Lucas M. Layman, Ph.D.

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RESEARCH INTERESTS

My primary areas of interest are: 1) human factors in software development and security; 2) empiricism and analytics to support software development and security; and 3) computer science education. I believe that both human-focused and technical perspectives are essential to improving the state-of-the-art in these areas. I perform applied research with professional software developers, security engineers, and everyday users, which I believe is a critical component to validating research results. I have led research on mobile device cybercrime, empirical software development, human aspects of computer security, data mining in software development, cognitive processes of debugging, and agile software development. I am committed to computer science education, having both taught and conducted research on pedagogy, personality types, and the sociological issues surrounding women and minorities in computer science education.

EDUCATION

Doctor of Philosophy, Computer Science — May 2009
North Carolina State University, Raleigh, NC
Dissertation title: "Information Needs of Developers for Program Comprehension during Software Maintenance Tasks"

Master of Science, Computer Science — May 2004
North Carolina State University, Raleigh, NC

Bachelor of Science, Computer Science — May 2002
Loyola College, Baltimore, MD

PROFESSIONAL EXPERIENCE

University of North Carolina Wilmington — July 2017 – Present
Department of Computer Science
Wilmington, NC
Assistant Professor

- Instructor of record for:
  - CSC 242 – Digital Logic and Computer Organization

Fraunhofer Center for Experimental Software Engineering — June 2009 – June 2017
College Park, MD
Research Scientist
Adjunct Associate Professor of Research, Dept. of Computer Science, North Carolina State University

- Security research and development
  - Co-PI on the Pocket Security project – NSF-sponsored research on psycho-social factors of smartphone use contributing to cybercrime using large scale data collection from Android smartphones. NSF Award #1619084
  - Developed security requirements and verification cases for automotive embedded systems software for a US passenger vehicle provider.
  - Conducted basic research on human processes for investigating malicious activity in webserver log files.
  - Led development of the InViz tool to visualize network application log files in real time to support attack investigation and monitoring.
- Software development basic and applied research
  - Conducted NSF-sponsored research on software engineering decision making and lessons transfer using machine learning techniques (transfer learning), including analysis of TSP, NASA, and commercial software process and product data. NSF Award #1302169
  - Conducted NASA-sponsored research on improving the utility of post-launch anomaly reporting, and extracting trends and lessons learned from anomaly databases using semi-automated data mining methods to improve software engineering and assurance efforts.
  - Applied and reported software quality and productivity metrics for the NASA Space Network Ground Segment Sustainment project.
  - Conducted NASA-sponsored research on software safety assessment and process improvement applied to the NASA Constellation program and Global Precipitation Measurement satellite.
  - Investigated software process techniques to improve quality, productivity and customer satisfaction in systems engineering with short development lifecycles, high requirements volatility, and high criticality as part of the Department of Defense's Systems Engineering Research Center (SERC).
  - Studied test-driven development and debugging practices and information needs of professional programmers at Microsoft.
  - Conducted independent product validation for an external customer producing database analysis software for government clients.

National Research Council January 2009 – June 2009
Ottawa, Ontario, Canada
Research Associate

Investigated the feasibility, effectiveness and application of software development methods that emphasize three main traits: agility, communication and collaboration. Assisted in a systematic literature review of test-driven development articles. Also participated in the planning and initial implementation of large, in-depth empirical study on the effectiveness of test-driven development at a major international software development corporation.

TEACHING, MENTORING, AND PEDAGOGICAL RESEARCH EXPERIENCE

- For more detail on my teaching activities, I encourage you to visit my Teaching Portfolio at https://lucas.ezzoterik.com/teaching/.
- (2010–2012) Co-taught the Requirements Engineering course for the Professional Master of Software Engineering program at the University of Maryland, College Park.

- (2009–2016) Mentored 19 interns (periods of 6-months to 1 year) in assorted research and development projects, including three Bachelor's theses and one Master's thesis.
- (2008) Completed N.C. State's Certificate of Accomplishment in Teaching program.
- (2003–2006) Teaching Assistant for CSC326 (Software Engineering) for four semesters, including weekly 2.5 hour lab instruction.
- (2006–2008) Graduate mentor in the NCSU Students & Technology in Academia, Research, and Service (STARS) Student Leadership Corps.
- (2003-2008) Supported by a graduate research assistantship through funding from the National Science Foundation Award #0305917 to investigate pedagogical and participation issues involving gender and ethnic minorities in computer science.

STUDENT RESEARCH EXPERIENCE

Microsoft Research May 2007 – August 2007
Redmond, WA
Research Intern

- Investigated the utility of fault-prediction models built using in-process metrics to iteratively predict fault-prone modules during development.
- Conducted a study of effort estimation in a large-scale software project. Used lightweight data-mining techniques to identify "problematic" estimates and their origins.
- Aided in a study of inter- and intra-team coordination in a large scale, distributed software project.
- Participated in the 2007 UW-MSR Summer Institute on the Human Side of Software Development (http://www.cs.washington.edu/mssi/2007/index.html)

North Carolina State University September 2002 – December, 2008
Raleigh, NC
Research Assistant

- Identified and investigated pedagogical and participation issues involving gender and ethnic minorities in computer science. Conducted numerous interviews and subsequent qualitative analyses. Supported an online pair evaluation and research instrument and performed statistical analyses on related quantitative data.
- Constructed intelligent IDE support systems to increase the utility of fault-detection tools by tailoring output to match developers' cognitive needs and work habits.
- Conducted multiple empirical case studies with industrial partners to evaluate software processes with respect to quality, productivity, and customer satisfaction.
  - IBM (Sept. 2002–May 2003): Created the first version of the Extreme Programming Evaluation Framework to evaluate the impact of Extreme Programming with a product development team.
  - Sabre Airline Solutions (June–July, 2003): Conducted case studies of three product development teams to evaluate the applicability of Extreme Programming to various team and product types.
  - Tekelec (August 2003–March 2004): Conducted a case study of Extreme Programming in a global software development setting.
- Created a proposed benchmark for the evaluation of the Extreme Programming software development methodology.

Loyola College May–Aug 2001
Baltimore, MD
Hauber Summer Science Research Fellowship Investigated the use of reduced decomposition slice graphs for program visualization and to identifying code clones.

PUBLICATIONS

Journal articles

- R. Krishna, T. Menzies, and L. Layman, "Less is More: Minimizing Code Reorganization using XTREE," *Information and Software Technology*, p. to appear., 2017
- T. Menzies, W. Nichols, F. Shull, and L. Layman, "Are Delayed Issues Harder to Resolve," *Empirical Software Engineering: An International Journal*, pp. 1–33, 2016
- L. Layman, V. R. Basili, and M. V. Zelkowitz, "A Methodology for Exposing Risk in Achieving Emergent System Properties," *Transactions on Software Engineering Methodology*, vol. 22, no. 3, p. Article 22, 2014
- T. Menzies, A. Butcher, D. Cok, A. Marcus, L. Layman, F. Shull, B. Turhan, and T. Zimmermann, "Local versus Global Lessons for Defect Prediction and Effort Estimation," *IEEE Transactions on Software Engineering*, vol. 39, pp. 822–834, jun 2013
- L. Layman, L. Williams, K. Slaten, S. Berenson, and M. Vouk, "Addressing Diverse Needs through a Balance of Agile and Plan-driven Software Development Methodologies in the Core Software Engineering Course," *International Journal of Engineering Education*, vol. 24, no. 4, pp. 659–670, 2008
- L. Layman, L. Williams, D. Damian, and H. Bures, "Essential Communication Practices for Extreme Programming in a Global Software Development Team," *Information and Software Technology*, vol. 48, no. 9, pp. 781–794, 2006
- L. Layman, L. Williams, and L. Cunningham, "Motivations and Measurements in an Agile Case Study," *Journal of Systems Architecture*, vol. 52, no. 11, pp. 654–667, 2006

Refereed conference papers

- L. Layman, A. P. Nikora, J. Meek, and T. Menzies, "Topic Modeling of NASA Space System Problem Reports," in *Proceedings of the 13th International Conference on Mining Software Repositories (MSR '16)*, (Austin, TX), pp. 303–314, 2016
- F. Peters, T. Menzies, and L. Layman, "LACE2: Better Privacy-Preserving Data Sharing for Cross Project Defect Prediction," in *37th International Conference on Software Engineering (ICSE '15)*, (Florence, Italy), pp. 801–811, 2015
- L. Layman, S. D. Diffo, and N. Zazworka, "Human Factors in Webserver Log File Analysis: A Controlled Experiment on Investigating Malicious Activity," in *Proc. of the 2014 Symposium and Bootcamp on the Science of Security (HotSoS '14)*, (Raleigh, NC), pp. 9:1–9:11, 2014
- D. Falessi and L. Layman, "Automated classification of NASA anomalies using natural language processing techniques," in *2013 IEEE International Symposium on Software Reliability Engineering Workshops (ISSREW)*, (Pasadena, CA), pp. 5–6, IEEE, nov 2013
- L. Layman, M. Diep, M. Nagappan, J. Singer, R. Deline, and G. Venolia, "Debugging Revisited: Toward Understanding the Debugging Needs of Contemporary Software Developers," in *2013 ACM / IEEE International Symposium on Empirical Software Engineering and Measurement*, pp. 383–392, IEEE, oct 2013
- L. Layman and G. Sigurdsson, "Using Amazon's Mechanical Turk for User Studies: Eight Things You Need to Know," in *Proceedings of the 7th International Symposium on Empirical Software Engineering and Measurement (ESEM 2013)*, (Baltimore, Maryland, USA), pp. 275–278, 2013
- L. Layman, M. Zelkowitz, V. Basili, and A. P. Nikora, "Toward Baselining Software Anomalies in NASA Missions," in *2012 IEEE 23rd International Symposium on Software Reliability Engineering Workshops*, (Dallas, Texas, USA), pp. 13–14, IEEE, nov 2012

- L. Layman, V. R. Basili, M. V. Zelkowitz, and K. L. Fisher, "A Case Study of Measuring Process Risk for Early Insights into Software Safety," in *Proceedings of the 33rd ACM/IEEE International Conference on Software Engineering (ICSE '11)*, (Honolulu, HI), pp. 623–632, 2011

- V. R. Basili, M. V. Zelkowitz, L. Layman, and K. Dangle, "Obtaining Valid Safety Data for Software Safety Measurement and Process Improvement," in *Proceedings of the 4th ACM/IEEE International Symposium on Empirical Soiftware Engineering and Measurement (ESEM '10)*, (Bolzano, Italy), p. Article No. 46, 2010

- L. Layman, F. Shull, P. Componation, S. O. Brien, A. Carrigy, and R. Turner, "A Methodology for Mapping System Engineering Challenges to Recommended Approaches," in *Proceedings of the 4th Annual IEEE International Systems Conference*, (San Diego, CA), pp. 294–299, 2010

- L. Layman, N. Nagappan, S. Guckenheimer, J. Beehler, and A. Begel, "Mining software effort data: A preliminary analysis of Visual Studio Team System Data," in *Proceedings of the 2008 International Working Conference on Mining software repositories - MSR '08*, (New York, New York, USA), pp. 43–46, ACM Press, may 2008

- L. Layman, G. Kudrjavets, and N. Nagappan, "Iterative identification of fault-prone binaries using in-process metrics," in *Proceedings of the Second ACM-IEEE international symposium on Empirical software engineering and measurement - ESEM '08*, (Kaiserslautern, Germany), pp. 206–212, ACM Press, oct 2008

- L. Williams, D. S. McCrickard, L. Layman, and K. Hussein, "Eleven Guidelines for Implementing Pair Programming in the Classroom," in *Agile 2008 Conference*, pp. 445–452, IEEE, 2008

- L. Layman, L. Williams, and R. S. Amant, "Toward Reducing Fault Fix Time: Understanding Developer Behavior for the Design of Automated Fault Detection Tools," in *First International Symposium on Empirical Software Engineering and Measurement (ESEM 2007)*, pp. 176–185, IEEE, sep 2007 **(Best Paper Award)**

- L. Williams, L. Layman, K. M. Slaten, S. B. Berenson, and C. Seaman, "On the Impact of a Collaborative Pedagogy on African American Millennial Students in Software Engineering," in *29th International Conference on Software Engineering (ICSE'07)*, pp. 677–687, IEEE, may 2007

- L. Williams and L. Layman, "Lab Partners: If They're Good Enough for the Natural Sciences, Why Aren't They Good Enough for Us?," in *20th Conference on Software Engineering Education and Training (CSEET'07)*, pp. 72–82, IEEE, jul 2007

- L. Layman, L. Williams, and K. Slaten, "Note to self: Make Assignments Meaningful," in *Proceedings of the 28th SIGCSE Technical Symposium on Computer Science Education*, (Covington, KY), pp. 459–463, ACM, mar 2007

- L. Williams, L. Layman, J. Osborne, and N. Katira, "Examining the Compatibility of Student Pair Programmers," in *AGILE 2006 (AGILE'06)*, pp. 411–420, IEEE, 2006

- L. Layman, "Changing Students' Perceptions: An Analysis of the Supplementary Benefits of Collaborative Software Development," in *19th Conference on Software Engineering Education and Training (CSEET'06)*, pp. 159–166, IEEE, 2006

- L. Layman, T. Cornwell, and L. Williams, "Personality Types, Learning Styles, and an Agile Approach to Software Engineering Education," in *Proceedings of the 37th SIGCSE Technical Symposium on Computer Science Education*, (Houston, TX), pp. 428–432, 2006

- L. Layman, L. Williams, J. Osborne, S. Berenson, K. Slaten, and M. Vouk, "How and Why Collaborative Software Development Impacts the Software Engineering Course," in *Proceedings Frontiers in Education 35th Annual Conference*, pp. T4C–9–T4C–14, IEEE, 2005

- K. Slaten, M. Droujkova, S. Berenson, L. Williams, and L. Layman, "Undergraduate student perceptions of pair programming and agile software methodologies: verifying a model of social interaction," in *Agile Development Conference (ADC'05)*, pp. 323–330, IEEE Comput. Soc, 2005
- L. Layman, L. Williams, and L. Cunningham, "Exploring Extreme Programming in Context: An Industrial Case Study," in *Agile Development Conference 2004 (ADC'04)*, (Salt Lake City, UT), pp. 32–41, 2004
- L. Williams, W. Krebs, L. Layman, A. I. A. Anton, P. Abrahamsson, L. Williams W. Krebs, L. Layman, and A. Antón, L. Williams, W. Krebs, L. Layman, A. I. A. Anton, and P. Abrahamsson, "Toward a Framework for Evaluating Extreme Programming," in *Proceedings of the 8th International Conference on Evaluation and Assessment in Software Engineering (EASE '04)*, (Edinburgh, Scotland), pp. 11–20, IET Digital Library, 2004

Refereed workshop publications, doctoral symposiums, and posters

- L. Layman, C. Seaman, D. Falessi, and M. Diep, "Ask the Engineers: Exploring Repertory Grids and Personal Constructs for Software Data Analysis," in *8th International Workshop on Cooperative and Human Aspects of Software Engineering (CHASE 2015)*, (Florence, Italy), pp. 81–84, 2015
- L. Layman and N. Zazworka, "InViz: Instant Visualization of Cyber Attacks," in *Proc. of the 2014 Symposium and Bootcamp on the Science of Security (HotSoS '14)*, (Raleigh, NC), p. article 9, 2014
- A. Begel, N. Nagappan, C. Poile, and L. Layman, "Coordination in large-scale software teams," in *2009 ICSE Workshop on Cooperative and Human Aspects on Software Engineering*, (Vancouver, BC), pp. 1–7, IEEE, may 2009
- L. M. Layman, L. A. Williams, and R. St. Amant, "MimEc: Intelligent User Notification of Faults in the Eclipse IDE," in *1st Workshop on Cooperative and Human Aspects of Software Engineering (CHASE '08)*, (Leipzig, Germany), pp. 73–76, 2008
- L. Layman, "Intelligent User Notifaction to Expedite Awareness of Fault Code," in *International Doctoral Symposium on Empirical Software Engineering (IDoESE '06)*, 2006
- L. Williams, L. Layman, and P. Abrahamsson, "On establishing the essential components of a technology-dependent framework," *ACM SIGSOFT Software Engineering Notes*, vol. 30, p. 1, jul 2005
- L. Layman, "Empirical investigation of the impact of extreme programming practices on software projects," in *Companion to the 19th annual ACM SIGPLAN conference on Object-oriented programming systems, languages, and applications - OOPSLA '04*, (New York, New York, USA), p. 328, ACM Press, oct 2004
- K. Gallagher and L. Layman, "Are decomposition slices clones?," in *Proceedings of the 11th International Workshop on Program Comprehension (IWPC '03)*, pp. 251–256, IEEE Comput. Soc, 2003

Book chapters and Magazine Articles

- F. Shull, D. Falessi, C. Seaman, M. Diep, and L. Layman, "Technical Debt: Showing the Way for Better Transfer of Empirical Results," in *Perspectives on the Future of Software Engineering: Essays in Honor of Dieter Rombach* (J. Münch and K. Schmid, eds.), pp. 179–190, Elsevier, 2013
- F. Shull, G. Melnik, B. Turhan, L. Layman, M. Diep, and H. Erdogmus, "What Do We Know about Test-Driven Development," *IEEE Software*, vol. 27, no. 6, pp. 16–19, 2010
- B. Turhan, L. Layman, M. Diep, H. Erdogmus, and F. Shull, "How Effective is Test Driven Development?," in *Making Software: What Really Works, and Why We Believe It* (A. Oram and G. Wilson, eds.), pp. 207–219, Cambridge, MA: O'Reilly, 2010

PROFESSIONAL ACTIVITIES

Organizing Committees

- International Doctoral Symposium on Empirical Software Engineering (IDoESE): Co-chair - 2016
- Symposium and Bootcamp on the Science of Security (HotSoS): Financial Chair - 2014
- Empirical Software Engineering and Measurement (ESEM): Financial Chair - 2009, 2013
- Product-Focused software Process Improvement (PROFES): Publicity Chair - 2012
- International Symposium on Software Reliability Engineering (ISSRE): Student Volunteers Chair and Registrar - 2006

Conference and Workshop Program Committees

- International Conference on Software Engineering (ICSE) - 2016
- Mining Software Repositories (MSR) - 2016–2017
- Foundations of Software Engineering (FSE) Industry Track - 2016–2017
- Int'l Conference on Evaluation and Assessment in Software Engineering (EASE) Short Papers- 2015
- Symposium and Bootcamp on the Science of Security (HotSoS) - 2015
- Empirical Software Engineering and Measurement (ESEM) - 2015
- Empirical Software Engineering and Measurement (ESEM) Short Papers - 2014–2016
- Agile (Development Conference) Research Track - 2013–2014
- Int'l Doctoral Symposium on Empirical Software Engineering (IDoESE) - 2013–2014, 201
- International Symposium on Software Reliability Engineering (ISSRE) - 2012
- Workshop on Empirical Requirements Engineering (EmpiRE) - 2012, 2014
- Workshop on Empirical Software Engineering in Practice (IWESEP) - 2012
- Workshop on Cooperative and Human Aspects of Software Engineering (CHASE) - 2009, 2011
- Workshop on Defects in Large Software Systems (DEFECTS) - 2009
- ACM Technical Symposium on Computer Science Education (SIGCSE) - 2007–2014
- Frontiers in Education (FIE) - 2006–2007
- OOPSLA Student Research Competition - 2005
- IEEE Systems Conference - 2013–2014

Journals and Magazine Reviewer

- IEEE Transactions on Software Engineering - 2006, 2008, 2010–2012, 2014, 2016-2017
- Empirical Software Engineering - 2008–2012, 2014–2016
- Information and Software Technology - 2005, 2010–2012, 2014
- IEEE Software (magazine) - 2012
- International Journal of Engineering Education - 2007
- Computer Science Education - 2010

Memberships

- Association for Computing Machinery (ACM), SIGSOFT, SIGCSE
- IEEE Computer Society

AWARDS, FELLOWSHIPS, HONOR SOCIETIES

Awards

- NASA Safety Center Certificate of Appreciation
- 2012 NASA Group Achievement Award - OSMA Software Assurance Research Program
- Completed N.C. State's Certificate of Accomplishment in Teaching program, 2008.
- Second place in the ACM Student Research Competition at OOPSLA '04.
- N.C. State University Outstanding Teaching Assistant Award, 2002–2003.
- Loyola College Dean's List, 1998–2002.
- Loyola College Presidential Scholarship.
- Loyola College Honors Program, 1998–2002.
- The National Dean's List, 2001.

Fellowships

- N.C. State Research Assistantship funded by the Graduate Student Support Plan, 2002–2008
- N.C. State College of Engineering Dean's Fellowship, 2002
- Hauber Summer Science Research Fellowship, May–Aug. 2001

Honor Societies

- Phi Beta Kappa, April 2002
- Upsilon Pi Epsilon, April 2000