Allison K. Sullivan, PhD
ASSISTANT PROFESSOR OF COMPUTER SCIENCE AT THE UNIVERSITY OF TEXAS AT ARLINGTON

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Research Interest

Software Engineering, in particular: Test/Oracle Generation, Automated Bug Localization and Repair, Regression Testing, and Mutation Testing.

Formal Methods and Programming Languages, in particular: Model Based Testing, First-Order Logic, Program Synthesis, Model Checking and Symbolic Execution.

Academic Experience

SEPT 2020	**Assistant Professor**, The University of Texas at Arlington	*Arlington, TX*
2018 - 2020	**Assistant Professor**, North Carolina A&T State University	*Greensboro, NC*
2012 - 2017	**Research Assistant**, The University of Texas at Austin	*Austin, Texas*
2011 - 2012	**Undergraduate Research Assistant**, The University of Texas at Dallas	*Richardson, Texas*

Education

The University of Texas at Austin   *Austin, Texas*

PH.D. IN SOFTWARE ENGINEERING   *May 2017*

- **Dissertation:** Automated Testing and Sketching of Alloy Models | **Advisor:** Dr. Sarfraz Khurshid | **GPA:** 3.93

The University of Texas at Austin   *Austin, Texas*

M.S. IN SOFTWARE ENGINEERING   *May 2014*

- **Thesis:** AUnit - A Testing Framework for Alloy | **Advisor:** Dr. Sarfraz Khurshid

The University of Texas at Dallas   *Richardson, Texas*

B.S. IN SOFTWARE ENGINEERING   *May 2012*

- **Specialization:** Embedded Systems | **GPA:** 3.99

Industry Experience

Google, Inc.   *Mountain View, CA*

FACULTY IN RESIDENCE (FIR)   *Jun. 2019 - July. 2019*

- **Professional Development.** FIR is an immersive program that trained me to: design and implement classroom experiments related to project-based learning, conduct resume workshops, and give mock interviews. During this program, I re-designed "Comp 285: Design and Analysis of Algorithms" with feedback from fellow FIR faculty and Google engineers.

Naval Research Laboratory (NRL)   *Washington, D.C.*

RESEARCH INTERN IN THE CENTER FOR HIGH ASSURANCE COMPUTER SYSTEMS   *Jun. 2015 - Jan. 2016*

- **Model Based Testing.** I expanded the applicability of NRL's model based testing (MBT) infrastructure by extending the SCR toolset to automatically generate test cases that incorporate assumptions. This included updating the automated translations of SCR models into SPIN, NuSMV, and PVS with formulas that explore the assumption(s).

IBM Research   *Austin, Texas*

SOFTWARE TESTING INTERN IN THE VIRTUAL TEST SUITE AUTOMATION TEAM   *May. 2013 - Aug. 2013*

- **Test Automation Toolset.** I built a test automation toolset to ensue test suites automatically feed their output into RQM, IBM's project management tool. This toolset bridges existing automation scripts with the RQM and is in place at IBM today.

Funding

3 grants | **Total amount:** $45,655,000 | **My share:** $1,045,000

[1] **Source:** NSF Major Research Instrumentation – **Title:** MRI: Acquisition of a Testbed of Connected Autonomous MicroTransit Vehicles – **Lead PI:** Ali Karimoddini, **My Role:** Co-PI – **Amt:** $550k, **Share:** $55k

[2] **Source:** DoD Research and Engineering (Modernization) – **Title:** Assured Development and Operation of Autonomous Systems (ADAS) – **Lead PI:** Constance Heitmeyer (NRL), **My Role:** Performer – **Amt:** $45M, **Share:** $885k

[3] **Source:** NSF Formal Methods in the Field – **Title:** Alloy Analyzer Plus: an Integrated Development Environment for Alloy – **PIs:** Allison Sullivan – **Amt:** $100k

[4] **Source:** NSF HBCU-UP ACE Implementation Project in Data Science Scholarship of Teaching and Learning Award – **Title:** Project Based Learning in the Teaching of Analysis of Algorithms – **PIs:** Allison Sullivan – **Amt:** $5k

Publications

Refereed Conference Papers

[1] Allison Sullivan, Darko Marinov, and Sarfraz Khurshid. Solution enumeration abstraction - a modeling idiom to enhance a lightweight formal method. In *International Conference on Formal Engineering Methods (ICFEM)*, 2019.

[2] Kaiyuan Wang, Allison Sullivan, and Sarfraz Khurshid. ARepair: A repair framework for Alloy. In *International Conference on Software Engineering (ICSE) Demonstration Track*, 2019.

[3] Kaiyuan Wang, Allison Sullivan, and Sarfraz Khurshid. Automated model repair for Alloy. In *International Conference on Automated Software Engineering (ASE)*, 2018.

[4] Kaiyuan Wang, Allison Sullivan, Darko Marinov, and Sarfraz Khurshid. Asketch: a sketching framework for Alloy. In *The ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (FSE)*, 2018.

[5] Allison Sullivan, Kaiyuan Wang, and Sarfraz Khurshid. AUnit: A test automation tool for Alloy. In *International Conference on Software Testing, Verification and Validation (ICST)*, 2018.

[6] Kaiyuan Wang, Allison Sullivan, Darko Marinov, and Sarfraz Khurshid. Solver-based sketching of Alloy models using test valuations. In *International ABZ Conference ASM, Alloy, B, TLA, VDM, Z*, 2018. **Invited for journal submission.**

[7] Kaiyuan Wang, Allison Sullivan, Manos Koukoutos, Darko Marinov, and Sarfraz Khurshid. Systematic generation of non-equivalent expressions for relational algebra. In *International ABZ Conference ASM, Alloy, B, TLA, VDM, Z*, 2018.

[8] Kaiyuan Wang, Allison Sullivan, and Sarfraz Khurshid. MuAlloy: A mutation testing framework for Alloy. In *International Conference on Software Engineering (ICSE)*, 2018.

[9] Allison Sullivan, Kaiyuan Wang, Razieh Nokhbeh Zaeem, and Sarfraz Khurshid. Automated test generation and mutation testing for Alloy. In *IEEE Conference on Software Testing, Validation and Verification (ICST)*, 2017.

[10] Nima Dini, Allison Sullivan, Milos Gligoric, and Gregg Rothermel. The effect of test suite type on regression test selection. In *International Symposium on Software Reliability Engineering (ISSRE)*, 2016.

[11] Allison Sullivan, Razieh Nokhbeh Zaeem, Sarfraz Khurshid, and Darko Marinov. Towards a test automation framework for Alloy. In *International Symposium on Model Checking of Software (SPIN)*, 2014.

Refereed Workshop Papers

[12] Allison Sullivan, Kaiyuan Wang, Sarfraz Khurshid, and Darko Marinov. Evaluating state modeling techniques in Alloy. In *Workshop on Software Quality Analysis, Monitoring, Improvement, and Applications (SQAMIA)*, 2017.

Thesis and Dissertation

[13] Allison Sullivan. Automated testing and sketching of Alloy models. In *Texas ScholarWorks - UT Electronic Theses and Dissertations*, 2017.

[14] Allison Sullivan. AUnit: A testing framework for Alloy. In *Texas ScholarWorks - UT Electronic Theses and Dissertations*, 2014.

University Service

NASA's University Leadership Initiative (ULI)
- I was a Co-PI on a 20 member interdisciplinary team lead by Dr. Abdollah Homaifar at NC A&T for NASA's ULI round 3 solicitation. Our proposal "Secure and Safe Assured Autonomy (S^2A^2)" was successfully funded (**Total:** $7,938,727). My share had I stayed at NC A&T would have been $635,000.

Corporate Outreach and Professional Development
- Member of the NC A&T team that helped bring Facebook's Engineer in Residence Program to A&T's CS department.
- NC A&T's CS Representative to Intel's HBCU Consortium, worked on NC A&T's submission to Intel's HBCU Beyond 2020 grant.
- NC A&T Representative to Facebook T3 "Train the Trainer" summit on Data Structures and Algorithms.

Faculty Advisor for Student Teams
- Faculty Mentor for NC A&T's SAE International AutoDrive Challenge Student Team
  - **Fall 2018 - Spring 2020.** Placed 2nd overall in Year 2 (2018-2019), my first year on the project.
  - **Functional Safety Group.** Mentored 4 graduate students, 1 undergraduate student.
  - **Mapping Group.** Mentored 4 graduate students. *Placed 3rd in Year 2 Mapping Challenge*
- Coach for NC A&T's 2nd and 3rd Annual Advancing Minorities' Interest in Engineering (AMIE) Design Challenge teams (Spring 2019 and Spring 2020).

Club Advisor
- I was the faculty advisor for NC A&T's "Girls Who Code Loops" and "Society of Women Engineers (SWE)"

Organizer for the Triad Programming Contest
- 2020: Lead organizer for the contest (https://triad-pc-2020.github.io/).
- 2019: Co-organized the contest and served as a judge for the contest.

Faculty Supervisor
- **Jeffrey Moore II** – **Level:** Masters, **Focus:** Hardware Verification Using Alloy, **Projected grad date:** Fall 2020

Graduated Students
- **Jasmine Mabrey**
  - **MS May 2020:** Automated Defect Classification using Machine Learning
  - **First job:** Sandia National Laboratory, Albuquerque, NM
  - **Award:** Named NC A&T Rising Scholar
- **George Thompson**
  - **MS May 2020:** Towards Automated Fault Localization for Prolog *Nominated for Outstanding Thesis Award*
  - **First job:** Sandia National Laboratory, Albuquerque, NM
- **Regina Bunch**
  - **MS December 2018:** AMail: Email for Autism
  - **First job:** Cigna, Philadelphia, PA
- **Joelle Banks** – **Level:** Undergraduate, **Focus:** Empirical Study of Program Repair Techniques, **Graduation date:** May 2020
- **William Dunston** – **Level:** Undergraduate, **Focus:** Extending Java-Based Program Repair, **Graduation date:** May 2020

Student Committee Member
- I have had the honor of serving on the following student committees: PhD Committees - Hanan Alshahr (Fall 2019, NC A&T), Master's Committee - Derrick Leflore (Fall 2019, NC A&T), Shannon Wiggins Brown (Spring 2020, NC A&T), and Yuanrui Ren (Fall 2018, The University of Texas at Austin).

Former member of NC A&T's Center of Excellence in Cybersecurity Research, Education and Outreach (CREO)
- 2018 -2020: I worked with an interdisciplinary group to apply formal methods to the cybersecurity field.

Open Source Contributions

Solution Enumeration for Alloy
- **Seabs.** Toolset to guide solution enumeration for Alloy models using abstract functions, which specify how the solutions must differ: *https://github.com/Allisonius/Seabs*.

AUnit: Unit Testing Tools for Alloy
- **AUnit Analyzer.** Extension to the Alloy Analyzer that provides support for AUnit, namely: test creation and execution, coverage reporting, and automated test generation: *https://sites.google.com/view/aunitanalyzer*.
- **MuAlloy.** A command line tool built on top of Alloy 4.2 that provides mutation testing and mutation-based test generation for Alloy models: *https://github.com/kaiyuanw/MuAlloy*.

Alloy Repair and Sketching Tools
- **ARepair.** A command line tool built on top of Alloy 4.2 that automatically repairs faulty Alloy models, including models with multiple faults: (*https://github.com/kaiyuanw/ARepair*).
- **ASketch.** A command line tool built on top of Alloy 5.0 that can synthesis partial Alloy models, producing complete models which are correct w.r.t. a test suite: *https://github.com/kaiyuanw/ASketch*.

Honors & Awards

Oct 2019	**Grace Hopper Celebration 2019 Faculty Scholarship** from AnitaB.org	
2012 - 2016	**Virginia and Ernest Cockrell Jr. Fellowship in Engineering Recipient,** University of Texas at Austin.	
Spring 2012	**ECS Departmental Honors,** University of Texas at Dallas.	
2008 - 2012	**Academic Excellence Scholarship Recipient,** University of Texas at Dallas.	

Teaching Experience

Fall 2020	**Instructor**, CSE 5311: Design and Analysis of Algorithms, University of Texas at Arlington.	*Graduate*
Spring 2020	**Instructor**, COMP 496: Senior Design, North Carolina A&T State.	*Undergrad*
Spring 2020	**Instructor**, COMP 681: Formal Methods, North Carolina A&T State.	*Graduate*
Fall 2019	**Instructor**, COMP 285: Analysis of Algorithms, North Carolina A&T State.	*Undergrad*
Fall 2019	**Instructor**, COMP 611: System Testing and Evaluation, North Carolina A&T State.	*Graduate*
Spring 2019	**Instructor**, COMP 496: Senior Design, North Carolina A&T State.	*Undergrad*
Spring 2019	**Instructor**, COMP 681: Formal Methods, North Carolina A&T State.	*Graduate*
Fall 2018	**Instructor**, COMP 285: Analysis of Algorithms, North Carolina A&T State.	*Undergrad*
Spring 2016	**Teaching Assistant**, EE 382C: Verification and Validation, University of Texas at Austin.	*Graduate*
Spring 2014	**Teaching Assistant**, EE 382C: Requirements Engineering, University of Texas at Austin.	*Graduate*
Fall 2011	**Teaching Assistant**, CS 3345: Data Structures & Algorithms, University of Texas at Dallas.	*Undergrad*

Professional Service

Panelst	2 panels at the National Science Foundation (NSF), Alexandria, VA in 2020
PC Member	The ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering Tools and Demostration Track (FSE Demo 2020)
PC Member	The 27th International SPIN Symposium on Model Checking of Software (SPIN 2020)
PC Member	Special Interest Group on Computer Science Education Technical Symposium (SIGCSE 2020)
PC Member	5th International Conference on Research in Equity and Sustained Participation in Engineering, Computing, and Technology (RESPECT 2020)
Reviewer	Software Tools for Technology Transfer (STTT)
Co-Reviewer	27th International Symposium on Software Testing and Analysis (ISSTA 2018)
Co-Reviewer	11th International Conference on Software Testing, Verification and Validation (ICST 2018)
Co-Reviewer	25th International Symposium on the Foundations of Software Engineering (FSE 2017)
Co-Reviewer	10th International Conference on Software Testing, Verification and Validation (ICST 2017)
Co-Reviewer	31st IEEE/ACM International Conference on Automated Software Engineering (ASE 2016)