

Scott D. Fleming

Assistant Professor

*Department of Computer Science
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Research Interests

Broadly: Software Engineering and Human-Computer Interaction
Specifically: SE Tools, Empirical SE, Information Foraging Theory for SE, End-User Programming, Gender Issues in Computing, In-Situ Learning, and CS Education

Education

- 2009 **Ph.D. in Computer Science, Michigan State University.**
Department of Computer Science and Engineering East Lansing, Michigan
Thesis: Successful Strategies for Debugging Concurrent Software: An Empirical Investigation
Advisor: Dr. R. E. Kurt Stirewalt
- 2001 **M.S. in Computer Science, Western Michigan University.**
Department of Computer Science Kalamazoo, Michigan
- 1999 **B.A. in Fine Art, Western Michigan University.**
Department of Computer Science Kalamazoo, Michigan

Professional Experience

- 2011–present **Assistant Professor, University of Memphis.**
Department of Computer Science Memphis, Tennessee
- 2009–2011 **Research Associate (Post-Doc), Oregon State University.**
School of Electrical Engineering and Computer Science Corvallis, Oregon
- 2004–2009 **Graduate Assistant, Michigan State University.**
Department of Computer Science and Engineering East Lansing, Michigan
- 2001–2003 **Instructor, Western Michigan University.**
Department of Computer Science Kalamazoo, Michigan
- 1999–2001 **Graduate Assistant, Western Michigan University.**
Department of Computer Science Kalamazoo, Michigan

Honors & Awards

- 2017 **Nominee/Finalist, Distinguished Teaching Award, University of Memphis.**
One of the top 19 faculty at the University to receive the most nominations from students, alumni, and faculty colleagues.

- 2016 **ACM SIGSOFT Distinguished Paper Award, ACM FSE.**
ACM SIGSOFT Int'l Symposium on the Foundations of Software Engineering.
Paper: "Foraging and Navigations, Fundamentally: Developers' Predictions of Value and Cost."
- 2016 **Best Paper Award, IEEE VL/HCC.**
IEEE Symposium on Visual Languages and Human-Centric Computing.
Paper: "Yestercode: Improving Code-Change Support in Visual Dataflow Programming Environments."
- 2015 **Early Career Research Award**, College of Arts and Sciences, University of Memphis.
- 2015 **Nominee/Finalist, Distinguished Teaching Award**, University of Memphis.
One of the top 22 faculty at the University to receive the most nominations from students and alumni.
- 2014 **Nominee/Finalist, Distinguished Teaching Award**, University of Memphis.
One of the top 20 faculty at the University to receive the most nominations from students and alumni.
- 2011 **Best Paper Award, IEEE VL/HCC.**
IEEE Symposium on Visual Languages and Human-Centric Computing.
Paper: "An Exploration of Design Opportunities for 'Gardening' End-User Programmers' Ideas."
- 2008 **Honda Shing Endowed Fellowship in Computer Science.**
Department of Computer Science and Engineering, Michigan State University.
- 2001 **Honorable Mention, Outstanding Graduate Student Award.**
Department of Computer Science, Western Michigan University.
- 2001 **Honorable Mention, Departmental Teaching Effectiveness Award.**
Department of Computer Science, Western Michigan University.

External Support

- 2013–2016 **National Science Foundation**, SHF: Medium: Collaborative Research: Information Foraging Theory: From Scientific Principles to Engineering Practice.
 - **Award: \$894,644** (My Portion: \$311,662) 09/01/2013–08/31/2016
 - Collaborative Grant:
 - University of Memphis: Scott Fleming (PI, Lead Organization).
 - Oregon State University: Chris Scaffidi (PI), Margaret Burnett (Co-PI).
 - Objectives: (1) Expand Information Foraging Theory to describe how learning affects developers' navigation through code and related artifacts, (2) generate theory-grounded design patterns explaining how to design tools that aid developers' information foraging, (3) develop a design method enabling tool builders to apply these patterns, and (4) evaluate the validity and effectiveness of 1–3.
 - **REU Supplement: \$16,200** 03/26/2015
- 2015–2016 **National Instruments Corporation**, Improving Refactoring in Visual Dataflow Languages through User-Centered Design.
 - **Award: \$31,769** 09/01/2015–08/31/2016
 - PI: Scott Fleming
 - Objectives: (1) Provide an empirically based characterization of how developers currently refactor code in LabVIEW, including barriers they face, (2) leveraging this empirical evidence, propose principles for the design of effective refactoring tools, and (3) design and implement new tool designs that follow the principles.

- 2015 **ABB Corporation**, Improving the Efficiency of Code Navigation through New Interfaces and Tool Concepts.
 o **Award: \$7,668** 05/15/2015–08/31/2015
 o PI: Scott Fleming
 o Objectives: Design and implement an extension to Microsoft Visual Studio that provides an interactive code visualization to help developers navigate code more efficiently.
- 2014–2015 **National Instruments Corporation**, Research Support.
 o **Award: \$11,684** 09/01/2014–08/31/2015
 o PI: Scott Fleming
 o Objectives: Conduct empirical research to enhance understanding of the barriers that LabVIEW programmers encounter in navigating and editing visual dataflow code.
- 2013 **National Science Foundation**, WORKSHOP: VL/HCC 2013 Graduate Consortium.
 o **Award: \$24,243** 01/15/2013–12/31/2013
 o PI: Scott Fleming
 o Objectives: Support the Graduate Consortium of the 2013 IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC '13), including travel funding for faculty panelists and student participants.

Journal Publications

Underline denotes PhD-holding authors (e.g., faculty, post-docs); others are generally students.

- [J5] **IwC '15**: Jill Cao, Scott D. Fleming, Margaret Burnett, and Christopher Scaffidi. “Idea Garden: Situated Support for Problem Solving by End-User Programmers.” *Interacting with Computers*, 27(6):640–660, Nov. 2015. DOI: 10.1093/iwc/iwu022. [Impact Factor (2012): 1.16]
- [J4] **ACM TOSEM '13**: Scott D. Fleming, Christopher Scaffidi, David Piorkowski, Margaret Burnett, Rachel K. E. Bellamy, Joseph Lawrance, and Irwin Kwan. “An Information Foraging Theory Perspective on Tools for Debugging, Refactoring, and Reuse Tasks.” *ACM Transactions on Software Engineering and Methodology*, 22(2):14:1–14:41, Mar. 2013. DOI: 10.1145/2430545.2430551. [Impact Factor (2012): 1.55]
- [J3] **IEEE TSE '13**: Joseph Lawrance, Christopher Bogart, Margaret Burnett, Rachel Bellamy, Kyle Rector, and **Scott D. Fleming**. “How Programmers Debug, Revisited: An Information Foraging Theory Perspective.” *IEEE Transactions on Software Engineering*, 39(2):197–215, Feb. 2013. DOI: 10.1109/TSE.2010.111. [Impact Factor (2012): 2.59]
- [J2] **IwC '11**: Margaret M. Burnett, Laura Beckwith, Susan Wiedenbeck, **Scott D. Fleming**, Jill Cao, Thomas H. Park, Valentina Grigoreanu, and Kyle Rector. “Gender Pluralism in Problem-Solving Software.” *Interacting with Computers*, 23(5):450–460, 2011. DOI: 10.1016/j.intcom.2011.06.004. [Impact Factor (2012): 1.16]
- [J1] **IVS '09**: Shaohua Xie, Eileen Kraemer, R. E. K. Stirewalt, Laura K. Dillon, and **Scott D. Fleming**. “Design and Evaluation of Extensions to UML Sequence Diagrams for Modeling Multithreaded Interactions.” *Information Visualization*, 8(2):120–136, 2009. DOI: 10.1057/ivs.2009.6. [Impact Factor (2010): 1.34]

Refereed Conference Publications

Underline denotes PhD-holding authors (e.g., faculty, post-docs); others are generally students.

- [C19] **ACM CHI '17:** Austin Z. Henley, Scott D. Fleming, and Maria V. Luong. "Toward Principles for the Design of Navigation Affordances in Code Editors: An Empirical Investigation." In *Proc. ACM SIGCHI Conference on Human Factors in Computing Systems*, 2017, 13 pages. DOI: 10.1145/3025453.3025645. [25% acceptance rate]
- [C18] **ACM FSE '16:** David Piorkowski, Austin Z. Henley, Tahmid Nabi, Scott D. Fleming, Christopher Scaffidi, and Margaret Burnett. "Foraging and Navigations, Fundamentally: Developers' Predictions of Value and Cost." In *Proc. ACM SIGSOFT Int'l Symposium on the Foundations of Software Engineering*, 2016, 12 pages. DOI: 10.1145/2950290.2950302. [27% acceptance rate]
★ **ACM SIGSOFT Distinguished Paper Award** ★
- [C17] **IEEE ICSME '16:** Alka Singh, Austin Z. Henley, Scott D. Fleming, and Maria V. Luong "An Empirical Evaluation of Models of Programmer Navigation." In *Proc. IEEE International Conference on Software Maintenance and Evolution*, 2016, 11 pages. DOI: 10.1109/ICSME.2016.84. [29% acceptance rate]
- [C16] **IEEE VL/HCC '16:** Austin Z. Henley and Scott D. Fleming. "Yesterday: Improving Code-Change Support in Visual Dataflow Programming Environments." In *Proc. IEEE Symp. Visual Languages and Human-Centric Computing*, 2016, 9 pages. DOI: 10.1109/VLHCC.2016.7739672. [33% acceptance rate]
★ **Best Paper Award** ★
- [C15] **IEEE ICSME '15:** David Piorkowski, Scott D. Fleming, Christopher Scaffidi, Margaret Burnett, Irwin Kwan, Austin Z. Henley, Jamie Macbeth, Charles Hill, and Amber Horvath. "To Fix or to Learn? How Production Bias Affects Developers' Information Foraging during Debugging." In *Proc. IEEE International Conference on Software Maintenance and Evolution*, 2015, 10 pages. DOI: 10.1109/ICSM.2015.7332447. [22% acceptance rate]
- [C14] **ACM CHI '14:** Austin Z. Henley and Scott D. Fleming. "The Patchworks Code Editor: Toward Faster Navigation with Less Code Arranging and Fewer Navigation Mistakes." In *Proc. ACM SIGCHI Conference on Human Factors in Computing Systems*, 2014, 10 pages. DOI: 10.1145/2556288.2557073. [23% acceptance rate]
- [C13] **IEEE VL/HCC '13:** Danielle L. Jones and Scott D. Fleming. "What Use Is a Backseat Driver? A Qualitative Investigation of Pair Programming." In *Proc. IEEE Symp. Visual Languages and Human-Centric Computing*, 2013, 8 pages. DOI: 10.1109/VLHCC.2013.6645252. [30% acceptance rate]
- [C12] **IEEE VL/HCC '13:** Jill Cao, Irwin Kwan, Faezeh Bahmani, Margaret Burnett, Scott D. Fleming, Josh Jordahl, Amber Horvath, Sherry Yang. "End-User Programmers in Trouble: Can the Idea Garden help them to help themselves?" In *Proc. IEEE Symp. Visual Languages and Human-Centric Computing*, 2013, 8 pages. DOI: 10.1109/VLHCC.2013.6645260 [30% acceptance rate]

- [C11] **ACM CHI '13:** David Piorkowski, **Scott D. Fleming**, Irwin Kwan, Margaret Burnett, Chris Scaffidi, Rachel K.E. Bellamy, and Joshua Jordhal. "The Whats and Hows of Programmers' Foraging Diets." In *Proc. 2013 ACM Annual Conf. Human Factors in Computing Systems*, 2013, 10 pages. DOI: 10.1145/2466416.2466418. [20% acceptance rate]
- [C10] **IEEE VL/HCC '12:** Jill Cao, Irwin Kwan, Rachel White, **Scott D. Fleming**, Margaret Burnett, and Christopher Scaffidi. "From Barriers to Learning in the Idea Garden: An Empirical Study." In *Proc. IEEE Symp. Visual Languages and Human-Centric Computing*, 2012, 8 pages. DOI: 10.1109/VLHCC.2012.6344483. [28% acceptance rate]
- [C9] **ACM CHI '12:** David Piorkowski, **Scott D. Fleming**, Christopher Scaffidi, Christopher Bogart, Margaret Burnett, Bonnie E. John, Rachel K. E. Bellamy, and Calvin Swart. "Reactive Information Foraging: An Empirical Investigation of Theory-Based Recommender Systems for Programmers." In *Proc. 2012 ACM Annual Conf. Human Factors in Computing Systems*, 2012, 10 pages. DOI: 10.1145/2207676.2208608. [23% acceptance rate]
- [C8] **IEEE VL/HCC '11:** Jill Cao, **Scott D. Fleming**, and Margaret Burnett. "An Exploration of Design Opportunities for 'Gardening' End-User Programmers' Ideas." In *Proc. IEEE Symp. Visual Languages and Human-Centric Computing*, 2011, 8 pages. DOI: 10.1109/VLHCC.2011.6070375. [33% acceptance rate] **★ Best Paper Award ★**
- [C7] **IEEE VL/HCC '11:** David Piorkowski, **Scott D. Fleming**, Christopher Scaffidi, Liza John, Christopher Bogart, Bonnie E. John, Margaret Burnett, and Rachel Bellamy. "Modeling Programmer Navigation: A head-to-head empirical evaluation of predictive models." In *Proc. IEEE Symp. Visual Languages and Human-Centric Computing*, 2011, 8 pages. DOI: 10.1109/VLHCC.2011.6070387. [33% acceptance rate]
- [C6] **IEEE VL/HCC '10:** **Scott D. Fleming**, Eileen Kraemer, R. E. K. Stirewalt, and Laura K. Dillon. "Debugging Concurrent Software: The Importance of External Representations." In *Proc. IEEE Symp. Visual Languages and Human-Centric Computing*, 2010, 8 pages. DOI: 10.1109/VLHCC.2010.14. [30% acceptance rate]
- [C5] **IEEE VL/HCC '10:** Jill Cao, Kyle Rector, Thomas H. Park, **Scott D. Fleming**, Margaret Burnett, and Susan Wiedenbeck. "A Debugging Perspective on End-User Mashup Programming." In *Proc. IEEE Symp. Visual Languages and Human-Centric Computing*, 2010, 8 pages. DOI: 10.1109/VLHCC.2010.29. [30% acceptance rate]
- [C4] **ESEM '10:** Margaret Burnett, **Scott Fleming**, Shamsi Iqbal, Gina Venolia, Vidya Rajaram, Umer Farooq, Valentina Grigoreanu, and Mary Czerwinski. "Gender Differences and Programming Environments: Across Programming Populations." In *Proc. 4th Int'l Symp. Empirical Software Engineering and Measurement*, 2010, 10 pages. DOI: 10.1145/1852786.1852824. [29% acceptance rate]

- [C3] **ACM SoftVis '08:** Shaohua Xie, Eileen Kraemer, R. E. K. Stirewalt, Laura K. Dillon, and **Scott D. Fleming**. "Assessing the Benefits of Synchronization-Adorned Sequence Diagrams: Two Controlled Experiments." In *Proc. 2008 ACM Symp. Software Visualization*, 2008, 10 pages. DOI: 10.1145/1409720.1409723. [42% acceptance rate]
- [C2] **IEEE ICPC '08:** **Scott D. Fleming**, Eileen Kraemer, R. E. K. Stirewalt, Laura K. Dillon, and Shaohua Xie. "Refining Existing Theories of Program Comprehension During Maintenance for Concurrent Software." In *Proc. 16th IEEE Int'l Conf. Program Comprehension*, 2008, 10 pages. DOI: 10.1109/ICPC.2008.40. [35% acceptance rate]
- [C1] **ACM/IEEE ICSE-SEE '08:** **Scott D. Fleming**, Eileen T. Kraemer, R. E. K. Stirewalt, Shaohua Xie, and Laura K. Dillon. "A Study of Student Strategies for the Corrective Maintenance of Concurrent Software." In *Proc. 30th ACM/IEEE Int'l Conf. Software Engineering*, Software Engineering Education Track, 2008, 10 pages. DOI: 10.1145/1368088.1368195. [24% acceptance rate]

Refereed Short Papers & Workshop Publications

Underline denotes PhD-holding authors (e.g., faculty, post-docs); others are generally students.

- [S8] **IEEE VL/HCC '16:** Tahmid Nabi, Kyle M.D. Sweeney, Sam Lichlyter, David Piorkowski, Christopher Scaffidi, Margaret Burnett, and **Scott D. Fleming**. "Putting Information Foraging Theory to Work: Community-based Design Patterns for Programming Tools." In *Proc. IEEE Symposium on Visual Languages and Human-Centric Computing*, 2016, 5 pages. DOI: 10.1109/VLHCC.2016.7739675.
- [S7] **IEEE VL/HCC '14:** Austin Z. Henley, Alka Singh, **Scott D. Fleming**, and Maria V. Luong. "Helping Programmers Navigate Code Faster with Patchworks: A Simulation Study." In *Proc. IEEE Symp. Visual Languages and Human-Centric Computing*, 2014, 4 pages. DOI: 10.1109/VLHCC.2014.6883026.
- [S6] **FutureCSD '12:** Irwin Kwan, **Scott D. Fleming**, and David Piorkowski. "Information Foraging Theory for Collaborative Software Development." In *Proc. CSCW 2012 Workshop on The Future of Collaborative Software Development*, 2012, 3 pages.
- [S5] **MISE '08:** Laura K. Dillon, R. E. K. Stirewalt, Eileen Kraemer, Shaohua Xie, and **Scott D. Fleming**. "Using Formal Models to Objectively Judge Quality of Multi-Threaded Programs in Empirical Studies." In *Proc. 2nd Workshop on Modeling in Software Engineering*, 2008, 6 pages. DOI: 10.1145/1370731.1370740.
- [S4] **WEASELtech '07:** **Scott D. Fleming**, R. E. K. Stirewalt, and Eileen T. Kraemer. "Toward a Task Model of Concurrent Software Maintenance." In *Proc. 1st Workshop Empirical Assessment of Software Engineering Languages and Technologies*, 2007, 2 pages. DOI: 10.1145/1353673.1353679.
- [S3] **ACoM '07:** **Scott D. Fleming**, R. E. K. Stirewalt, and Laura K. Dillon. "Using Program Families for Maintenance Experiments." In *Proc. 1st Int'l Workshop Assessment of Contemporary Modularization Techniques*. 2007, 2 pages. DOI: 10.1109/ACOM.2007.12.

- [S2] **Alloy '06:** Laura K. Dillon, R. E. K. Stirewalt, Beata Sarna-Starosta, and **Scott D. Fleming**. "Developing an Alloy Framework Akin to OO Frameworks." In *Proc. 1st Alloy Workshop*, 2006, 10 pages.
- [S1] **DEAS '05:** **Scott D. Fleming**, Betty H. C. Cheng, R. E. Kurt Stirewalt, and Philip K. McKinley. "An Approach to Implementing Dynamic Adaptation in C++." In *Proc. 2005 Workshop Design and Evolution of Autonomic Application Software*. 2005, 7 pages. DOI: 10.1145/1083063.1083089.

Invited Presentations

- 2015 **Invited Speaker, National Instruments Corporation.**
"A Human-Oriented Approach to Programmer Navigation and Information Seeking," Austin, Texas.
- 2014 **Invited Speaker, ABB Corporation.**
"Speeding Up Code Navigation with Patchworks," Raleigh, North Carolina.
- 2010 **Panelist, PPIG.**
22nd Annual Psychology of Programming Interest Group, Madrid, Spain.
- 2008 **Invited Speaker, Wayne State University.**
"An Empirical Investigation of Strategies for Debugging Multithreaded Programs," Detroit, Michigan.

Students Advised

As Major Professor:

- Ph.D. Current Advisees: 4
Expected graduation of first Ph.D. student in 2017.
- M.S. Thesis Advisees Graduated: 2
- M.S. Project Advisees Graduated: 13
All non-thesis M.S. students at the U. of Memphis must complete a project under their faculty advisor.

As Committee Member:

- Ph.D. Students Graduated:
 - o University of Memphis: 7
 - o Oregon State University: 2
- M.S. Students Graduated:
 - o University of Memphis: 25
 - o Oregon State University: 2

Teaching Experience

University of Memphis:

COMP 4040 Programming Languages (F13)

COMP 4081 Software Engineering (F11, F12, F13, F14, F15, F16, S17)
COMP 4882 Software Capstone Project (S12, S13, S14, S15, S16, S17)
COMP 7012 Foundations of Software Engineering (S12, S13, S14, S15, S16)
COMP 7085 Program Comprehension (F12, F14, F15, F16)

Michigan State University (As Instructor):

CSE 335 Object-Oriented Software Design (S09)

Michigan State University (As Teaching Assistant):

CSE 240 Informatics (F03)

Western Michigan University (As Instructor):

CS 111 Computer Science I (F02, S03)
CS 112 Computer Science II (F01, S02, F02, S03)
CS 331 Data and File Structures (S02)

Western Michigan University (As Teaching Assistant):

CS 111 Computer Science I (F00, S01)
CS 112 Computer Science II (F99, S00, F00)

Professional Service

International Program Committees:

VL/HCC 2013, 2014, 2016, 2017.
IEEE Symp. on Visual Languages and Human-Centric Computing.

ICSE-SEIS 2015, 2016, 2017.
ACM/IEEE Int'l Conf. on Software Engineering, Software Engineering in Society.

ICSME-ERA 2016.
IEEE Int'l Conf. on Software Maintenance and Evolution, Early Research Achievements.

ICPC 2011, 2012.
IEEE Int'l Conf. on Program Comprehension.

HCSE 2014.
Int'l Conf. on Human-Centered Software Engineering.

SEKE 2011, 2012, 2013.
Int'l Conf. on Software Engineering and Knowledge Engineering.

EUD4Services 2011.
Int'l Workshop on End User Development for Services.

Conference Organizing Committees:

- VL/HCC IEEE Symp. on Visual Languages and Human-Centric Computing.
★ **Program Co-Chair: 2015**
- Graduate Consortium Chair: 2013
 - Publication Chair: 2014
 - Social Media Chair: 2016
 - Graduate Consortium Panelist: 2014, 2016
- ICSE ACM/IEEE Int'l Conf. on Software Engineering.
- Workshops Selection Committee: 2013, 2014
 - New Faculty Symposium Panelist: 2016
- ASE IEEE/ACM Int'l Conf. on Automated Software Engineering.
- Webmaster: 2007
- ICPC IEEE Int'l Conf. on Program Comprehension.
- Tool Demonstrations Chair: 2009
- EUSES Annual Meeting of the EUSES Consortium (End Users to Shape Effective Software).
- Assistant Organizer: 2009
- IS-EUD Int'l Symp. on End-User Development.
- Publicity Co-Chair: 2013

Grant Proposal Review Boards and Panels:

- NSF National Science Foundation.
- CISE/CCF: 2015

Journal Reviewer:

- TSE 2012, 2013, 2014, 2015.
IEEE Transactions on Software Engineering.
- TOSEM 2014.
ACM Transactions on Software Engineering and Methodology.
- TOCHI 2012.
ACM Transactions on Computer-Human Interaction.
- TiiS 2015.
ACM Transactions on Interactive Intelligent Systems.
- JSS 2015, 2016.
Journal of Systems and Software.
- EMSE 2012, 2013, 2014.
Empirical Software Engineering (Springer Journal).
- VLSS 2016.
Journal of Visual Languages and Sentient Systems.
- FORM 2015.
Formal Methods in System Design (Springer Journal).

Conference Reviewer:

- CHI 2012, 2014, 2015, 2016, 2017.
ACM SIGCHI Conf. on Human Factors in Computing Systems.
- CSCW 2014.
ACM Conf. on Computer Supported Collaborative Work and Social Computing.
- UIST 2014.
ACM Symp. on User Interface Software and Technology.
- IUI 2015.
ACM Conf. on Intelligent User Interfaces.
- DIS 2014.
ACM Conf. on Designing Interactive Systems.
- Diagrams 2012.
Int'l Conf. on the Theory and Application of Diagrams (Diagrams).

University Service

University of Memphis:

- o College of Arts and Sciences Council for Research and Graduate Studies: 2016–2017
- o Graduate Committee (CS Dept): 2011–2016
- o Self-Assessment and Goals Committee (CS Dept): 2013–2015
- o Faculty Awards Committee (CS Dept): 2014–2015
- o Faculty Search Committee (CS Dept): 2015–2016
- o Search Committee (Non-Tenure Track CS Faculty): 2014