

# Lucas Michael Layman

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## Work

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## Home

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## RESEARCH INTERESTS

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My primary research interest is the study of computer programming from a human cognition perspective to create practical tools for improving everyday software development. I am also interested in empirical software engineering, agile software development, and social aspects of computer science education. Much of my previous research has focused on industrial case studies to empirically assess the efficacy of agile software development techniques. I have also studied the sociological and pedagogical issues surrounding women and minorities in computer science education.

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## EDUCATION

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| <b>Ph.D. in Computer Science</b><br><i>North Carolina State University, Raleigh, NC</i><br>Dissertation: "Information Needs of Developers for Program Comprehension during Software Maintenance Tasks"<br>Advisors: Laurie Williams and Robert St. Amant | <b>2009</b> |
| <b>M.S. in Computer Science</b><br><i>North Carolina State University, Raleigh, NC</i><br>Topic: "Empirical Evaluation of Extreme Programming"   | <b>2004</b> |
| <b>B.S. in Computer Science</b><br><i>Loyola College, Baltimore, MD</i><br>Minor: Mathematical Science   | <b>2002</b> |
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## EMPLOYMENT

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| <b>Research Scientist</b><br><i>Fraunhofer Center for Experimental Software Engineering</i><br><i>College Park, MD</i>  | <b>June 2009-present</b> |
| <ul style="list-style-type: none"><li>• Studying software safety assessment and process improvement in large scale, safety-critical projects at NASA.</li><li>• Investigating 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.</li><li>• Performing studies of test-driven development and debugging practices and information needs of professional programmers at Microsoft.</li></ul> |                          |

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| <b>Research Associate</b><br><i>Institute for Information Technology</i><br><i>National Research Council, Ottawa, ON, Canada</i> | <b>Jan.–June 2009</b> |
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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.

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## RESEARCH EXPERIENCE

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**Research Intern** (Mentors: Nachiappan Nagappan, Andrew Begel) **May-Aug. 2007**  
*Microsoft Corporation, Redmond, WA*

- 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. The analysis techniques used will be transferred to commercial products and will be used to help guide future development.
- 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>)

**Research Assistant** (Advisor: Laurie Williams) **Sept. 2002- Dec. 2008**  
*North Carolina State University, Raleigh, NC*

- Constructed intelligent IDE support systems to increase the utility of fault-detection tools by tailoring output to match developers’ cognitive needs and work habits.
- 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.
- 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.

**Hauber Summer Science Research Fellow** (Advisor: Keith Gallagher) **May – Aug. 2001**  
*Loyola College, Baltimore, MD*

- Investigated the use of reduced decomposition slice graphs for program visualization and to identifying code clones.

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## TEACHING EXPERIENCE

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**Computer Science Affiliate** **Spring 2010**  
*University of Maryland, College Park, MD*

Co-taught a graduate course on requirements engineering in the computer science professional master’s program (ENPM 612) with Madeline Diep.

- Composed and delivered four 160 minute lectures.
- Co-developed the course project, assignment and exams.
- Co-developed the course syllabus and assisted in general course administration.

**Teaching Assistant** **Fall 2003**  
*North Carolina State University, Raleigh, NC* **Fall 2004**  
**Spring 2005**  
**Spring 2006**

Served as a teaching assistant for the undergraduate core course in software engineering (CSC 326).

- Held weekly lab sections where students participated in hands-on software engineering exercises.
- Created multiple homework assignments and detailed programming projects.
- Assisted in grading and general course administration.

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## PUBLICATIONS AND PAPERS

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### Journal articles

- [1] Lucas Layman, Laurie Williams, Kelli Slaten, Sarah Berenson, and Mladen 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, issue 4, pp. 659-670.
- [2] Lucas Layman, Laurie Williams, Daniela Damian, and Hynek Bures, "Essential Communication Practices for Extreme Programming in a Global Software Development Team," *Information and Software Technology*, vol. 48, issue 9, pp. 781-794.
- [3] Lucas Layman, Laurie Williams, and Lynn Cunningham, "Motivations and Measurements in an Agile Case Study," *Journal of Systems Architecture*, vol. 52, issue 11, pp. 654-667.

### Refereed conference papers

- [4] Lucas Layman, Forrest Shull, Paul Componation, Sue O'Brien, Dawn Sabados, Anne Carrigy, Richard Turner, "Systematic Mapping of System Engineering Challenges to Recommended Approaches," *IEEE Systems Conference 2010 (SysConf '10)*, pp. 294-299.
- [5] Lucas Layman, Gunnar Kudrjavets, Nachiappan Nagappan, "Iterative Identification of Fault-Prone Binaries Using In-Process Metrics," *Proceedings of the 2<sup>nd</sup> joint symposium on Empirical Software Engineering and Metrics (ESEM '08)*, pp. 206-212.
- [6] Laurie Williams, D. Scott McCrickard, Lucas Layman, Khaled Hussein, "Eleven Guidelines for Implementing Pair Programming in the Classroom," *Proceedings of Agile 2008*, Toronto, ON, pp. 445-452.
- [7] Lucas Layman, Laurie Williams, Robert St. Amant, "Toward Reducing Fault Fix Time: Understanding Developer Behavior for the Design of Automated Fault Detection Tools," *Empirical Software Engineering and Metrics (ESEM '07)*, pp. 176-185. **(Best Paper Award)**
- [8] Laurie Williams, Lucas Layman, Kelli M. Slaten, Carolyn Seaman, Sarah B. Berenson, "On the Impact of a Collaborative Pedagogy on African-American Millennial Students in Software Engineering," *International Conference on Software Engineering Educator's Symposium (ICSE '07)*, pp. 677-687.
- [9] Laurie Williams, Lucas Layman, "Lab Partners: If They're Good Enough for the Sciences, Why Aren't They Good Enough for Us?" *20th Conference on Software Engineering Education and Training (CSEET '07)*, pp. 72-82.
- [10] Lucas Layman, Laurie Williams, Kelli Slaten, "Note to Self: Make Assignments Meaningful," *Proceedings of the ACM Technical Symposium on Computer Science Education (SIGCSE '07)*, Covington, KY, pp. 459-463.
- [11] Laurie Williams, Lucas Layman, Jason Osborne, Neha Katira, "Examining the Compatibility of Student Pair Programmers," *Proceedings of Agile 2006*, Minneapolis, MN, pp. 411-420.
- [12] Lucas Layman, "Changing Students' Perceptions: An Analysis of the Supplementary Benefits of Collaborative Software Development," *Proceedings of 19th Conference on Software Engineering Education and Training (CSEET '06)*, Turtle Bay, HI, pp. 159-166.
- [13] Lucas Layman, Travis Cornwell, and Laurie Williams, "Personality Types, Learning Styles, and an Agile Approach to Software Engineering Education," *Proceedings of the ACM Technical Symposium on Computer Science Education (SIGCSE '06)*, Houston, TX, pp. 428-432.
- [14] Lucas Layman, Laurie Williams, Jason Osborne, Sarah Berenson, Kelli Slaten, and Mladen Vouk, "How and Why Collaborative Software Development Impacts the Software Engineering Course," *Proceedings of Frontiers in Education (FIE '05)*, Indianapolis, IN, pp. T4C 9-14.
- [15] Kelli M. Slaten, Maria Droujkova, Sarah Berenson, Laurie Williams, and Lucas Layman, "Undergraduate Student Perceptions of Pair Programming and Agile Software Methodologies: Verifying a Model of Social Interaction," *Proceedings of the 3<sup>rd</sup> Agile Development Conference (ADC '05)*, Denver, CO, pp. 323-330.
- [16] Lucas Layman, Laurie Williams, and Lynn Cunningham, "Exploring Extreme Programming in Context: An Industrial Case Study," *Proceedings of the 2<sup>nd</sup> Agile Development Conference (ADC*

'04), Salt Lake City, UT, pp. 32-41.

- [17] Laurie Williams, William Krebs, Lucas Layman, and Annie I. Antón, "Toward a Framework for Evaluating Extreme Programming," *Proceedings of the 8th International Conference on Empirical Assessment in Software Engineering (EASE '04)*, Edinburgh, Scotland, pp. 11-20.

#### **Book chapters**

- [18] Burak Turhan, Hakan Erdogmus, Lucas Layman, "Test-driven Development," in *Evidence-Based Software Engineering*, Greg Wilson Ed., O'Reilly, Cambridge, MA, to appear.

#### **Workshop publications, doctoral symposiums, and posters**

- [19] Andrew Begel, Nachiappan Nagappan, Christopher Poile, Lucas Layman, "Coordination in Large-Scale Software Teams," *2<sup>nd</sup> Workshop on Cooperative and Human Aspects of Software Engineering (CHASE '09)*, in conjunction with the *31<sup>st</sup> International Conference on Software Engineering (ICSE '09)*, Vancouver, BC, to appear.
- [20] Lucas Layman, Nachiappan Nagappan, Sam Guckenheimer, Jeff Beehler, Andrew Begel, "Mining Software Effort Data: Preliminary Analysis of Visual Studio Team System Data," *5<sup>th</sup> Working Conference on Mining Software Repositories (MSR '08)*, in conjunction with the *30<sup>th</sup> International Conference on Software Engineering (ICSE '08)*, Leipzig, Germany, pp. 43-46.
- [21] Lucas Layman, Laurie Williams, Robert St. Amant, "MimEc: Intelligent User Notification of Faults in the Eclipse IDE," *1<sup>st</sup> Workshop on Cooperative and Human Aspects of Software Engineering (CHASE '08)*, in conjunction with the *30<sup>th</sup> International Conference on Software Engineering (ICSE '08)*, Leipzig, Germany, pp. 73-76.
- [22] Lucas Layman, "Intelligent User Notification to Expedite Awareness of Faulty Code" *1<sup>st</sup> International Doctoral Symposium on Empirical Software Engineering (IDoESE '06)*, Rio de Janeiro, Brazil.
- [23] Laurie Williams, Lucas Layman, Pekka Abrahamsson, "On Establishing the Essential Components of a Technology-Dependent Framework: A Strawman Framework for Industrial Case Study-Based Research," *Workshop on Realising Evidence-Based Software Engineering (REBSE '05)*, in conjunction with the *International Conference on Software Engineering (ICSE '05)*, St. Louis, MO, pp. 1-5.
- [24] Lucas Layman, "Empirical Investigation of the Impact of Extreme Programming Practices on Software Projects," *Companion to the 19th Annual ACM Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA '04)*, Vancouver, BC, pp. 328-329.
- [25] Keith Gallagher and Lucas Layman, "Are Decomposition Slices Clones?" *Proceedings of the 11th IEEE International Workshop on Program Comprehension (IWPC '03)*, in conjunction with the *International Conference on Software Engineering (ICSE '03)*, Portland, OR, pp. 251-256.

#### **Technical reports**

- [26] Lucas Layman, Travis Cornwell, Laurie Williams, and Jason Osborne, "Personality Profiles and Learning Styles of Advanced Undergraduate Computer Science Students," North Carolina State University Department of Computer Science [TR-2005-40](#).
- [27] William Krebs, Chih-wei Ho, Laurie Williams, and Lucas Layman, "Rational Unified Process Evaluation Framework Version 1.0," North Carolina State University Department of Computer Science [TR-2005-46](#).
- [28] Laurie Williams, Lucas Layman, and William Krebs, "Extreme Programming Evaluation Framework for Object-Oriented Languages – Version 1.4," North Carolina State University Department of Computer Science [TR-2004-18](#).
- [29] Laurie Williams, Williams Krebs, and Lucas Layman, "Extreme Programming Evaluation Framework for Object-Oriented Languages – Version 1.3," North Carolina State University Department of Computer Science [TR-2004-11](#).
- [30] Laurie Williams, Lucas Layman, William Krebs, and Annie I. Antón, "Exploring the Use of a 'Safe Subset' of Extreme Programming: An Industrial Case Study," North Carolina State University Department of Computer Science [TR-2004-3](#).
- [31] Laurie Williams, Williams Krebs, and Lucas Layman, "Extreme Programming Evaluation Framework for Object-Oriented Languages – Version 1.2," North Carolina State University Department of Computer Science [TR-2004-1](#).
- [32] Laurie Williams, Williams Krebs, and Lucas Layman, "Extreme Programming Evaluation

Framework for Object-Oriented Languages – Version 1.1,” North Carolina State University Department of Computer Science [TR-2003-20](#).

[33] Laurie Williams, William Krebs, Lucas Layman, and Annie I. Antón, “Toward an XP Evaluation Framework,” North Carolina State University Department of Computer Science [TR-2003-18](#).

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#### CONFERENCE PRESENTATIONS

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- “NASA Software Standards Improvement – Software Safety Risk Metrics Initiative,” V. Basili, K. Dangle, L. Esker, L. Layman, M. Zelkowitz, NASA Software Assurance Symposium, Fairmont, WV, September 22-23, 2009.
  - [4] at ESEM 2008, Kaiserslautern, Germany (10/08)
  - [20] at MSR and [21] at CHASE 2008 workshops (ICSE), Leipzig, Germany (5/08)
  - [7] at ESEM 2007, Madrid, Spain (9/07)
  - [10] at SIGCSE 2007, Covington, KY (3/07)
  - [22] at IDoESE 2006, Rio de Janeiro, Brazil (9/06)
  - [12] at CSEET 2006, Honolulu, HI (4/06)
  - [13] at SIGCSE 2006, Houston, TX (3/06)
  - [14] at FIE 2005, Indianapolis, IN (10/05)
  - [15] at Agile 2005, Denver, CO (7/05)
  - [23] at REBSE workshop (ICSE), St. Louis, MO (5/05)
  - [3] at QUTE-SWAP workshop (FSE), Newport Beach CA (11/04)
  - [24] at OOPSLA, Vancouver, BC (10/04)
  - [16] at ADC, Salt Lake City, UT (6/04)
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#### INVITED PRESENTATIONS

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- STARS Alliance Workshop, “Pair Programming,” Tampa, FL (1/07)
  - Triangle XP Users Group, “Skeptics, Research, and Industry,” Raleigh, NC (10/04)
  - Cadence, “Agile Software Development,” Munich, Germany (8/04)
  - Tekelec, “XP Planning Practices,” Raleigh, NC (01/04)
  - Tekelec, “Experiences with Extreme Programming,” Raleigh, NC (01/04)
  - Sabre Airline Solutions, “Sabre-NCSU XP Assessment Study,” Dallas, TX (7/03)
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#### PROFESSIONAL ACTIVITIES

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##### **Committees**

- Empirical Software Engineering and Measurement (ESEM), 2009 – Financial Chair
- International Symposium on Software Reliability Engineering (ISSRE), 2006 – Student Volunteers Chair and Registrar

##### **Program Committee**

- Workshop on Cooperative and Human Aspects of Software Engineering (CHASE) – 2009
- Workshop on Defects in Large Software Systems (DEFECTS) - 2009

##### **Reviewer**

- ACM Technical Symposium on Computer Science Education (SIGCSE) – 2007-2008
- Computer Science Education (journal) - 2010
- Empirical Software Engineering (journal) – 2008-2010
- Frontiers in Education (FIE) – 2006-2007
- Information and Software Technology – 2005, 2010
- International Journal of Engineering Education special issue on Trends in Software Engineering Education – 2007
- OOPSLA Student Research Competition - 2005
- IEEE Transactions on Software Engineering – 2006, 2008, 2010

##### **Co-reviewer**

- Agile Development Conference (ADC/Agile) – 2005, 2006
- Asia Pacific Software Engineering Conference – 2006
- Empirical Software Engineering (journal) – 2005, 2006
- IEEE Software issue on agile software development – 2004
- IEEE Transactions on Software Engineering – 2005
- International Symposium on Empirical Software Engineering (ISESE) – 2004-2005

- International Symposium on Software Reliability Engineering (ISSRE) – 2005
- International Conference on Agile Processes in Software Engineering and Extreme Programming (XP) – 2007
- International Conference on Software Engineering (ICSE) – 2004-2005, 2007-2008
- International Conference on Software Process (ICSP) – 2007

#### **Memberships**

- Association for Computer Machinery (ACM), SIGSOFT, SIGCSE
  - Institute of Electrical and Electronics Engineers (IEEE)
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#### SKILLS

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- Extensive experience with Java programming language
  - Extensive Eclipse IDE plug-in development experience
  - Extensive experience with the SPSS statistical package
  - Moderate experience using SAS data analysis software
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#### SELECTED PROJECTS

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##### **AWARE (Automated Warning Application for Reliability Engineering)**

- <http://agile.csc.ncsu.edu/aware>
- Developer on the AWARE plug-in for Eclipse. AWARE provides developers with fault information gathered from static analysis tools during the coding process to increase programmer awareness of potentially faulty code earlier in the life cycle.
- Currently conducting studies on an intelligent method for presenting fault information to the user and providing maximum utility of this information.

##### **PairEval**

- <http://agile.csc.ncsu.edu/paireval>
  - Currently maintain the open source PairEval system for aiding instructors in managing pair programming assignments and groups. The system contains mechanisms for peer evaluations of pairs and groups, managing groups, surveys for students, and other features.
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#### AWARDS AND HONORS

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##### **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

##### **Awards**

- 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.

##### **Societies**

- Phi Beta Kappa, April 2002.
  - Upsilon Pi Epsilon (National Collegiate Computer Science Honor Society), April 2000
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#### REFERENCES

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Available upon request.