

Brittany I. Johnson-Matthews

Assistant Professor

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education

August 2017 **Doctor of Philosophy** in Computer Science North Carolina State University
A Tool (Mis)communication Theory and Adaptive Approach for Supporting Developer Tool Use
This thesis explored how we can improve program analysis tools to better support developers when building and maintaining software.

May 2011 **Bachelor of Arts** in Computer Science College of Charleston

publications

Conference Papers [Peer-reviewed]

Brittany Johnson, Yuriy Brun, & Alexandra Meliou. **Causal Testing: Understanding Defects' Root Causes.** *International Conference on Software Engineering 2020.*

Brittany Johnson, Rahul Pandita, Justin Smith, Denae Ford, Sarah Elder, Emerson Murphy-Hill, & Sarah Heckman. **A Cross-Tool Communication Study on Program Analysis Tool Notifications.** *International Symposium on the Foundations of Software Engineering 2016.*

Titus Barik, Yoonki Song, Brittany Johnson, & Emerson Murphy-Hill. **From Quick Fixes to Slow Fixes: Reimagining Static Analysis Resolutions to Enable Design Space Exploration.** *International Conference on Software Maintenance and Evolution 2016.*

Justin Smith, Brittany Johnson, Emerson Murphy-Hill, Bill Chu, & Heather Lipford. **Questions Developers Ask While Diagnosing Potential Security Vulnerabilities with Static Analysis.** *International Symposium on the Foundations of Software Engineering 2015.*

Brittany Johnson, Yoonki Song, Emerson Murphy-Hill, & Robert Bowdidge. **Why Don't Software Developers Use Static Analysis Tools to Find Bugs?** *International Conference on Software Engineering 2013.*

Workshop Papers [Peer-reviewed]

Brittany Johnson and Justin Smith. **Towards Ethical Data-Driven Software: Filling the Gaps in Ethics Research & Practice.** *SEthics 2021, co-located with ICSE 2021 (to appear).*

Short Papers [Peer-reviewed]

Rico Angell, Brittany Johnson, Yuriy Brun, & Alexandra Meliou. **Themis: Automatically testing software for discrimination.** *International Symposium on the Foundations of Software Engineering 2018.* Demonstrations Track.

Devarshi Singh, Varun Ramachandra Sekar, Kathryn T. Stolee, & Brittany Johnson. **Evaluating how static analysis tools can reduce code review effort.** *IEEE Symposium on Visual Languages and Human Centric Computing 2017.*

Brittany Johnson. **Adapting Program Analysis Tool Notifications to the Individual Developer.** *IEEE Symposium on Visual Language and Human Centric Computing 2015.* Graduate Consortium.

Brittany Johnson, Rahul Pandita, Emerson Murphy-Hill, & Sarah Heckman. **Bespoke Tools: Adapted to the Concepts Developers Know.** *International Symposium on the Foundations of Software Engineering 2015*. New Ideas and Emerging Results (NIER).

Titus Barik, Brittany Johnson, & Emerson Murphy-Hill. **I Heart Hacker News: Expanding Qualitative Research Findings by Analyzing Social News Website.** *International Symposium on the Foundations of Software Engineering 2015*. New Ideas and Emerging Results (NIER).

Titus Barik, Jim Witschey, Brittany Johnson, & Emerson Murphy-Hill. **Compiler Error Messages Revisited: An interaction-first approach for helping developers more effectively comprehend and resolve compiler error messages.** *International Symposium on the Foundations of Software Engineering 2014*. New Ideas and Emerging Results (NIER).

Brooke Jordan, Brittany Johnson, Jim Witschey, & Emerson Murphy-Hill. **Designing Intervention to Persuade Software Developers to Adopt Security Tools.** *CCS Workshop on Security Information Workers 2014*.

Brittany Johnson. **Enhancing Tools' Intelligence for Improved Program Analysis Tool Usability.** *IEEE Symposium on Visual Languages and Human Centric Computing 2014*. Doctoral Symposium.

Journal Papers [Peer-reviewed]

Brittany Johnson, Thomas Zimmermann, & Christian Bird. **The Effect of Work Environments on Productivity and Satisfaction of Software Engineers.** *IEEE Transactions on Software Engineering 2019*.

Justin Smith, Brittany Johnson, Emerson Murphy-Hill, Bill Chu, & Heather Ritcher. **How Developers Diagnose Potential Security Vulnerabilities with a Static Analysis Tools.** *IEEE Transactions on Software Engineering 2018*.

Gustavo Soares, Rohit Gheyi, Emerson Murphy-Hill, & Brittany Johnson. **Comparing approaches to analyze refactoring activity on software repositories.** *Journal of Systems and Software 2013*.

Technical Contributions

Fairkit-learn: A toolkit for machine learning model evaluation and comparison.

Holmes: A proof-of-concept Causal Testing prototype

Themis: A prototype tool for software fairness testing

experience

Research

2020–Present **George Mason University**

Fairfax, Virginia

Assistant Professor

- Researching sociotechnical problems pertaining to developer productivity, software development, and software use.
- Implementing and evaluating software tools and techniques.
- Teaching software engineering courses
- Mentoring and advising students (graduate and undergraduate)

- 2017–2020 **University of Massachusetts Amherst** Amherst, Massachusetts
Postdoctoral Research Associate
Advisors: Drs. Yuriy Brun and Alexandra Meliou
- Researching fairness and debugging in software engineering
 - Implementing and evaluating a testing tool to help developers determine the cause of test failures
 - Implementing and evaluating tools that support software and machine learning model fairness.
 - Mentoring students (graduate and undergraduate) working on software fairness
- 2011–2017 **NC State University** Raleigh, North Carolina
National Science Foundation Graduate Research Fellow
Graduate Research Assistant
Advisors: Drs. Emerson Murphy-Hill and Sarah Heckman
- Conducted empirical studies on program analysis tool use
 - Implemented and evaluated models and tools for improving tool usability
 - Mentored students (graduate and undergraduate) on various research projects
- 2015 **Microsoft Research** Redmond, Seattle
Research Intern
Supervisor: Dr. Thomas Zimmermann
- Explored the relationship between work environments, satisfaction, and productivity
 - Presented incremental findings to other researchers and developers

Teaching

- Fall 2020 **George Mason University** Fairfax, Virginia
Software Testing and Maintenance
 - Co-designed and taught lessons on theoretical and practical software testing techniques and concepts
- Fall 2018 **University of Massachusetts Amherst** Amherst, Massachusetts
Lecturer
Great Women in CS: Past, Present, and Future
 - Designed and led course that exposes the great contributions in the field of Computer Science women from diverse backgrounds have made.
 - Assigned each student a great woman in CS to research and present as a form of active learning
- 2016 **NC State University** Raleigh, North Carolina
Python Workshop Leader
 - Designed, organized and led a workshop to teach Python programming to non-CS majors
- 2014–2015 **Wade Edwards Foundation and Learning Lab (WELL)** Raleigh, North Carolina
Hi-Tech Teens Mentor/Teacher
 - Co-organized sessions to teach high schoolers how to program using Python
 - Created and led interactive classes on writing code in Python
 - Created and led a week long camp on using MIT AppInventor 2
- 2014 & 2016 **NC State University** Raleigh, North Carolina
Girls Video Game Design Camp Co-Lead
 - Co-organized camp activities with co-camp leads
 - Taught middle school students how to build design, build, and critique video games using GameMaker 8.1 along with co-camp lead
 - Engaged students with various forms of active learning (e.g. think-pair-share)
- 2012 **NC State University** Raleigh, North Carolina
Graduate Teaching Assistant
 - Assisted the professor with course activities and grading of assignments and exams
 - Assisted student in the course via office hours where I was available to resolve issues and answer questions related to the course material

student supervision

Graduate

Rico Angell

Project: Fairness in ML-based Software Systems

Undergraduate

Jesse Bartola

Project: Supporting Data Scientists in Training Fair Models

Aisiri Murulidhar

Project: Fairness in Image Recognition Systems

Anastasia Egorova

Project: Augmenting Program Analysis Tool Intelligence

Adam Smith

Project: Augmenting Program Analysis Tool Intelligence

invited talks

2020	Towards Building Ethically-Sound Data-Driven Software ACM SIGPLAN conference on Systems, Programming, Languages, and Applications: Software for Humanity Keynote	Virtual Presentation
2019	Surviving (and Thriving) in STEM Annual Technology, Engineering, and Science Latinx Symposium Keynote	University of Connecticut
2018	Software (Un)Fairness Center for Data Science Research Symposium	University of Massachusetts Amherst
2018	Software (Un)Fairness Mass Mutual Meetup guest speaker	Mass Mutual
2018	Surviving (and Thriving) in Grad School LS-AMP meeting speaker	University of Massachusetts Amherst
2017	Producing Productive Programmers Data Science Tea speaker	University of Massachusetts Amherst
2016	Producing Productive Programmers Guest speaker in software course	School of Informatics, Northern Kentucky University
2016	Producing Productive Programmers	IBM T.J. Watson Research Center
2015	Qualitative Data Analysis	CSEd Workshop, NC State University
2013	Improving the Usability of Program Analysis Tools	WiC@CofC, College of Charleston
2013	Improving the Usability of Program Analysis Tools	The Attic, Seattle, WA

skills

programming

Java, Python, R, & HTML

software

Eclipse, RStudio, Excel