Ameer Hamza

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A Ph.D. candidate at Florida State University, with 5+ years of programming experience and research interests in Automated Reasoning, Formal Methods, and Program Analysis

Education

Florida State University (FSU) — Tallahassee, FL
Ph.D. in Computer Science | GPA: 3.86/4.00 — December 2024
Relevant Coursework: Compiler Construction, Computer Architecture, Computer-Aided Verification, Computer Security

Lahore University of Management Sciences (LUMS) — Lahore, PK
Bachelor's in Computer Science — May 2018
Relevant Coursework: Software Engineering, Program Analysis, Operating Systems, High-Performance Computing

Technical Skills

Programming: C/C++, Python, Haskell, OCaml, Rust, Bash Scripting, Unix/Linux System Programming, Assembly
Frameworks/Tools: Z3, CVC5, Eldarica, Coq, Lean Theorem Prover, SeaHorn Verification Framework, LLVM, MLIR

Work Experience and Projects

- **SDE Intern – ML Compilers** at **Amazon, Inc.**, Cupertino, CA — May 2024 – August 2024
  Project: **SMT-based Fuzzing Testing of an ML Compiler Front-end** | SMT, Fuzzing, Compilers
  - Generating fuzzing testing suite for HLO IR by generating model inputs for Neuron (Machine Learning) Compiler
  - Using SMT-solving as an engine for generating a fuzzing tool, guided by documented constraints as specification
  - Improving test coverage and allowing a programmer to better patch a bug by covering for multiple scenarios
  - Providing a framework for extending the tool for other IRs

- **Graduate Research Assistant** at **Florida State University**, Tallahassee, FL — May 2020 – Present
  Project: **Equivalence Checking of Unbalanced Loops** | C++, LLVM |
  - Developing a novel technique for equivalence checking of programs where programs can have different structures
  - Checking the equivalence of a program with optimized version for compiler optimizations like Loop Vectorization
  - Uses Abstraction-Refinement for program reasoning, and SMT-based Model Checking for proof generation
  - Dependency analysis of program variables using LLVM passes

- **Computer Science Lab Intern** at **SRI International**, (Remote) — October 2021 – March 2022
  Project: **Verification of eBPF Programs** | C++ |
  - Verifying memory safety and information safety of eBPF programs (Linux Kernel extensions) in user-space
  - Developing a Type System with Abstract Interpretation underneath for eBPF (Proof-Carrying code infrastructure)
  - Generating proof certificates that can be passed to and trusted by the kernel, and are human-readable
  - Provide a framework for eBPF programmers to write better quality eBPF code guided by its type system

- *Course Project*: **Automatic Assertion Generation** | Python | — November 2019 – December 2019
  - Designed a static analysis technique for generating assertions for C programs using a portion of program trace data
  - Improved time performance by using static analysis over a dynamic analysis tool, Daikon
  - Used CBMC (a verification tool) to prove/disprove these assertions on a range of benchmarks from SV-COMP

- **Graduate Teaching Assistant** at **Florida State University**, Tallahassee, FL
  Web Programming and Design (May 2023 – August 2023)
  Theory of Computation (August 2022 – May 2023)
  Software Engineering (January 2021 – May 2021)
  Software Engineering (August 2019 – December 2019)

Publications

A. Hamza and G. Fedyukovich, "*Lockstep Composition for Unbalanced Loops,*" in International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS), 2023 — *Published*