thesis, 2004)
21. Madeline Hardojo, Topic: Profiling Deployed Software (MS-Thesis, 2004)
22. Satya Kanduri, Topic: Failures Reproduction and Anomaly Detection (MS-Thesis, 2003)
23. Srikanth Karre, Topic: Web Testing (MS-Thesis, 2003)
24. Xin Liu, Topic: Failure Reproduction (MS-Thesis, 2002)
25. Praveen Kallakuri, Topic: Regression Testing (MS-Thesis, 2002)
26. Smita Narla, Topic: Operational Profiles (MS-Project, 2001)
27. David Gable, Topic: Regression Testing (MS-Thesis, 2001)

**Committee Member:** Sandeep Kotal (PhD, 2014), John Paul Ore (MS, 2013); Elena Sherman (Ph.D., 2012); Rahul Purandare (Ph.D, 2011); Xiao Qu (Ph.D, 2010); Christopher Scaffidi (Ph.D, CMU, 2009); Suzette Person (Ph.D, 2009); Fangrui Ma (Ph.D, 2009); Xi Xia Ren (Ph.D, Rutgers, 2008); Hyunsook Do (Ph.D, 2007); Jian Kang (Ph.D, 2007); Neo Jia (MS, 2006); Mulyadi Oey (MS, 2005); Rohini Krishnapura (MS, 2004); Sita Madhuri Tangirala (MS, 2004); Teuta Cata (Ph.D, 2003); Zheyang Jane Yang (MS, 2003); Yuhui Jiao; Seong No Yoon (MS, 2001); Amit Kulharni (MS, 2001); Rahul Reddy (MS, 2000); Shromila Chitgopkar (MS, 2000); Santosh Sangras (MS, 2000); Vandana Gupta (MS, 2000); Ingyu Lee (MS, 2000).

**Support through Independent Research:** Lingyun Wang (MS, 2001); Jian Tang (MS, 2001); Luyin Zhao (MS, 2001); Suresh Namala (MS, 2004).

**Undergraduate Research:** Eric Gruber; Tuan Duc Dao (undergraduate Thesis and UCARE recipient); Ted Whaler; Khoa Lee (supported through REU); Shane Geiger ; Jared Bakewell; David Friberg (supported through REU); Bhyn; Cuddy Ebberson; Jonathan Dokulil (UCARE recipient and supported through REU); Nick Steinbaugh (supported through REU); Matthew Jorde (supported through REU), Bumsoo Hong (supported through grant); Steve Trout (supported through REU); Bumsoo Hong (supported through REU), Josh Reed (supported through NASA grant), Charles Lucas (supported through REU), Xin Guo (supported through NSF grant), Megan Jensen (AFOSR support), Daniel Dobos (NSF support), Adam Taylor (AFOSR support), David Shriver (NSF Support).