SONEYA BINTA HOSSAIN

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EDUCATION

Ph.D., Computer Science August 2019 - Present
University of Virginia, Charlottesville, VA
M.S., Computer Science August 2019 - December 2020
University of Virginia, Charlottesville, VA CGPA: 4.00
B.Sc., Computer Science February 2011 - February 2016
Bangladesh University of Engineering and Technology, Dhaka, Bangladesh CGPA: 3.65
Thesis: Balanced Coverage in Fault-Tolerant Broadcasting for Wireless Multi-hop Networks

EXPERIENCE

Graduate Research Assistant, LESS Lab, University of Virginia August 2019 - present

- Advisor: Dr. Matthew Dwyer

Applied Scientist Intern, Amazon Web Services Summer'22, Summer'23

- Mentor: Antonio Filieri, Willem Visser (Summer'22), Qiang Zhou (Summer'23)

Graduate Teaching Assistant, Department of CS, University of Virginia August 2019 - present

- Courses Assisted: Graduate Compilers (CS 6620), Undergraduate Compilers (CS 4620)
- Responsibilities: Contributed to educational compilers feature design and implementation, graded assignments, help TA office hours.

Software Development Engineer, REVE Systems (R&D) March 2016 - May 2019
Undergraduate Research Assistant, BUET March 2015 - March 2016

- **Advisor:** Dr. A.K.M. Ashikur Rahman

PUBLICATIONS (GOOGLE SCHOLAR)

1. Measuring and Mitigating Gaps in Structural Testing
Soneya Binta Hossain, Matthew Dwyer, Sebastian Elbaum, Anh Nguyen-Tuong
Proceedings of the 45th International Conference on Software Engineering (ICSE '23) (26% acceptance rate)

2. Neural-Based Test Oracle Generation: A Large-scale Evaluation and Lessons Learned
Soneya Binta Hossain, Antonio Filieri, Matthew Dwyer, Sebastian Elbaum, Willem Visser
Proceedings of the 31th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE 2023) (22.6% acceptance rate)

3. Oracle-based Test Adequacy Metrics: A Survey
Soneya Binta Hossain, Matthew Dwyer (available on arXiv)

ARTIFACTS

1. Artifact: Measuring and Mitigating Gaps in Structural Testing
Soneya Binta Hossain, Matthew Dwyer, Sebastian Elbaum, Anh Nguyen-Tuong
Proceedings of the 45th International Conference on Software Engineering (ICSE '23)

RESEARCH PROJECTS

1. Leveraging Large Code Language Models (LCLMs) for Automated Bug Repair (Internship Project)
Software bugs cost software developers and companies significant time and money. Even when detected, fixing bugs can be time-consuming and challenging. This work leverages Large Code Language Models (LCLMs) to detect bugs early in the development phase and generate corrective patches, offering significant potential to streamline both bug detection and resolution cost.

2. Graph Neural Networks in Predictive Mutation Testing (Ph.D. Project)
Mutation testing is a powerful testing technique for evaluating a test suite's fault-detection effectiveness. Unfortunately, the substantial cost of mutation testing for large systems hinders its broader adoption. This research addresses this issue by

proposing a graph-neural network-based approach that predicts mutation test outcomes, thereby eliminating the need—and associated expense—of executing the test suites, which is the main bottleneck.

3. A Large-scale Evaluation of Neural-Based Test Oracle Generation Methods (Ph.D. + Internship Project)
[paper]
In a large-scale study of 25 real-world Java systems, we evaluated several state-of-the-art learning-based and search-based automated test oracle generation techniques in terms of their ability to produce fewer false positives and strong test oracles capable of detecting elusive bugs.

4. Measuring and Mitigating Gaps in Structural Testing (Ph.D. Project)
[paper] [artifact] [talk] [poster]
This work introduces *coverage gaps*, a metric designed to identify under-tested program structures by analyzing the test oracles in a test suite. Next, it proposes a recommender system that leverages coverage gaps and recommends ways to enhance the test suite with additional test oracles. Our experimental results indicate that these additional oracles not only improve testing for under-tested codes but also enhance the overall fault-detection effectiveness of the test suite.

5. MuSlicer: A Language Agnostic Dynamic Program Slicing Tool (Internship Project)
This tool implements the classic dynamic slicing algorithm. Program execution trace and muGraph (an extended abstract syntax tree) are used to construct a dynamic program dependency graph (DPDG). Next, from the DPDG, a breadth-first traversal is performed w.r.t the slicing criterion to compute the dynamic slice.

6. STG-I: A Dynamic Symbolic Constraint Generation Tool Based on LLVM IR (Ph.D. 1st year project)
[GitHub]
This tool, working on LLVM IR, instruments the bitcode to record execution traces. In a program, variables can be marked as symbolic or unknown. When the program runs on concrete inputs, it produces symbolic constraints. These constraints can be utilized for dynamic symbolic execution or for computing input domain coverage through quantification

INDUSTRY PROJECTS

1. iTel Billing: A VoIP billing management system [More Info]
- Led the iTel Billing team, significantly contributed to feature design and development, and ensured continued system stability and bug resolution.

2. REVE Secure: A two-factor authentication system
- Integrated with the iTelBilling web system

3. Payment Solutions
- Developed and maintained several payment solutions: world wide Mobile Top UP Service and Money Transfer [More Info]

SERVICE

Research Mentor, Department of CS, University of Virginia
- Guided Nicki Choquette and Kasra Lekan (CS, UVa) in their research project "Insight into SEER", a replication study of an FSE'22 research paper.
- Mentored Ashley Hart (CS, University of Florida) during her UVa LESS lab internship, leading to the development of a Boolean satisfiability solver.

Student Mentor, University of Virginia
- Mentee: Srikar Chittari, Computer Engineering (CpE), UVa
- Guided through the graduate school application process

Leadership Chair, Computer Science Graduate Student Group (CSGSG), UVa Jan'20 - Dec'22
- Planned and organized CS Research Symposium for 2020 and 2021 [News][Tweet]
- Helped with CS department faculty recruitment and coordinated prospective student visits in the department
- Organized social events for graduate students

Social Chair, Association of Bangladeshi Students (ABS), UVa August'21 - Summer'22
- Represented Bangladeshi students at the University of Virginia, organized events showcasing Bangladeshi culture and history to foster diversity within the broader community

AWARDS AND SCHOLARSHIPS

- John A. Stankovic Outstanding Graduate Research Award (2022-2023) [News]
- Travel Grant by Computing Research Association (CRA) to attend Grad Cohort, San Francisco, CA, 2023
- End-of-Year Computer Science Department Outstanding Service Award (2021-2022), [News]
- Best Poster Award in Fall CS Research Symposium, 2021 [News]
- Travel Grant by Computing Research Association (CRA) to attend Grad Cohort, New Orleans, LA, 2020
- PhD Fellowship, Department of CS, University of Virginia, 2019
- Outstanding Undergraduate Thesis Award, Department of CSE, BUET, 2016
- Travel Grant by Grace Hopper Celebration of Women in Computing (GHCI), Bangalore, India, December 2015.
- Top Ten Database Project Award, Department of CSE, BUET, 2014
- Dean's and Merit list Award, Department of CSE, BUET, 2013-2014
- Tanlentpool Scholarship in 8th, 10th, and 12th Grade, Bangladesh Ministry of Education (2004-2012)

TECHNICAL SKILLS

Programming: Java, Python, LLVM, C, C++, Bash,
Machine Learning or AI Tools: TensorFlow, PyTorch, scikit-learn
Database: MySQL, Oracle
Version Control: Git