Muhammad **Abdullah**

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Education

Massachusetts Institute of Technology
Candidate for B.S. Computer Science and Engineering, GPA: 4.7/5.0 **Class of 2024**
- *Relevant Undergraduate Coursework*: Performance Engineering, Operating Systems, Systems Engineering, Linear Algebra, Probability, Principles of Software Construction
- *Relevant Graduate Coursework*: Distributed Systems, Computer Architecture, Advanced Algorithms, Theory of Computation

Work Experience

MIT Computer Architecture Lab Jan. 2022 - present
Morais and Rosenblum Undergraduate Research Scholar ***Cambridge, MA***

→ Implemented a modified KVM module in the Linux kernel to support Trusted Execution Environments (TEEs).
→ Developed implementation using C, RISC-V, and hardware primitives for sub-OS layer support.
→ Examined the provision of OS/hardware level cryptographic security assurance for VMs on cloud servers.

MIT Software Security Group Jan. 2023 - present
Student Researcher ***Cambridge, MA***

→ Reverse Engineered the IOMMU in the AMD EPYC 7413 Processor.
→ Analyzed the IOMMU for timing attacks and side channel attacks, identifying potential vulnerabilities.
→ Investigated cache poisoning and other security weaknesses to enhance security of standard IOMMU implementations

Harvard School of Engineering and Applied Sciences Summer 2023
Student Researcher ***Cambridge, MA***

→ Designed a multistage, generic, templated processor in Scala LMS for Formal Analysis.
→ Synthesized the Processor into an Interpreter and used Bounded Model Checking to validate timing properties.
→ Collaborated with the research team to optimize processor performance and enhance its formal verification capabilities.

Rescale, Inc. Summer 2022
SW Intern ***San Franciso, CA***

→ Implemented a High-Performance Data Analysis pipeline to showcase cloud management systems.
→ Developed a dynamic process management solution using Message Passing Interface for distributed systems.
→ Conducted platform reviews and offered optimization recommendations to company teams.

MIT Kavli Institute Summer 2021
Stundent Researcher ***Cambridge, MA***

→ Developed a Machine Learning classification system in Python for analyzing TESS space telescope's data.
→ Built an AI-driven ensemble of three ML models incorporating techniques such as HDBSCAN clustering, Isolation Forest anomaly detection, and t-SNE dimensionality reduction.
→ Achieved efficient data management with an x8 size reduction, preserving accuracy at 95%.

Projects

OneChan: An FPGA-based Chess Engine supplemented with a custom TPU. link
U2F: An open source, homemade 2-factor authentication security key based on the FIDO alliance's U2F specification link
Profemon: A dynamic, pvp, in-person, turn-based fighting game similar to Pokemon Go. Implemented on an ESP32 link
Depolarizer: React app that suggests news articles and sources to promote exposure to opposing viewpoints. link
Optimal Bounds For Range Search: Reviewed and simplified several recent keystone papers in DS and Algorithms. link

Skills Summary

Languages: *Software*; C++, Python, C,Typescript, Scala, Kotlin, x86-Assembly, RISC-V. *Hardware*; System Verilog, Bluespec
Tools: Git, Linux, LLVM, clang, cilk, Xilinx SDK, React, Angular, gdb, Valgrind, Z3, yosys, Tensorflow, sklearn
Interests: Performance Engineering, Systems, Computer Architecture, and Security

Awards

International Mathematical Olympiad 2020 (IMO) - Honorable Mention
6.172 (Performace Engineering) Leiserchess Tournament 2022 - Final Winner