Curriculum Vitæ

Mark Hills

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RESEARCH INTERESTS

I am interested broadly in the fields of programming languages and software engineering, especially where they intersect. Specifically, my research focuses on program analysis, programming language semantics, and program verification, with a goal of helping developers create more reliable software systems while being better able to understand the systems they are building. I'm also interested in using ideas from language workbenches and language semantics to turn these ideas into tools that can be used both by developers and by other researchers. As part of this, I am a continuing contributor to Rascal, a meta-programming language for program analysis, program transformation, and programming language implementation.

EDUCATION

- Ph.D. in Computer Science (advisor Grigore Roşu), University of Illinois Urbana-Champaign, completed December 2009.
- B.S. in Computer Science, Western Illinois University, 1995

PROFESSIONAL POSITIONS

Associate Professor Appalachian State University, Department of Computer Science (2022–present)

My research at Appalachian State University focuses on understanding complex software systems. This research includes a strong empirical component, looking first at how developers use specific features of programming languages, and second at how knowledge of these uses, which implicitly represent developer intent, can lead to more precise program analysis tools. I've also continued to work on the semantics of programming languages and on building meta-programming tools to support developing and analyzing languages. My teaching interests include courses on software engineering, mobile development, cloud computing, and programming languages.

Associate Professor East Carolina University, Department of Computer Science (Assistant Professor 2013–2019, Associate Professor 2019–2022)

My research at ECU focused on program analysis, language semantics, and empirical software engineering, and has continued at Appalachian State University (see above). I taught undergraduate and graduate courses in software engineering, mobile development, cloud computing, and programming languages.

Postdoctoral Researcher Centrum Wiskunde & Informatica (CWI), Software Analysis and Transformation (SWAT), 2009–2013

My research at CWI focused on understanding software systems, specifically those written in dynamic languages. This research used a combination of static analysis and empirical techniques to understand how specific parts of languages are used, and how this knowledge could then impact the creation of program analysis tools. I also worked on refactoring; on linking Rascal with formal language specifications created in Maude and in K; and on enhancing Rascal with new language features and tools, including a type checker.

Research Assistant Dept. of Computer Science, University of Illinois, 2004–2009

I worked with Professor Grigore Roşu on the rewriting logic semantics of programming languages. My research included defining new and existing languages using rewriting logic, developing improved notations for specifying language semantics, developing techniques to improve the modularity of language definitions, and developing tool support for language design. Using these techniques, I defined an analysis framework for C based on a formal semantics of the language. To show the capabilities of this framework, I also defined an analysis for checking the safe use of units of measurement.

Lecturer Dept. of Computer Science, University of Illinois, 2006 and 2008

Course instructor for CS421, Programming Languages and Compilers. Tasks included preparing and delivering lectures, developing homeworks and tests, working with students to develop appropriate course projects, grading homeworks, tests, and projects, and working with students to provide an effective learning environment. Students included a mix of undergraduate, on-campus graduate, and online graduate students.

Teaching Assistant Dept. of Computer Science, University of Illinois, 2004–2007

Served as a teaching assistant for CS422, Programming Language Design, delivered lecture on several occasions, provided support over the course newsgroup and in one-on-one meetings with students, developed the course project, graded homeworks and project submissions.

Research Assistant Dept. of Computer Science, University of Illinois, 2003–2004

Worked with Professor Laxmikant Kale on an orchestration language for parallel object-based systems; collaborated with other research areas and departments on a parallel version of a physical simulation framework.

Technology Consultant Inforte Corp., 1995–2002, Independent, 2003

Worked on all aspects of application requirements, architecture, design, development, and deployment; managed technology aspects of custom development projects; worked directly with software vendors to customize and improve products; trained internal staff on technology issues.

PUBLICATIONS

Refereed Conference and Workshop Papers

[1] M. Hills and J.B. Fenwick, Jr. Starting a Civic Engagement Capstone: An Experience Report. To appear in *Papers of the 38th Annual CCSC Southeastern Conference*, ACM, 2024.

[2] K. Adams and A. Vilkomir and M. Hills. A Comparison of Machine Learning Code Quality in Python Scripts and Jupyter Notebooks. In *Papers of the 37th Annual CCSC Southeastern Conference*, ACM, 2023. `https://dl.acm.org/doi/10.5555/3637068.3637077`

[3] L. Swearngan and M. Hills. Enabling Go Program Analysis in Rascal. In *Proceedings of the 23rd IEEE International Working Conference on Source Code Analysis and Manipulation (SCAM 2023)*, Engineering Track, pages 242–247. IEEE, 2023. `https://doi.org/10.1109/SCAM59687.2023.00033`

[4] M. Hills. Introducing DevOps Techniques in a Software Construction Class. In *Proceedings of the 32nd IEEE Conference on Software Engineering Education and Training (CSEE&T 2020)*, pages 1–5. IEEE, 2020. `https://doi.org/10.1109/CSEET49119.2020.9206183`

[5] D. Anderson and M. Hills. Supporting Analysis of SQL Queries in PHP AiR. In *Proceedings of the 17th IEEE International Working Conference on Source Code Analysis and Manipulation (SCAM 2017)*, Engineering Track, pages 153–158. IEEE, 2017. `https://doi.org/10.1109/SCAM.2017.23`

[6] D. Anderson and M. Hills. Query Construction Patterns in PHP. In *Proceedings of the 24th IEEE International Conference on Software Analysis, Evolution, and Reengineering (SANER 2017)*, ERA Track, pages 452–456. IEEE, 2017. http://dx.doi.org/10.1109/SANER.2017.7884652

[7] M. Hills. Navigating the WordPress Plugin Landscape. In *Proceedings of the 24th IEEE International Conference on Program Comprehension (ICPC 2016)*, pages 1–10. IEEE, 2016. http://dx.doi.org/10.1109/ICPC.2016.7503709 **(Acceptance Rate: 30%)**

[8] M. Hills. Variable Feature Usage Patterns in PHP. In *Proceedings of the 30th IEEE/ACM International Conference on Automated Software Engineering (ASE 2015)*, pages 563–573. IEEE, 2015. http://dx.doi.org/10.1109/ASE.2015.72 **(Acceptance Rate: 21%)**

[9] M. Hills. Supporting PHP Dynamic Analysis in PHP AiR. In *Proceedings of the 13th International Workshop on Dynamic Analysis (WODA 2015)*, pages 37–38. ACM, 2015. http://dx.doi.org/10.1145/2823363.2823373

[10] M. Hills. Evolution of Dynamic Feature Usage in PHP. In *Proceedings of the 22nd IEEE International Conference on Software Analysis, Evolution, and Reengineering (SANER 2015)*, ERA Track, pages 525–529. IEEE, 2015. http://dx.doi.org/10.1109/SANER.2015.7081870

[11] B. Basten and M. Hills and P. Klint and D. Landman and A. Shahi and M. Steindorfer and J.J. Vinju. M^3: A General Model for Source Code Analytics in Rascal. In *Proceedings of the 1st IEEE International Workshop on Software Analytics (SWAN 2015)*, pages 25–28. IEEE, 2015. http://dx.doi.org/10.1109/SWAN.2015.7070485

[12] M. Hills and P. Klint and J.J. Vinju. Static, Lightweight Includes Resolution for PHP. In *Proceedings of the 29th IEEE/ACM International Conference on Automated Software Engineering (ASE 2014)*, pages 503–514. ACM, 2014. http://dx.doi.org/10.1145/2642937.2643017 **(Acceptance Rate: 20%)**

[13] M. Hills. Streamlining Control-Flow Graph Construction with DCFlow. In *Proceedings of the 7th International Conference on Software Language Engineering (SLE 2014)*, volume 8706 of *LNCS*, pages 322–341. Springer, 2014. http://dx.doi.org/10.1007/978-3-319-11245-9_18 **(Acceptance Rate: 30%)**

[14] M. Hills and P. Klint. PHP AiR: Analyzing PHP Systems with Rascal. In *Proceedings of the 2014 Software Evolution Week—IEEE Conference on Software Maintenance, Reengineering and Reverse Engineering (CSMR-WCRE 2014)*, pages 454–457. IEEE, 2014. http://dx.doi.org/10.1109/CSMR-WCRE.2014.6747217

[15] M. Hills and P. Klint and J.J. Vinju. An Empirical Study of PHP Feature Usage: A Static Analysis Perspective. In *Proceedings of the 2013 International Symposium on Software Testing and Analysis (ISSTA 2013)*, pages 325–335. ACM, 2013. http://dx.doi.org/10.1145/2483760.2483786 **(Acceptance Rate: 26%)**

[16] M. Hills and P. Klint. Enabling PHP Software Engineering Research in Rascal. Appeared in workshop proceedings for the 4th International Workshop on Academic Software Development Tools and Techniques (WASDeTT 2013). http://www.cs.ecu.edu/hillsma/publications/hills-klint-2013-wasdett.pdf

[17] M. Hills and P. Klint and J.J. Vinju. Meta-Language Support for Type-Safe Access to External Resources. In *Proceedings of the 5th International Conference on Software Language Engineering (SLE 2012)*, volume 7745 of *LNCS*, pages 372–391. Springer, 2013. http://dx.doi.org/10.1007/978-3-642-36089-3_21

[18] M. Hills and P. Klint and J.J. Vinju. Scripting a Refactoring with Rascal and Eclipse. In *Proceedings of the 5th Workshop on Refactoring Tools (WRT 2012)*, pages 40–49. ACM, 2012. http://dx.doi.org/10.1145/2328876.2328882

[19] M. Hills and P. Klint and J.J. Vinju. RLSRunner: Linking Rascal with K for Program Analysis. In *Proceedings of the 4th International Conference on Software Language Engineering (SLE 2011)*, volume 6940 of *LNCS*, pages 344–353. Springer, 2011. http://dx.doi.org/10.1007/978-3-642-28830-2_19

[20] M. Hills and P. Klint and T.v.d. Storm and J.J. Vinju. A Case of Visitor versus Interpreter Pattern. In *Proceedings of the 49th International Conference on Objects, Models, Components, and Patterns (TOOLS 2011)*, volume 6705 of *LNCS*, pages 228–243. Springer, 2011. http://dx.doi.org/10.1007/978-3-642-21952-8_17 **(Acceptance Rate: 28%)**

[21] M. Hills and G. Roşu. A Rewriting Logic Semantics Approach to Modular Program Analysis. In *Proceedings of the 21st International Conference on Rewriting Techniques and Applications (RTA 2010)*, volume 6 of Leibniz International Proceedings in Informatics (LIPIcs), pages 151–160. Schloss Dagstuhl–Leibniz-Zentrum fuer Informatik, 2010. http://dx.doi.org/10.4230/LIPIcs.RTA.2010.151

[22] M. Hills and G. Roşu. Towards a Module System for K. In *Proceedings of the 19th International Workshop on Recent Trends in Algebraic Development Techniques (WADT 2008)*, volume 5486 of *LNCS*, pages 187–205. Springer, 2009. http://dx.doi.org/10.1007/978-3-642-03429-9_13

[23] M. Hills, F. Chen, and G. Roşu. A Rewriting Logic Approach to Static Checking of Units of Measurement in C. In *Proceedings of the Ninth International Workshop on Rule-Based Programming (RULE 2008)*, volume 290 of *ENTCS*, pages 51–67. Elsevier, 2012. http://dx.doi.org/10.1016/j.entcs.2012.11.011

[24] M. Hills. Memory Representations in Rewriting Logic Semantics Definitions. In *Proceedings of the Seventh International Workshop on Rewriting Logic and its Applications (WRLA 2008)*, volume 238 of *ENTCS*, pages 155–172. Elsevier, 2009. http://dx.doi.org/10.1016/j.entcs.2009.05.018

[25] M. Hills and G. Roşu. KOOL: An Application of Rewriting Logic to Language Prototyping and Analysis. In *Proceedings of the 18th International Conference on Term Rewriting and Applications (RTA 2007)*, volume 4533 of *LNCS*, pages 246–256. Springer, 2007. http://dx.doi.org/10.1007/978-3-540-73449-9_19

[26] M. Hills and G. Roşu. On Formal Analysis of OO Languages using Rewriting Logic: Designing for Performance. In *Proceedings of the 9th IFIP WG 6.1 International Conference on Formal Methods for Open Object-Based Distributed Systems (FMOODS 2007)*, volume 4468 of *LNCS*, pages 107–121. Springer, 2007. http://dx.doi.org/10.1007/978-3-540-72952-5_7

[27] M. Hills, T. F. Şerbănuţă, and G. Roşu. A Rewrite Framework for Language Definitions and for Generation of Efficient Interpreters. In *Proceedings of the 6th International Workshop on Rewriting Logic and its Applications (WRLA 2006)*, volume 176 of *ENTCS*, pages 215–231. Elsevier, 2007. http://dx.doi.org/10.1016/j.entcs.2007.06.017

[28] L. V. Kalé, M. Hills, and C. Huang. An Orchestration Language for Parallel Objects. In *Proceedings of Seventh Workshop on Languages, Compilers, and Run-time Support for Scalable Systems (LCR 2004)*, Houston, Texas, October 2004. http://dx.doi.org/10.1145/1066650.1066658

Journal Papers

[29] M. Hills and P. Klint and J.J. Vinju. Enabling PHP software engineering research in Rascal. In *Science of Computer Programming*, volume 134, pages 37–46. Elsevier, 2017. http://dx.doi.org/10.1016/j.scico.2016.05.003

[30] B. Basten and J. van den Bos and M. Hills and P. Klint and A. Lankamp and B. Lisser and A. van der Ploeg and T. van der Storm and J.J. Vinju. Modular Language Implementation in Rascal—experience report. In *Science of Computer Programming*, volume 114, pages 7–19. Elsevier, 2015. http://dx.doi.org/10.1016/j.scico.2015.11.003

Invited Conference and Workshop Publications

[31] M. Hills and P. Klint and J.J. Vinju. Program Analysis Scenarios in Rascal. In *Proceedings of the 9th International Workshop on Rewriting Logic and its Applications (WRLA 2012)*, volume 7571 of *LNCS*, pages 10–30. Springer, 2012. http://dx.doi.org/10.1007/978-3-642-34005-5_2

[32] J.v.d. Bos and M. Hills and P. Klint and T.v.d. Storm and J.J. Vinju. Rascal: From Algebraic Specification to Meta-Programming. In *Proceedings of the Second International Workshop on Algebraic Methods in Model-Based Software Engineering (AMMSE 2011)*, volume 56 of *EPTCS*, pages 15–32. 2011. http://dx.doi.org/10.4204/EPTCS.56.2

Books and Book Chapters

[33] Talcott, C., Ananieva, S., Bae, K., Combemale, B., Heinrich, R., Hills, M., Khakpour, N., Reussner, R., Rumpe, B., Scandurra, P., Vangheluwe, H., Durán, F., and Zschaler, S. Foundations. In Heinrich, R., Durán, F., Talcott, C., and Zschaler, S., editors, *Composing Model-Based Analysis Tools*, chapter 2, pages 9–37. 2021. Springer. https://doi.org/10.1007/978-3-030-81915-6_2

[34] Talcott, C., Ananieva, S., Bae, K., Combemale, B., Heinrich, R., Hills, M., Khakpour, N., Reussner, R., Rumpe, B., Scandurra, P., and Vangheluwe, H. Composition of Languages, Models, and Analyses. In Heinrich, R., Durán, F., Talcott, C., and Zschaler, S., editors, *Composing Model-Based Analysis Tools*, chapter 4, pages 45–70. 2021. Springer. https://doi.org/10.1007/978-3-030-81915-6_4

Other Conference and Workshop Publications

[35] J. Paterson and J. Adams and L. White and A. Csizmadia and D.C. Erdil and D. Foster and M. Hills and Z. Kazmi and K. Kuber and S. Nazir and M. Sakr and L. Stott Planning a Conceptual Framework Approach for Teaching Cloud Fundamentals (Abstract). In *Proceedings of the 26th ACM Conference on Innovation and Technology in Computer Science Education, Working Group Reports (ITiCSE 2021)*, pages 605–606. 2021. https://doi.org/10.1145/3456565.3461443

[36] J. Adams and B. Hainey and L. White and D. Foster and N. Hall and M. Hills and S. Hooshangi and K. Kuber and S. Nazir and M. Sakr and L. Stott and C. Taglienti Cloud Computing Curriculum: Developing Exemplar Modules for General Course Inclusion. In *Proceedings of the Working Group Reports on Innovation and Technology in Computer Science Education (ITiCSE-WGR 2020)*, pages 151–172. 2020. https://doi.org/10.1145/3437800.3439206

[37] M. Hills. Understanding Database Usage in PHP Systems: Current and Future Work. Appeared in the *The Southeast Regional Programming Languages Seminar (SERPL 2019).*

[38] M. Davis and M. Hills. Escaping the Clone Zone: Java Runtime-Managed Snapshots, Current and Future Work Appeared in the *The Southeast Regional Programming Languages Seminar (SERPL 2019).*

[39] M. Hills. Domain-Specific Languages for Program Analysis. Appeared in the *Third International Workshop on Open and Original Problems in Software Language Engineering (OOPSLE 2015)* Workshop Proceedings. http://www.cs.ecu.edu/hillsma/publications/hills-2015-oopsle.pdf

[40] M. Hills. Capturing Programmer Intent with Extensible Annotation Systems. Abstract Submission Only, Appeared in the *Second International Workshop on Open and Original Problems in Software Language Engineering (OOPSLE 2014)* Workshop Proceedings.

[41] M. Hills. Modular Language Specifications for Program Analysis. Abstract Submission Only, Appeared in the *Workshop on Scalable Language Specification (SLS 2013)* Workshop Proceedings. http://www.cs.ecu.edu/hillsma/publications/hills-2013-sls.pdf

[42] M. Hills. Streamlining Policy Creation in Policy Frameworks. Abstract Submission Only, Appeared in the *21st International Workshop on Algebraic Development Techniques (WADT 2012)* Pre-Proceedings. http://www.cs.ecu.edu/hillsma/publications/hills-2012-wadt.pdf

[43] M. Hills and P. Klint and J.J. Vinju. KRunner: Linking Rascal with K. Abstract Submission Only, Appeared in the *Second International Workshop on the K Framework and its Applications (K 2011)* Pre-Proceedings. http://www.cs.ecu.edu/hillsma/publications/hills-klint-vinju-2011-k.pdf

Magazine and Newsletter Publications

[44] M. Hills and P. Klint and T.v.d. Storm and J.J. Vinju. A One-Stop Shop for Software Evolution Tool Construction. In *ERCIM News 2012(88)*, 2012. http://ercim-news.ercim.eu/en88/special/a-one-stop-shop-for-software-evolution-tool-construction

Doctoral Dissertation

[45] M. Hills. A Modular Rewriting Approach to Language Design, Evolution and Analysis. Department of Computer Science, University of Illinois at Urbana-Champaign, December 2009. http://hdl.handle.net/2142/14465

Posters and Demonstrations

[46] G. Hotelling and C. Hendren and A. Witcombe and A. Fanatico and A. Adams and G. Marasco-Plummer and K. Bourne and M. Hills and M. Ogwu and M. Hambourger and R. Swarthout and S. Grooms and S. Tuberty and S. Dent. Convergence Research to Support Undergraduate Education and Phosphorus Sustainability in the High Country of North Carolina. Presented at the 2024 STEPS NSF Site Visit Meeting.

[47] M. Hills. Rascal: A One-Stop-Shop for Meta-Programming. Presented at the 2014 Software Evolution Week—IEEE Conference on Software Maintenance, Reengineering and Reverse Engineering (CSMR-WCRE 2014).

[48] M. Hills and G. Rosu. A Rewriting Approach to the Design and Evolution of Object-Oriented Languages. In the *Companion to the 22nd Annual ACM SIGPLAN Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA 2007)*, pages 827–828, 2007. http://doi.acm.org/10.1145/1297846.1297908

[49] G. R. Patrick Meredith, Mark Hills. An Executable Rewriting Logic Semantics of K-Scheme. In *Proceedings of the 2007 Workshop on Scheme and Functional Programming*. Laval University, 2007. http://www.cs.ecu.edu/hillsma/publications/meredith-hills-rosu-2007-scheme.pdf

[50] M. Hills and G. Roşu. A Rewriting Approach to the Design and Evolution of Object-Oriented Languages. Presented at the 21st European Conference on Object-Oriented Programming (ECOOP 2007) Poster Session, July 2007.

Doctoral Symposia

[51] M. Hills and G. Roşu. A Rewriting Approach to the Design and Evolution of Object-Oriented Languages. Technical Report Bericht-Nr. 2007-7, Fakultät IV - Elektrotechnik und Informatik, Technische Universität Berlin, 2007.

Technical Reports

[52] M. Hills, F. Chen, and G. Roşu. Pluggable Policies for C. Technical Report UIUCDCS-R-2008-2931, Department of Computer Science, University of Illinois at Urbana-Champaign, 2008. http://www.cs.ecu.edu/hillsma/publications/hills-chen-rosu-2008-tr.pdf

[53] P. Meredith, M. Hills, and G. Roşu. A K Definition of Scheme. Technical Report UIUCDCS-R-2007-2907, Department of Computer Science, University of Illinois at Urbana-Champaign, 2007. http://www.cs.ecu.edu/hillsma/publications/meredith-hills-rosu-2007-tr-b.pdf

[54] P. Meredith, M. Hills, and G. Roşu. A Formal Rewriting Logic Semantic Definition of Scheme. Technical Report UIUCDCS-R-2007-2877, Department of Computer Science, University of Illinois at Urbana-Champaign, 2007. http://hdl.handle.net/2142/11368

[55] M. Hills and G. Roşu. A Rewriting Based Approach to OO Language Prototyping and Design. Technical Report UIUCDCS-R-2006-2786, University of Illinois at Urbana-Champaign, 2006. http://www.cs.ecu.edu/hillsma/publications/hills-rosu-2006-tr-b.pdf

[56] M. Hills and G. Roşu. KOOL: A K-based Object-Oriented Language. Technical Report UIUCDCS-R-2006-2779, University of Illinois at Urbana-Champaign, 2006. http://www.cs.ecu.edu/hillsma/publications/hills-rosu-2006a-tr.pdf

[57] F. Chen, M. Hills, and G. Roşu. A Rewrite Logic Approach to Semantic Definition, Design and Analysis of Object-Oriented Languages. Technical Report UIUCDCS-R-2006-2702, Department of Computer Science, University of Illinois at Urbana-Champaign, 2006. http://www.cs.ecu.edu/hillsma/publications/chen-hills-rosu-2006-tr.pdf

[58] M. d'Amorim, M. Hills, F. Chen, and G. Roşu. Automatic and Precise Dimensional Analysis. Technical Report UIUCDCS-R-2005-2668, Department of Computer Science, University of Illinois at Urbana-Champaign, 2005. http://www.cs.ecu.edu/hillsma/publications/damorim-hills-chen-rosu-2005-tr.pdf

[59] M. Hills, T. B. Aktemur, and G. Roşu. An Executable Semantic Definition of the Beta Language using Rewriting Logic. Technical Report UIUCDCS-R-2005-2650, Department of Computer Science, University of Illinois at Urbana-Champaign, 2005. http://www.cs.ecu.edu/hillsma/publications/hills-aktemur-rosu-2005-tr.pdf

FUNDED GRANTS

- "Interdisciplinary Language Integration Opportunity (interLINGO): An online application for shared language development in convergence research teams". Internal grant funded by the Research Institute for Environment, Energy, and Economics (RIEEE) at Appalachian State University. Role: PI. Period: September 1, 2024 to January 15, 2025. Amount funded: $\$2,620$.
- "A Formal Approach to Safer, More Understandable Programs". Internal grant funded by the College of Arts and Sciences at Appalachian State University. Role: PI. Period: Summer 2024. Amount funded: $\$5,000$.
- "Tech Local: Engaging Local Community Partners with Technology Needs in a CS Capstone Course". Internal grant funded by the Center for Excellence in Teaching and Learning for Student Success (CETLSS) at Appalachian State University. Role: PI. Period: October 12, 2023 to June 30, 2024. Amount funded: $\$2,500$.
- "Language Integration Opportunity (LINGO): An online application for shared language development in convergence research teams". Internal grant funded by the Research Institute for Environment, Energy, and Economics (RIEEE) at Appalachian State University. Role: PI. Period: July 1, 2023 to June 30, 2024. Amount funded: $\$10,236$.

- "REU Site: Software and Data Analytics". Funded by National Science Foundation. Role: co-PI. Period: March 1, 2021 to February 29, 2024. Amount funded: $381,268.
- "IUSE/PFE:RED: From Programmers to Professional Software Engineers". Funded by National Science Foundation. Role: Senior Personnel. Period: July 1, 2017 to June 30, 2022. Amount funded: $2,000,000.
- Travel Award, 26th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE 2018). Amount funded: $1,000.
- "Recreational Boating Data Acquisition through Crowdsourcing: A Complementary Prototype to the National Recreational Boating Safety Survey". Funded by National Safe Boating Council and United States Coast Guard. Role: Co-Investigator. Period: October 1, 2017 to September 30, 2018. Amount funded: $64,000.
- "Evaluating Alternatives to Traditional Probability Based Survey Techniques for Unregistered Boater Data Capture". Funded by American Canoe Association and United States Coast Guard. Role: Co-Investigator. Period: October 1, 2017 to September 30, 2018. Amount funded: $79,250.
- "Developing a 21st Century Intelligence Assistance Platform for Education and Health". Internal interdisciplinary grant funded by East Carolina University. Role: Co-Investigator. Period: July 1, 2017 to June 30, 2018. Amount funded: $13,338.
- "REU Site: Software Testing and Analytics". Funded by National Science Foundation. Role: Faculty Mentor. Period: April 1, 2016 to March 31, 2019. Amount funded: $359,838.
- "REU Site: Software Testing–Foundations, Tools and Applications". Funded by National Science Foundation. Role: Faculty Mentor. Period: April 1, 2013 to March 31, 2016. Amount funded: $358,676.
- "Research RoadMap". Funded by North Carolina Library Services and Technology Act (LSTA). Role: co-PI. Period: July 1, 2014 to June 30, 2015. Amount funded: $18,038.

PRESENTATIONS

- "Starting a Civic Engagement Capstone: An Experience Report", 38th Annual CCSC:Southeastern Conference (CCSC-SE 2024), November 2024.
- "Program Analysis and Verification with Rewriting Logic and Rascal", International Lecture Series, Kristu Jayanti College, February 2024.
- "A Comparison of Machine Learning Code Quality in Python Scripts and Jupyter Notebooks", 37th Annual CCSC:Southeastern Conference (CCSC-SE 2023), November 2023.
- "Enabling Go Program Analysis in Rascal", 23rd IEEE International Working Conference on Source Code Analysis and Manipulation (SCAM 2023), Engineering Track, October 2023.
- "Supporting Analysis of SQL Queries in PHP AiR", PEM Colloquium, Centrum Wiskunde & Informatica (CWI), June 2023.
- "Introducing DevOps Techniques in a Software Construction Class", 32nd IEEE Conference on Software Engineering Education and Training (CSEE&T 2020), November 2020.
- "Continuous Integration and Delivery in Student Projects", Google Faculty Institute 2020, September 2020.
- "Understanding Database Usage in PHP Systems: Current and Future Work", The Southeast Regional Programming Languages Seminar (SERPL 2019), May 2019.

- "Supporting Analysis of SQL Queries in PHP AiR", 17th IEEE International Working Conference on Source Code Analysis and Manipulation (SCAM 2017), Engineering Track, September 2017.
- "Meta-Programming for Program Analysis & Comprehension", ABB Corporate Research, April 2017.
- "Query Construction Patterns in PHP", 24th IEEE International Conference on Software Analysis, Evolution, and Reengineering (SANER 2017), ERA Track, February 2017.
- "Navigating the WordPress Plugin Landscape", 24th IEEE International Conference on Program Comprehension (ICPC 2016), May 2016.
- "Variable Feature Usage Patterns in PHP", 30th IEEE/ACM International Conference on Automated Software Engineering (ASE 2015), November 2015.
- "Supporting PHP Dynamic Analysis in PHP AiR", 13th International Workshop on Dynamic Analysis (WODA 2015), October 2015.
- "Program Analysis and Transformation with Rascal" (tutorial given jointly with Paul Klint and Jurgen J. Vinju), 36th Annual ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI 2015), June 2015.
- "Evolution of Dynamic Feature Usage in PHP", 22nd IEEE International Conference on Software Analysis, Evolution, and Reengineering (SANER 2015), ERA Track, March 2015.
- "Domain-Specific Languages for Program Analysis", Third International Workshop on Open and Original Problems in Software Language Engineering (OOPSLE 2015), March 2015.
- "Static, Lightweight Includes Resolution for PHP", 29th IEEE/ACM International Conference on Automated Software Engineering (ASE 2014), September 2014.
- "Streamlining Control-Flow Graph Construction with DCFlow", 7th International Conference on Software Language Engineering (SLE 2014), September 2014.
- "PHP AiR: Analyzing PHP Systems with Rascal", 2014 Software Evolution Week—IEEE Conference on Software Maintenance, Reengineering and Reverse Engineering (CSMR-WCRE 2014), February 2014.
- "Capturing Programmer Intent with Extensible Annotation Systems", Second International Workshop on Open and Original Problems in Software Language Engineering (OOPSLE 2014), February 2014.
- "An Empirical Study of PHP Feature Usage: A Static Analysis Perspective", 22nd International Symposium on Software Testing and Analysis (ISSTA 2013), July 2013.
- "Enabling PHP Software Engineering Research in Rascal", 4th International Workshop on Academic Software Development Tools and Techniques (WASDeTT-4), July 2013.
- "Modular Language Specifications for Program Analysis", Workshop on Scalable Language Specification (SLS 2013), June 2013.
- "Rascal: A One-Stop-Shop for Program Analysis and Transformation", Software Engineering & Technology Seminar, Eindhoven University of Technology, November 2012.
- "Meta-Language Support for Type-Safe Access to External Resources", 5th International Conference on Software Language Engineering (SLE 2012), September 2012.
- "Streamlining Policy Creation in Policy Frameworks", 21st International Workshop on Algebraic Development Techniques (WADT 2012), June 2012.
- "Scripting a Refactoring with Rascal and Eclipse", 5th Workshop on Refactoring Tools (WRT 2012), June 2012.

- "Program Analysis Scenarios in Rascal", 9th International Workshop in Rewriting Logic and its Applications (WRLA 2012), March 2012.
- "KRunner: Linking Rascal with K", 2nd International Workshop on the K Framework and its Applications (K 2011), August 2011.
- "RLSRunner: Linking Rascal with K for Program Analysis", 4th International Conference on Software Language Engineering (SLE 2011), July 2011.
- "Rascal: From Algebraic Specification to Meta-Programming", 2nd Workshop on Algebraic Methods in Model-Based Software Engineering (AMMSE 2011), June 2011.
- "Building an IDE with Rascal", INRIA Devexp Workshop, May 2011.
- "A Rewriting Logic Semantics Approach to Modular Program Analysis", 21st International Conference on Rewriting Techniques and Applications (RTA 2010), July 2010.
- "A Rewriting Logic Approach to Static Checking of Units of Measurement in C", 9th International Workshop on Rule-Based Programming (RULE 2008), July 2008.
- "Towards a Module System for K", 19th International Workshop on Algebraic Development Techniques (WADT 2008), June 2008.
- "Memory Representations in Rewriting Logic Semantics Definitions", 7th International Workshop on Rewriting Logic and its Applications (WRLA 2008), March 2008 (Presentation created by Mark Hills, presented by Grigore Roşu in his absence)
- "A Rewriting Approach to the Design and Evolution of Object-Oriented Languages", 17th ECOOP Doctoral Symposium, July 2007.
- "KOOL: An Application of Rewriting Logic to Language Prototyping and Analysis", Rewriting Techniques and Applications (RTA 2007), June 2007.
- "On Formal Analysis of OO Languages using Rewriting Logic: Designing for Performance", 9th IFIP International Conference on Formal Methods for Open Object-Based Distributed Systems (FMOODS 07), June 2007.
- "Rewriting Logic Semantics", Midwest Society for Programming Languages and Systems (MSPLS), April 2006.

PROFESSIONAL SERVICE

- Publicity Chair, CCSC:SE Regional Board, 2026
- PC Member, Artifact Evaluation Committee, SLE 2026
- PC Member, Tool Demo Track, ICPC 2026
- PC Member, SLE 2025
- PC Member, Artifact Evaluation Committee, SLE 2025
- PC Co-Chair, Tool Demo Track, ICPC 2025
- Publicity Chair, CCSC:SE Regional Board, 2025
- PC Member, Artifact Evaluation Track, ICSME/SCAM/VISSOFT 2024
- PC Member, Artifact Evaluation Track, ICSME/SCAM/VISSOFT 2023
- PC Co-Chair, Doctoral Symposium, ICSME 2022

- PC Member, Artifact Evaluation Track, ICSME/SCAM/VISSOFT 2022
- PC Member, RENE Track, SCAM 2022
- PC Member, WRLA 2022
- Steering Committee Member, SCAM, 2018–2021
- PC Member, Artifact Evaluation Track, ICSME/SCAM/VISSOFT 2021
- PC Member, RENE Track, SCAM 2021
- Working Group Member, WG 5: Planning a Conceptual Framework Approach for Teaching Cloud Fundamentals, ITiCSE 2021
- PC Member, ACMSE 2021
- PC Member, RENE Track, SCAM 2020
- Working Group Member, WG 7: Cloud Computing Curriculum: Developing Exemplar Modules for General Course Inclusion, ITiCSE 2020
- PC Member, Research Track, SCAM 2019
- PC Co-Chair, Research Track, SCAM 2018
- Student Volunteer Co-Chair, ASE 2017
- Member, Doctoral Symposium PC and Panel, ASE 2017
- PC Member, AST 2017
- PC Member, CSMR-WCRE 2014 Tool Demonstration Track
- PC Member, CALCO-Tools 2013
- PC Member, FMOODS & FORTE 2012
- PC Chair, K 2011
- Student member of UIUC Department of Computer Science Admissions committee for 2009 admissions
- Organizational Co-chair, AMAST 2008
- PC Chair, 2008 ECOOP Doctoral Symposium and PhD Students Workshop
- Member of UIUC Department of Computer Science GradStudy committee (2005–2007)
- Organized the local programming languages seminar and reading group (2004–2007)
- Organized the April 2006 meeting of the Midwest Society for Programming Languages and Systems at UIUC (April 2006)
- Reviewed submissions for the following workshops and conferences:
  - 40th Annual CCSC Southeastern Regional Conference (CCSC:SE 2026)
  - 38th Annual CCSC Southeastern Regional Conference (CCSC:SE 2024)
  - 23rd Asia-Pacific Software Engineering Conference (ASPEC 2016)
  - 30th IEEE/ACM International Conference on Automated Software Engineering (ASE 2015)
  - Tools Track, 18th European Conference on Software Maintenance and Reengineering and 21st Working Conference on Reverse Engineering (CSMR/WCRE 2014 Tools Track)
  - Tools Track, 5th Conference on Algebra and Coalgebra in Computer Science (CALCO-Tools 2013)

  - 15th International Symposium on Symbolic and Numeric Algorithms for Scientific Computing (SYNASC 2013)
  - 22nd International Conference on Compiler Construction (CC 2013)
  - 28th IEEE International Conference on Software Maintenance (ICSM 2012)
  - IFIP International Conference on Formal Techniques for Distributed Systems, Joint International Conference: 14th Formal Methods for Open Object-Based Distributed Systems and 32nd Formal Techniques for Networked and Distributed Systems (FMOODS & FORTE 2012)
  - 2nd International Workshop on the K Framework and its Applications (K 2011)
  - 8th International Conference on Rewriting Logic and its Applications (WRLA 2010)
  - 11th International ACM SIGPLAN Symposium on Principles and Practice of Declarative Programming (PPDP 2009)
  - Tools Track, 3rd Conference on Algebra and Coalgebra in Computer Science (CALCO-Tools 2009)
  - 10th International Conference on Distributed Computing and Networking (ICDCN 2009)
  - 12th International Conference on Algebraic Methodology and Software Technology (AMAST 2008)
  - 2008 ECOOP Doctoral Symposium and PhD Student Workshop
  - 8th Workshop on Runtime Verification (RV 2008)
  - 7th International Workshop on Rewriting Logic and its Applications (WRLA 2008)
  - 2nd Conference on Algebra and Coalgebra in Computer Science (CALCO 2007)
  - 9th IFIP International Conference on Formal Methods for Open Object-Based Distributed Systems (FMOODS 2007)
  - Structural Operational Semantics 2007 (SOS 2007)
  - International Symposium on Logic-based Program Synthesis and Transformation (LOPSTR 2006)
  - 6th International Workshop on Rewriting Logic and its Applications (WRLA 2006)
  - 12th International Conference on Logic for Programming, Artificial Intelligence and Reasoning (LPAR 2005)
  - ACM SIGPLAN 2005 Conference on Programming Language Design and Implementation (PLDI 2005)

- Reviewed submissions for the following journals:
  - ACM Transactions on Software Engineering and Methodology
  - Computer Languages, Systems & Structures
  - IEEE Software
  - IET Software
  - Journal of Logical and Algebraic Methods in Programming
  - Journal of Software: Evolution and Process
  - Journal of Systems and Software
  - Journal of Theoretical Computer Science
  - Science of Computer Programming
  - Software and Systems Modeling
  - Software: Practice and Experience
- Member of *ACM* (special interest groups: SIGPLAN, SIGSOFT, SIGCSE, SIGLOG), *IEEE* Computer Society, and EAPLS

AWARDS AND HONORARIES

- Named to first Google Cloud Faculty Expert cohort, Spring 2020.
- ECU College of Engineering and Technology Teaching Innovation Fellow, Spring 2019.
- Recipient, BB&T Active Learning and Leadership Development Incentive Grant Program, Spring 2019.
- Recipient, Excellent Teaching Assistant Award, Department of Computer Science, UIUC, 2005 (for Fall 2004).
- Computer Science Department Fellow, Department of Computer Science, UIUC, 2003.

TEACHING EXPERIENCE

- Appalachian State University, Undergraduate Courses
  - Capstone Project (Spring 2023, Spring 2024, Fall 2024, Spring 2025, Fall 2025, Spring 2026)
  - Cloud Computing (Fall 2022, Spring 2025, Summer 2026)
  - Computer Science I (Fall 2022)
  - Computer Science II (Spring 2023)
  - Mobile Device Programming (Fall 2024)
  - Program Analysis (Summer 2023, Summer 2025)
  - Software Engineering (Fall 2023, Spring 2024, Fall 2024)
  - Software Modeling (Summer 2024)
  - Systems I (Fall 2025, Spring 2026)
  - Systems II (Fall 2026)
- Appalachian State University, Graduate Courses
  - Advanced Software Engineering (Spring 2025)
  - Cloud Computing (Fall 2022)
  - Mobile Device Programming (Fall 2023, Fall 2024)
- East Carolina University, Undergraduate Courses
  - Cloud Computing (Spring 2021, Spring 2022)
  - Ethical and Professional Issues in Computer Science (Spring 2018)
  - Mobile Computing (Fall 2017, Summer 2019, Summer 2020, Summer 2021, Summer 2022)
  - Organization of Programming Languages (Fall 2013)
  - Software Engineering I (Fall 2015, Fall 2016, Fall 2018, Fall 2019, Spring 2020, Fall 2020, Fall 2021)
  - Software Engineering II (Spring 2016, Spring 2019, Spring 2020)
- East Carolina University, Graduate Courses
  - Cloud Computing (Spring 2021, Spring 2022)
  - Cyber-Physical Systems (Fall 2021)
  - Dependable Systems and Software Reliability (Spring 2014)
  - Developing e-Commerce Systems (Fall 2014)
  - Mobile Computing (Summer 2019, Summer 2020, Summer 2021, Summer 2022)
  - Software Construction (Spring 2015, Spring 2017, Spring 2018, Spring 2019, Spring 2022)

  - Software Engineering Foundations (Fall 2017, Fall 2018)
  - Software Systems Modeling and Analysis (Fall 2013, Fall 2014, Fall 2016, Fall 2019, Spring 2021)
  - Topics in Language Design (Spring 2015)
- University of Illinois at Urbana-Champaign, Undergraduate Courses
  - Programming Languages and Compilers (Summer 2006, Summer 2008)

DEPARTMENTAL/UNIVERSITY SERVICE

- Appalachian State University
  - Undergraduate Program Director (2026-current)
  - Departmental Honors Program Director (2023-current)
  - Member, Departmental Appointment, Promotion, and Tenure (APT) Committee (2025-current)
  - Member, Departmental Curriculum Committee (2022-2023,2026-current)
  - Member, Departmental Policy Committee (2025-current)
  - Member, Departmental Faculty Search Committee (2023-2024)
  - Co-Chair, Departmental Faculty Search Committee (2023)
  - Co-Director, Departmental Honors Program (2022-2023)
- East Carolina University
  - Graduate Program Director, Department of Computer Science (2020-2022)
  - Chair, Departmental Faculty Search Committee (2019)
  - Chair, Departmental Instructor Search Committee (2021)
  - Member, Departmental Assessment Committee (2013-2016)
  - Member, Departmental Awards Committee (2014-2020)
  - Member, Departmental Curriculum Committee (2013-2016)
  - Member, Departmental Faculty Search Committee (2016, 2019)
  - Member, Departmental Graduate Curriculum Committee (2019-2022)
  - Member, Departmental Personnel Committee (2019-2022)
  - Member, College-Level Review Committee for Computer Science Chair (2019-2020)
  - Member, University Patent Committee (2015-2019)
  - Member, University QEP (Writing) Committee (2013-2019)
  - Departmental Library Liaison (2013-2022)
  - Departmental Writing Liaison (2019-2022)