

MUHAMMAD USMAN NADEEM
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EDUCATION

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY (VIRGINIA TECH)

MS / Ph.D Computer Science Major GPA 3.85

- Area: Software Reliability, Security, and Compilers
- Relevant Courses: Advanced Compilers, Multiprocessor Programming, Linux Kernel Programming, Software Engineering, Operating Systems, System and Software Security, LLVM Programming

Blacksburg, VA
2016 – Present

LAHORE UNIVERSITY OF MANAGEMENT SCIENCES (LUMS)

B.S. Computer Science Major GPA 3.67

Lahore, PK
2012 – 2016

PROJECTS

LLVM Code Equivalence Verification (Research Assistant – Virginia Tech)

- Implemented a Semantic Equivalence checker on top of KLEE's symbolic execution engine to verify the equality of LLVM bitcode after it had been instrumented with security enhancing code
- Currently extending the tool to add verification support for Control and Data Obfuscation

Sept 2017 – Present
(C++, KLEE, LLVM)

Test Case Coverage Analysis in Open Source Software (Course Project – Software Engineering)

- Built a tool on top of an existing open source code coverage measurement framework that uses Cobertura API
- Found that refactored test cases sometimes cover fewer lines of code than the original but this negative change goes mostly unnoticed if developers only look at high-level coverage numbers

Sept 2018 – Dec 2018
(Java, Open Source tools, GitHub)

Branch Patterns and Feedback-Directed Optimizations (FDO) (Course Project – Compilers)

- Used Intel Processor Trace and Linux Perf tool to analyze Branch patterns in SPEC 2006 benchmarks
- Showed that the training input for Feedback Directed Optimization yielded different branch patterns than the full 'ref' inputs in some cases, e.g. Omnetpp only had 16% path overlap
- Uncovered some interesting patterns that could lead to optimization opportunities, for example, long alternating phases of taken and not-taken outcome for highly biased branches

Sept 2017 – Dec 2017
(Intel PT, Linux Perf, Python)

Optimizing *IFRit*; A data race detector (Course Project – Multiprocessor Programming)

- Optimized an existing Interference Free Region based data race detector and achieved 2-3x speedup on PARSEC benchmark over original tool
- Re-implemented the data access mechanism to use Intel MPX (hardware accelerated two-level lookup) as a key-value store instead of hash tables
- Redesigned the data structures and reduced the amount of *shared* data needed per memory location to *fit in a 128-bit array*
- Implemented *fine-grained synchronization* to improve parallelism

Sept 2017 – Dec 2017
(C++, Intel MPX)

Hardening Android Applications to Enhance Data Security (Senior Year Project – Undergrad)

Advisors: Dr. Fareed Zaffar, Dr. Junaid Haroon Siddiqui

- Implemented a course-grained static taint analysis for smali byte code in Java
- Tracked sensitive data from Android API calls to data sinks; Replaced it with garbage data to prevent data leakage and maintain user privacy

2015 – 2016
(Java, Smali Android bytecode)

OTHER EXPERIENCE

GRADUATE TEACHING ASSISTANT

- CS 2114 Software Design and Data Structures, CS 2505 Computer Organization

Virginia Tech, USA

UNDERGRAD TEACHING ASSISTANT

- CS 200 Intro to Programming and CS 202- Data Structures

LUMS, PK

TOOLS/LANGUAGES

- C/C++ (Proficient), KLEE, Linux and Java (Moderate), Python, LLVM, perf tools and x86 assembly (Beginner)