

Nicholas A. Kraft

Department of Computer Science
The University of Alabama
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Technical Research Interests

Program comprehension, reverse engineering, static analysis, mining software repositories, and software maintenance and evolution.

Educational Research Interests

Improving motivation, self-efficacy, and critical thinking using student centered learning approaches such as guided discovery learning and service-learning.

Education

Clemson University, Clemson, South Carolina, USA

Ph.D. Computer Science, May 2007

Dissertation: *An Infrastructure to Support Interoperability in Reverse Engineering*

Advisor: Brian A. Malloy

Indiana University Southeast, New Albany, Indiana, USA

B.A. Mathematics, May 2002

Professional Experience

The University of Alabama, August 2007—present

Assistant Professor of Computer Science

Clemson University, Department of Computer Science, 2002—2004 and 2006—2007

Graduate Lab Assistant (Systems Administrator)

Graduate Teaching Assistant

Clemson University, Digital Production Arts, 2005—2006

Graduate Lab Assistant (Systems Administrator)

Indiana University Southeast, Student Development Center, 2002

Supplemental Instructor

Sponsored Research

Dr. Kraft has served as PI or co-PI on approximately \$1.8M in grants from NSF and ED.

External Awards

NSF 1156563

“REU Site: Empirical Software Engineering,” *Research Experiences for Undergraduates Sites*, 02/01/12–01/31/15, \$333,000, N.A. Kraft (PI — 67%), J.C. Carver.

ED P200A100182

“Doctoral Fellowships in Computer Science: Next-Generation Science and Practice of Software Engineering,” *Graduate Assistance in Areas of National Need*, 08/16/10–08/15/13, \$525,060*, N.A. Kraft (co-PI — 24%), S. Vrbsky (PI), J.C. Carver, D. Cordes, J. Gray, J.C. Lusth, A. Parrish, R.K. Smith.

NSF 0941992

“Text-to-Art,” *EHR/DUE CCLI-Type 1 (Exploratory)*, 07/01/10–06/30/12, \$100,000, N.A. Kraft (PI — 50%), J.C. Lusth.

NSF 0915559 & 0915403

“SHF:Small:Collaborative Research: Improved Code Clone Categorization,” *CISE/CCF Software and Hardware Foundations*, 09/15/09–09/14/12, \$494,054 (UA Share: \$360,812), N.A. Kraft (Overall PI — 50%), L.H. Etzkorn (PI at UAHunstville), J.C. Carver.

NSF 0851824

“REU Site: Software Language Engineering,” *Research Experiences for Undergraduates Sites*, 08/01/09–07/31/12, \$306,111, N.A. Kraft (PI — 95%), A. Parrish.

NSF 0837210

“100P: A Guided Discovery Curriculum for Computer Science,” *EHR/DUE CCLI-Phase 1 (Exploratory)*, 05/01/09–04/30/11, \$98,286, N.A. Kraft (co-PI — 33%), J.C. Lusth (PI), X. Hong.

Internal Awards

UA Offices of Academic Affairs and Research

“Postdoctoral Research Fellow in Software Engineering,” *Research Stimulation Program*, 06/01/10–05/31/12, ≈\$90,000, N.A. Kraft (co-PI — 25%), J.C. Carver, J. Gray, R.K. Smith.

* Excluding cost share. Project total with cost share: \$656,325.

Publications

Dr. Kraft, graduate student authors⁺, and undergraduate student authors^{*} are noted.

Refereed Journal Articles

- [1] J.R. Pate⁺, R. Tairas⁺, and N.A. Kraft, “Clone evolution: a systematic review,” *Journal of Software Maintenance and Evolution: Research and Practice*, 23 pages. Accepted for publication on September 8, 2011.
- [2] P. Shao⁺, T. Atkison, N.A. Kraft, and R.K. Smith, “Combining lexical and structural information for static bug localization,” *International Journal of Computer Applications in Technology*, 11 pages. Accepted for publication on March 9, 2011.
- [3] J. Durand⁺, J. Flores⁺, T. Atkison, N.A. Kraft, and R.K. Smith, “Using Executable Slicing to Improve Rogue Software Detection Algorithms,” *International Journal of Secure Software Engineering*, 2(2): 53–64, April–June 2011.
- [4] D.A. Steil⁺, J.R. Pate⁺, N.A. Kraft, R.K. Smith, B. Dixon, L. Ding⁺, and A. Parrish, “Patrol Routing Expression, Execution, Evaluation, and Engagement,” *IEEE Transactions on Intelligent Transportation Systems*, 12(1): 58–72, March 2011.
- [5] S.K. Lukins⁺, N.A. Kraft, and L.H. Etzkorn, “Bug localization using latent Dirichlet allocation,” *Information and Software Technology*, 52(9): 972–990, September 2010.
- [6] N.A. Kraft, E.B. Duffy⁺, and B.A. Malloy, “Grammar Recovery from Parse Trees and Metrics-Guided Grammar Refactoring,” *IEEE Transactions on Software Engineering*, 35(6): 780–794, November/December 2009.
- [7] G. Jay⁺, J. Hale, R.K. Smith, D. Hale, N.A. Kraft, and C. Ward⁺, “Cyclomatic Complexity and Lines of Code: Empirical Evidence of a Stable Linear Relationship,” *Journal of Software Engineering and Applications*, 2(3): 137–143, October 2009.
- [8] N.A. Kraft, B.A. Malloy, and J.F. Power, “A tool chain for reverse engineering C++ applications,” *Science of Computer Programming (Special Issue on Experimental Software and Toolkits)*, 69(1–3): 3–13, December 2007.
- [9] N.A. Kraft, B.A. Malloy, and J.F. Power, “An infrastructure to support interoperability in reverse engineering,” *Information and Software Technology*, 49(3): 292–307, March 2007. **Special issue containing the best papers** from the 12th Working Conference on Reverse Engineering (WCRE 2005). Extensive revision and expansion of the conference paper.
- [10] N.A. Kraft, E.L. Lloyd, B.A. Malloy, and P.J. Clarke, “The implementation of an extensible system for comparison and visualization of class ordering methodologies,” *Journal of Systems and Software*, 79(8): 1092–1109, August 2006.

Refereed Conference and Workshop Proceedings

- [1] X. Hong, J.C. Lusth, N.A. Kraft, and D.M. McCallum, "Evolution of the 100 Problems Curriculum of Computer Science," *Proc. Of the ASEE Southeastern Section Conf. (ASEE-SE'12)*, Starkville, MS, USA, 10 pages, April 2012.
- [2] M.D. Beard⁺, N.A. Kraft, L.H. Etzkorn, and S.K. Lukins, "Measuring the Accuracy of Information Retrieval based Bug Localization Techniques," *Proc. of the 18th Working Conf. on Reverse Engineering (WCRE'11)*, Lero, Ireland, 5 pages, October 2011 [acceptance rate: 48%].
- [3] N.A. Kraft, X. Hong, J.C. Lusth, and D. McCallum, "Experiences with CS2 and Data Structures in the 100 Problems Format," *Proc. of the 41st ASEE/IEEE Frontiers in Education Conf. (FIE'11)*, Rapid City, SD, USA, 7 pages, October 2011.
- [4] L.R. Biggers⁺, B.P. Eddy⁺, N.A. Kraft, and L.H. Etzkorn, "Toward a Metrics Suite for Source Code Lexicons," *Proc. of the 27th IEEE Int'l Conf. on Software Maintenance (ICSM'11)*, Williamsburg, VA, USA, 4 pages, September 2011 [acceptance rate: 38%].
- [5] D. Chatterji⁺, J.C. Carver, B. Massengill^{*}, J. Oslin⁺, and N.A. Kraft, "Measuring the Efficacy of Code Clone Information in a Bug Localization Task: An Empirical Study," *Proc. of the 5th ACM/IEEE Int'l Sym. on Empirical Software Engineering and Measurement (ESEM'11)*, Banff, Alberta, Canada, 10 pages, September 2011 [acceptance rate: 31%].
- [6] C.S. Corley^{*}, N.A. Kraft, L.H. Etzkorn, and S.K. Lukins, "Recovering Traceability Links between Source Code and Fixed Bugs via Patch Analysis," *Proc. of the 6th Int'l Wksp. On Traceability in Emerging Forms of Software Engineering (TEFSE'11)*, Honolulu, HI, USA, 7 pages, May 2011 [acceptance rate: 44%].
- [7] J.C. Carver, D. Chatterji⁺, and N.A. Kraft, "On the Need for Human-based Empirical Validation of Techniques and Tools for Code Clone Analysis," *Proc. of the 5th Int'l Wksp. on Software Clones (IWSC'11)*, Honolulu, HI, USA, 2 pages, May 2011.
- [8] J.C. Carver and N.A. Kraft, "Evaluating the Testing Ability of Senior-level Computer Science Students," *Proc. of the 24th IEEE-CS Conf. on Software Engineering Education and Training (CSEE&T'11)*, Honolulu, HI, USA, 10 pages, May 2011 [acceptance rate: 40%].
- [9] L.R. Biggers⁺ and N.A. Kraft, "Quantifying the Similarities between Source Code Lexicons," *Proc. of the 49th ACM Southeast Conf. (ACM SE'11)*, Kennesaw, GA, USA, 6 pages, April 2011 [acceptance rate: 54%].

- [10] D. Chatterji⁺, B. Massengill⁺, J. Oslin⁺, J.C. Carver, and N.A. Kraft, "Measuring the Efficacy of Code Clone Information: An Empirical Study," *Proc. of Evaluation and Usability of Programming Languages and Tools (PLATEAU'10)*, Reno, NV, USA, 6 pages, October 2010 [acceptance rate: 83%].
- [11] C. Patterson⁺, N.A. Kraft, and S. Burkett, "AVS: Science and Technology Virtual Museum," *Proc. of the ASEE Annual Conf. & Expo (ASEE'10)*, Louisville, KY, USA, 4 pages, June 2010.
- [12] P. Shao⁺, R.K. Smith, and N.A. Kraft, "Combining Latent Semantic Indexing and Call Graphs to Improve Feature Location," *Proc. of the IASTED Int'l Conf. on Software Engineering and Applications (SEA'09)*, Cambridge, MA, USA, 6 pages, November 2009.
- [13] J.C. Lusth, N.A. Kraft, and J. Tacey⁺, "Language Subsetting via Reflection and Overloading," *Proc. of the 39th ASEE/IEEE Frontiers in Education Conf. (FIE'09)*, San Antonio, TX, USA, 6 pages, October 2009.
- [14] Y. Liang⁺, N.A. Kraft, and R.K. Smith, "Automatic Class Matching to Compare Extracted Class Diagrams: Approach and Case Study," *Proc. of the 21st Int'l Conf. on Software Engineering and Knowledge Engineering (SEKE'09)*, Boston, MA, USA, 5 pages, July 2009 [acceptance rate: 38%].
- [15] S.K. Lukins⁺, N.A. Kraft, and L.H. Etzkorn, "Source Code Retrieval for Bug Localization using Latent Dirichlet Allocation," *Proc. of the 15th Working Conf. on Reverse Engineering (WCRE'08)*, Antwerp, Belgium, pp. 155–164, October 2008 [acceptance rate: 29%].
- [16] N.A. Kraft and K.S. Webb⁺, "Evaluating the Accuracy of Call Graphs Extracted with the Eclipse CDT," *Proc. of the 20th Int'l Conf. on Software Engineering and Knowledge Engineering (SEKE'08)*, San Francisco, CA, USA, pp. 85–90, July 2008 [acceptance rate: 48%].
- [17] N.A. Kraft, B.W. Bonds⁺, and R.K. Smith, "Cross-Language Clone Detection," *Proc. of the 20th Int'l Conf. on Software Engineering and Knowledge Engineering (SEKE'08)*, San Francisco, CA, USA, pp. 54–59, July 2008 [acceptance rate: 48%].
- [18] B.N. Hoipkemier⁺, N.A. Kraft, and B.A. Malloy, "3D Visualization of Class Template Diagrams for Deployed Open Source Applications," *Proc. of the 18th Int'l Conf. on Software Engineering and Knowledge Engineering (SEKE'06)*, 4 pages, July 2006.
- [19] N.A. Kraft, B.A. Malloy, and J.F. Power, "Toward an Infrastructure to Support Interoperability in Reverse Engineering," *Proc. of the 12th Working Conf. on Reverse Engineering (WCRE'05)*, Pittsburgh, PA, USA, pp. 196–205, November 2005 [acceptance rate: 36%].
- [20] A.C. Jamieson⁺, N.A. Kraft, J.O. Hallstrom, and B.A. Malloy, "A Metric Evaluation of Game Application Software," *Proc. of Future Play: The Int'l Academic Conf. on the Future of Game Design and Technology*, East Lansing, MI, USA, 6 pages, October 2005.

- [21] N.A. Kraft, B.A. Malloy, and J.F. Power, "g4re: Harnessing GCC to Reverse Engineer C++ Applications," *Dagstuhl Seminar Proc. 05161: Transformation Techniques in Software Engineering*, Dagstuhl, Germany, 11 pages, April 2005.
- [22] R.B. Finkbine and N.A. Kraft, "Introducing the Test Harness: Automating the Test Suite," *Proc. of the Information Systems Education Conf. (ISECON'02)*, San Antonio, TX, USA, 3 pages, November 2002.

Invited/Editorially Reviewed Journal Articles

- [1] C.J. Hayes, B.D. Nichols, N.A. Kraft, and M.D. Anderson, "Improving LSI-based Bug Localization using Historical Patch Data," *The University of Alabama McNair Journal*, 10(1): 51–60, Spring 2010.
- [2] B.A. Malloy, N.A. Kraft, J.O. Hallstrom, and J.M. Voas, "Improving the Predictable Assembly of Service-Oriented Architectures," *IEEE Software*, 23(2): 12–15, March / April 2006.

Refereed Conference and Workshop Proceedings (Advisees as Sole-Authors)

- [1] B.D. Nichols, "Augmented Bug Localization using Past Bug Information," *Proc. of the 48th ACM Southeast Conf. (ACM-SE'10)*, Oxford, MS, USA, 6 pages, April 2010.

Other Conference and Workshop Presentations

- [1] M. Brown, X. Hong, N.A. Kraft, and J.C. Lusth, "100P: A Guided Discovery Curriculum for Computer Science," *Poster Presentation at the 41st ACM Technical Sym. on Computer Science Education (SIGCSE'10)*, Milwaukee, WI, USA, March 2010.
- [2] N.A. Kraft, B.A. Malloy, and J.F. Power, "g4re: A Tool Chain for Reverse Engineering C++," *Tool Demonstration at the 12th Working Conf. on Reverse Engineering (WCRE'05)*, Pittsburgh, PA, USA, November 2005.

Invited Talks

Recovering Traceability Links between Source Code and Issue Reports

The University of Alabama in Huntsville, Huntsville, AL, USA (March 4, 2011)

Improved Code Clone Categorization

Google Tech Talk, Atlanta, GA, USA (June 24, 2010)

Alabama A&M University, Normal, AL, USA (November 24, 2010)

Recovery and Metrics-Guided Refactoring of a Grammar from a Hard-Coded Parser

The University of Mississippi, University, MS, USA (November 19, 2008)

Alabama IEEE Computer Society, Birmingham, AL, USA (November 24, 2008)

Innovations in Computer Science Education at The University of Alabama
NetApp, Research Triangle Park, NC, USA (February 26, 2009)
Duke University, Durham, NC, USA (February 27, 2009)

Teaching

Graduate Courses

- CS 600 Foundations of Software Engineering (Fall 2008)
- CS 603 Organization of Programming Languages (Spring 2011, Spring 2010, Spring 2009)
- CS 691 Software Maintenance and Evolution (Fall 2009)
- CS 691 Analysis, Testing, and Maintenance of Object-Oriented Software (Fall 2007)

Undergraduate Courses

- CS 250 Programming II (Fall 2010, Fall 2009)
- CS 403/503 Programming Languages (Fall 2008)
- CS 415/515 Software Design and Development (Fall 2011, Spring 2008)
- CS 434 Compiler Construction (Summer 2008)

100P Courses (<http://100P.cs.ua.edu>)

- CS 260 Foundations of Computer Science (Fall 2010, Spring 2010, Fall 2009)
- CS 315 Software Engineering (Fall 2010)
- CS 357 Data Structures (Spring 2010)
- CS 360 Data Structures & Algorithm Analysis (Spring 2011, Fall 2010)
- CS 403 Programming Languages (Spring 2011, Fall 2010)

Student Supervision

Current Graduate Students — Advisor

- Blake Bassett, M.S. Student
- Lauren R. Biggers, Ph.D. Student
- Christopher S. Corley, Ph.D. Student
- Brian P. Eddy, Ph.D. Student
- Elizabeth A. Kammer, M.S. Student
- Jeremy R. Pate, Ph.D. Student
- Jeffrey A. Robinson, Ph.D. Student

Current Graduate Students — Committee Member

- Rachael Bishop-Ross, Ph.D. Student (Mathematics; advisor: Jon M. Corson)
- Amiangshu Bosu, Ph.D. Student (advisor: Jeffrey C. Carver)
- Debarshi Chatterji, Ph.D. Student (advisor: Jeffrey C. Carver)
- Ferosh Jacob, Ph.D. Student (advisor: Jeff Gray)
- Aziz Nanthaamornphong, Ph.D. Student (advisor: Jeffrey C. Carver)

- Madhav Rao (ECE; advisor: Susan Burkett)
- Songqing Yue, Ph.D. Student (advisor: Jeff Gray)
- Lei Zeng, Ph.D. Student (advisor: Yang Xiao)

Past Graduate Students — Advisor

- Yan Liang, Ph.D. (Dec 2011)
Co-advised with Randy K. Smith
- Peng Shao, Ph.D. (Aug 2011)
Co-advised with Randy K. Smith
- Michael G. Raines, M.S. (Dec 2010)
First position after graduation: Software Engineer at Amazon
- Tom Childress, M.S. (May 2010)
First position after graduation: Software Engineer at Boeing
- Brent D. Nichols, M.S. (May 2010)
First position after graduation: Software Engineer at SAIC
- Adam Ferguson, M.S. (May 2008)
First position after graduation: Assistant Research Engineer at UA
- Kevin Webb, M.S. (May 2008)
First position after graduation: MIS Analyst at Intergraph

Past Graduate Students — Committee Member

- Jason Oslin, M.S. (May 2010; advisor: Jeffrey C. Carver)
First position after graduation: Software Engineer at Harris
- Robert Tairas, Ph.D. (May 2010; University of Alabama at Birmingham; advisor: Jeff Gray)
First position after graduation: Postdoc at INRIA / EMN
- Graylin Trevor Jay, Ph.D. (Aug 2009; advisor: Randy K. Smith)
First position after graduation: Postdoc at Brown University
- Janet T. Jenkins, Ph.D. (Aug 2008; advisor: Randy K. Smith)
First position after graduation: Assistant Professor at Univ. of North Alabama

Past Undergraduate Students

- Cecylia Bocovich, REU Participant (2011; Macalester College)
- Riley Capshaw, REU Participant (2011; Hendrix College)
- Adam Cardenas, REU Participant (2011; California State University, Fresno)
- John Cipriano, REU Participant (2011; Fairfield University)
- Anastasia Drebot, REU Participant (2011; James Madison University)
- Juliet Rubin, REU Participant (2011; University of San Francisco)
- Andrew Springall, REU Participant (2011)
- Elizabeth A. Williams, REU Participant (2011), Research Assistant (2010)
- Nathan Bishop, Research Assistant (2010)
- Bethany Blackmon, REU Participant (2010; Tennessee State University)
- Rachael Breece, REU Participant (2010; Tennessee Tech University)

- Christopher S. Corley, REU Participant (2010, 2009; University of North Alabama)
First position after graduation: Ph.D. Student at UA
- Jeff Byrd (2009)
- Anton Dukeman (2009)
First position after graduation: M.S. Student at UA
- Cory J. Hayes, McNair Scholar (2009)
First position after graduation: Ph.D. Student at University of Notre Dame
- Elizabeth A. Kammer, REU Participant (2009; Department of Mathematics)
First position after graduation: M.S. Student at UA
- Ben Lemmond, REU Participant (2009)
First position after graduation: M.S. Student at UA
Last known position: Systems Engineer at ADTRAN (2011)
- Keith H. Weber, Computer-Based Honors Student (2008)
First position after graduation: M.S. Student at UA

Professional Activities

Organizing Committee Member

- Local Arrangements Chair, 50th ACM Southeast Conf. (ACM SE'12)
- Publicity Co-Chair, 3rd Int'l Conf. on Software Language Engineering (SLE'10)
- Program Co-Chair, 48th ACM Southeast Conf. (ACM SE'10)
- Publicity Chair, 17th Int'l Conf. on Program Comprehension (ICPC'09)

Program Committee Member

- IEEE Int'l Conf. on Program Comprehension (ICPC): 2011, 2010, 2009
- IEEE Int'l Conf. on Software Maintenance (ICSM) — Early Research Achievements (ERA): 2012, 2011, 2010
- IEEE Int'l Sym. on Software Reliability Engineering (ISSRE) — Student Papers: 2011
- Working Conf. on Reverse Engineering (WCRE): 2011
- International Conf. on Software Language Engineering (SLE): 2011, 2010, 2009
- Int'l Conf. on Software Engineering and Knowledge Engineering (SEKE): 2011, 2010, 2009
- Int'l Conf. on Software Engineering Research, Management and Applications (SERA): 2009
- Int'l Wksp. On Software Clones (IWSC): 2012
- Workshop on Automating Service Quality (WRASQ): 2007

Panelist

- National Science Foundation (NSF): 2011, 2009

Reviewer

- ACM Technical Sym. on Computer Science Education (SIGCSE): 2012, 2011, 2010, 2009
- ACM Annual Conf. on Innovation and Technology in Computer Science Education (ITiCSE): 2010

- Frontiers in Education Conf. (FIE): 2011, 2009
- ACM Transactions on Software Engineering and Methodology
- Software Practice & Experience
- Science of Computer Programming
- Journal of Systems and Software
- Advances in Software Engineering
- International Journal of Software Engineering and Knowledge Engineering
- Journal of Software Engineering

External Reviewer

- ACM Sym. on Applied Computing (SAC) — Software Engineering (SE): 2010
- IFIP Working Conf. on Domain Specific Languages (DSL WC): 2009
- Wksp. on Language Descriptions, Tools, and Applications (LDTA): 2007, 2006
- Int'l Conf. on Software Engineering Research, Management, and Applications (SERA): 2007, 2005

Honors and Awards

Outstanding Graduate Student Researcher Award, 2005–2006

Sponsored by the Clemson University Research Foundation and awarded to two graduate students each year, selected from all of Clemson University (over 3,000 graduate students that year). The highest university honor that graduate students engaged in research can receive.

Outstanding Graduate Researcher Award, 2005–2006

Awarded to two graduate students each year, selected from the entire College of Engineering and Science at Clemson University (over 1,000 graduate students that year). The highest College of Engineering and Science honor for excellence in graduate research.

Outstanding Ph.D. Student in Computer Science, 2005–2006

Awarded to one graduate student each year (from 34 Ph.D. students that year). The highest departmental honor for Ph.D. student excellence.

Special Faculty Recognition Award, 2005–2006

Awarded to two graduate students each year, selected from the entire Department of Computer Science at Clemson University (116 graduate students that year). The departmental award for exceptional students who have excelled in ways that cannot always be measured by traditional means.

Upsilon Pi Epsilon, 2004

International honor society for the computing and information disciplines.

Professional Memberships

IEEE, 2006–present

IEEE Computer Society, 2006–present

Association for Computing Machinery (ACM), 2002–present

ACM Special Interest Group on Software Engineering (SIGSOFT), 2002–present

ACM Special Interest Group on Computer Science Education (SIGCSE), 2008–present