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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

<i>Doctor of Philosophy</i> , Computer Science North Carolina State University, Raleigh, NC Dissertation title: "Information Needs of Developers for Program Comprehension during Software Maintenance Tasks"	May 2009
<i>Master of Science</i> , Computer Science North Carolina State University, Raleigh, NC	May 2004
<i>Bachelor of Science</i> , Computer Science Loyola College, Baltimore, MD	May 2002

PROFESSIONAL EXPERIENCE

<i>University of North Carolina Wilmington</i> Department of Computer Science Wilmington, NC Assistant Professor	July 2017 – Present
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- Instructor of record for:
 - CSC 231 – Introduction to Data Structures
 - CSC 242 – Digital Logic and Computer Organization
 - CSC 315 – Application Development for Mobile Devices
 - CSC 475/592 – Engineering Secure Software
- Research projects:
 - A master's thesis on an empirical study of factors impacting cyber security analyst performance in the use of intrusion detection systems
 - A mobile application developed with the College of Education to deliver interactive information for [Carolina Beach State Park](#)

- Internally-funded award to study machine learning of Twitter streams for early warning of threats relevant to the UNCW network.
- Internally-funded award to supervise a student project to analyze performance of machine learning algorithms in facial-recognition tasks for a US government customer.

Fraunhofer Center for Experimental Software Engineering
College Park, MD
Research Scientist

June 2009 – June 2017

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
Ottawa, Ontario, Canada
Research Associate

January 2009 – June 2009

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.

CURRENT AND PAST FUNDING

Competitive funding received on projects where serving as Principal Investigator or Project Manager:

Source	Topic	Period	Amount
NSF	Pocket Security – Smartphone Cybercrime in the Wild	9/16–9/18	\$309,000
Cisco University Research Program Fund	Data Protection Policy Effectiveness Measures	12/16–11/17	\$100,000
NSF	Transfer Learning in Software Engineering	07/13–06/17	\$482,852
US Automotive OEM	Software Reliability Metric Analysis	05/16–11/16	\$40,000
US Automotive OEM	Security Requirements Engineering for Embedded Software	09/14–01/15	\$100,000
NASA OSMA SARP	Software Anomalies: Trending, Analysis, and Lessons Learned	10/13–09/15	\$202,500
NASA OSMA SARP	A JIRA-based Hazard Tracking System	10/13–09/15	\$82,005
NASA OSMA SARP	Improving the Utility of Anomaly Reports	10/12–09/13	\$115,117
Fraunhofer USA	InViz: Instant Visualization of Cyber Attacks	02/12–03/13	\$145,000
SERC UARC	Modeling of Contingency Bases	09/11–11/12	\$62,019
NASA OSMA SARP	NASA Software Standards Improvement - Software Safety Risk Metrics Initiative	06/09–09/12	\$988,000

PUBLICATIONS

Journal articles

- C. Sabottke, D. Chen, L. Layman, and T. Dumitra, “How to trick the Borg: threat models against manual and automated techniques for detecting network attacks,” *Computers & Security*, vol. 81, pp. 25–40, mar 2019
- R. Krishna, T. Menzies, and L. Layman, “Less is More: Minimizing Code Reorganization using XTREE,” *Information and Software Technology*, vol. 88, pp. 53–66, 2017
- T. Menzies, W. Nichols, F. Shull, and L. Layman, “Are delayed issues harder to resolve? Revisiting cost-to-fix of defects throughout the lifecycle,” *Empirical Software Engineering: An International Journal*, vol. 22, no. 4, pp. 1903–1935, 2016
- L. Layman, V. R. V. Basili, and M. 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)*, vol. 1, (Florence, Italy), pp. 801–811, 2015
- L. Layman, S. 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*, (Baltimore, Maryland, USA), 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 Baseline 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. V. Basili, M. M. V. Zelkowitz, and K. 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. V. Basili, M. M. V. Zelkowitz, L. Layman, K. Dangle, and M. Diep, "Obtaining Valid Safety Data for Software Safety Measurement and Process Improvement," in *Proceedings of the 4th ACM/IEEE International Symposium on Empirical Software Engineering and Measurement (ESEM '10)*, (Bolzano, Italy), p. Article No. 46, 2010
- L. Layman, F. Shull, P. Compton, S. O'Brien, D. Sabados, A. Carrigy, R. Turner, 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, R. St. Amant, R. S. Amant, and R. St. 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)*, (Madrid, Spain), pp. 176–185, IEEE, sep 2007 (**Best Paper Award**)
- L. Williams and L. Layman, "Lab Partners: If They're Good Enough for the Sciences, Why Aren't They Good Enough for Us?," in *20th Conference on Software Engineering Education and Training (CSEET'07)*, (Dublin, Ireland), pp. 72–82, IEEE, jul 2007
- 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. 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)*, (Minneapolis, MN), 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, M. Vouk, L. 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*, (Indianapolis, Indiana), pp. T4C 9–14, IEEE, 2005
- K. M. K. Slaten, M. Droujkova, S. 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)*, (Denver, CO), 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 Notification 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.), vol. 9783642373, 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

- Empirical Software Engineering and Measurement (ESEM): Proceedings Chair - 2018
- 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

- Empirical Software Engineering and Measurement (ESEM) Industry Track - 2019
- IEEE International Conference on Software Analysis, Evolution and Reengineering (SANER) - 2018
- Mining Software Repositories (MSR) - 2016–2017
- Foundations of Software Engineering (FSE) Industry Track - 2016–2017
- International Conference on Software Engineering (ICSE) - 2016
- Empirical Software Engineering and Measurement (ESEM) Short Papers - 2014–2016
- 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
- ACM Technical Symposium on Computer Science Education (SIGCSE) - 2007–2014
- IEEE Systems Conference - 2013–2014
- Agile (Development Conference) Research Track - 2013–2014
- Int'l Doctoral Symposium on Empirical Software Engineering (IDoESE) - 2013–2014
- Workshop on Empirical Requirements Engineering (EmpiRE) - 2012, 2014
- International Symposium on Software Reliability Engineering (ISSRE) - 2012
- 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
- Frontiers in Education (FIE) - 2006–2007
- OOPSLA Student Research Competition - 2005

Journals and Magazine Reviewer

- IEEE Transactions on Software Engineering - 2006, 2008, 2010–2012, 2014, 2016-2018
- Empirical Software Engineering - 2008–2012, 2014–2018

- Information and Software Technology - 2005, 2010–2012, 2014
- IEEE Software (magazine) - 2012
- Computer Science Education - 2010
- International Journal of Engineering Education - 2007

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