Mahmoud Abumandour

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EDUCATION

Simon Fraser University **Sep 2024 – Present**

Ph.D. in Computer Science (GPA: 4.11/4.33) *BC, Canada*

Simon Fraser University **Sep 2022 – Aug 2024**

Master of Science in Computer Science (GPA: 4.07/4.33) *BC, Canada*

Thesis: **Resilient Neural Networks at the Edge: Uncovering and Mitigating Bit-Flip Vulnerabilities**

Mansoura University **Sep 2017 – Jul 2022**

Bachelor of Science in Computer and Communication Engineering (GPA: 3.96/4.0) *Mansoura, Egypt*

Ranked first over a class of 180 students

EXPERIENCE

Simon Fraser University **BC, Canada**

Graduate Research Assistant ***Sep 2022 – Present***

- Conducted research in machine learning, system, and hardware security.
- Designed attacks and defenses for deep learning applications in software and hardware.

Simon Fraser University **BC, Canada**

Teaching Assistant ***Jan 2023 – Present***

- Conduct tutorials and lab sessions, grading assignments and exams, and providing support during office hours
- Courses: Intro to Computer Systems, Principles of Compiler Design, Computer Architecture, Distributed Systems

Intel Corporation **Santa Clara, CA (Remote)**

CPU Architecture Intern ***Jan 2024 – May 2024***

- Researched, modelled, and assessed CPU front-end features, including instruction prefetching and caching
- Performed workload analysis to categorize based on instruction cache footprint and branch behavior
- Conducted comparative studies between functional and cycle-accurate simulators to identify sources of miscorrelation

Google Summer of Code (RTEMS) **Remote**

Student Developer ***May 2022 – Sep 2022***

- Achieved 8x speedup over the previous release notes generator by using a multi-threaded architecture
- Automated release data fetching from RTEMS bug tracker and Markdown to RST & PDF generation

Master Micro **Cairo, Egypt**

Software Engineering Intern ***Oct 2021 – Feb 2022***

- Designed a range format for an EDA design lookup table file, reducing query time by 50% over a binary format

Google Summer of Code (QEMU)

Student Developer ***May 2021 – Aug 2021***

- Implemented multi-core, multi-level cache performance emulation of user-space and full-system workloads
- Improved the system call tracing by making its reports more script-friendly for post-processing

Publications

- **Mahmoud Abumandour**, Srinija Ramichetty, Guru Venkataramani, and Alaa R. Alameldeen. 2025. *WeightSentry: Real-Time Bit-Flip Protection for Deep Neural Networks on GPUs*. In Hardware and Architectural Support for Security and Privacy 2025 (HASP 2025)

Talks

- *Position-Adaptive Temporal Sparsity for KV Caches in Long-Context LLMs.* In Sparsity, the Key Ingredient from HPC to Efficient LLMs, Co-located with the International Symposium on Microarchitecture (MICRO) 2025

Projects

- **The Kyoto Compiler and Fuzzer**: Designed the Kyoto Programming Language and its compiler. Used LLVM for code generation and analysis. Implemented a grammar-based rust fuzzer for the compiler.
- **Symbolic Execution Engine (Mnemosyne):** Built a QEMU binary tracing plugin and a symbolic execution engine
- **Fuzzing with RISC-V Emulation**: Developed a RISC-V 64-bit functional emulator for userspace fuzzing. Increased test generation throughput linearly with available resources by mitigating kernel overhead of native execution
- **Database Engine (RheaDB)**: Implemented a disk-oriented DBMS with SQL support, in-memory pool caching, B+ Tree indexing, and JDBC driver
- **AES Encryption Core**: Designed a low-power AES encryption core for FPGA. Reduced area and power consumption by more than 80% over a high-throughput pipelined design
- **Hyperthreaded, Software-Interlocked RISC Processor**: A multi-threaded five-stage pipelined RISC core for FPGA and a custom assembler with software interlocking, achieving 5x more throughput over single-threaded execution

Skills

Programming Languages: C++, C, x86 Assembly, Rust, Python, Bash Scripting, Java
Tools: Ghidra, Gem5, LLVM, Git, Docker, Valgrind, perf, PyTorch, Tensorflow
Platforms: Linux, QEMU, FPGA, ARM Cortex M4, Raspberry Pi
Hardware Design Tools: Xilinx Vivado, ModelSim, SystemVerilog, VHDL

Open-Source Contributions

- **RISC-V Newlib:** Profiled and optimized the newlib standard library implementation for RISC-V. Used QEMU, Spike, Gem5, and a RISC-V Raspberry Pi board for benchmarking.
- **SerenityOS**: Defined a global OS versioning API. Increased user-space utilities POSIX compliance. Improved the SerenityOS DBMS SQL support
- **QEMU**: Modernized the usage of locking and memory allocation APIs by using scope-based locks and automatically freed allocations. Redefined plugins' configuration interface adhering to modern QEMU standards