Ahmer Raza

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Passionate researcher seeking to advance the development of secure, intelligent, and robust autonomous systems designed for real-world applications in dynamic and unpredictable environments.

Education

Clemson University — Clemson, SC
M.S. Mathematics, Statistics concentration — August 2024 – August 2025 (expected)

Clemson University — Clemson, SC
B.S. Computer Science, Mathematics minor — August 2021 – May 2024
4.0/4.0 GPA, Departmental Honors

Research Experience

Graduate Research — Fall 2024 – present
Differential Privacy/Statistics (advisors: Dr. Chris McMahan and Dr. Rafael D'Oliveira)

- Conducting research at the intersection of differential privacy and group testing. Looking at specific scenarios of group testing and their differential privacy guarantees.

Honors Thesis Undergraduate Research/Graduate Research Assistant — Spring 2024 – present
Hardware Cybersecurity (advisor: Dr. Zhenkai Zhang)

- Conducting research to create a secure automotive Electronic Control Unit (ECU) for connected vehicles using RISC-V and TEEs. Secure ECU built from the bottom-up using Rocket Chip, Keystone Enclave, and external CAN bus hardware.
- Built and deployed a Rocket core-based System-on-Chip (SoC) on an Artix-7 FPGA; built and run a custom embedded version of Debian Linux on the SoC; modified and ported Keystone Enclave to the system; wrote SPI and CAN drivers for Keystone Enclave; and added Instruction Set Randomization (ISR) to the Rocket core CPU pipeline.
- Ongoing work to finish implementation of ISR and use the CARLA simulator to test the platform.

Undergraduate Research — Summer 2023 – Fall 2023
GPU Cybersecurity (advisor: Dr. Zhenkai Zhang)

- Conducted research evaluating the feasibility, effectiveness, and mitigation techniques of bit disturbance attacks such as Rowhammer and RowPress launched from discrete GPUs on motherboard DRAM.
- Replicated Rowhammer results on a desktop computer and attempted to hammer pinned main memory from a discrete GPU using the CUDA DMA mechanism.
- Concluded Rowhammer and RowPress via CUDA DMA were infeasible due to long DMA engine program/unprogram times.

Creative Inquiry (Student-Driven Undergraduate Research) — Fall 2023 – Spring 2024
Robotics Systems Research (advisor: Dr. William J. Reid)

- Designed a rigid-bodied autonomous robot that won 1st place among more than 50 universities in the IEEE SoutheastCon 2024 Hardware Competition.
- The robot included a chassis/drivetrain module, sensing modules, and an object manipulation module.
  - Chassis module included two-wheel drive to allow for in-place steering using omni wheels.
  - Sensor modules included DC motor encoders and line-following, time-of-flight, and light sensors.
  - Object manipulation module encompassed a three degrees-of-freedom (df) "hard" robotic arm with a one df gripper end effector.

Nanotechnology

- Conducted review research on quantum computing and the role of nanotechnology, nanomaterials, and nanodevices in quantum computers.

Circuit Cellar

- Designed and implemented a Printed Circuit Board (PCB) using Electronic Design Automation (EDA) tools.

Senior Capstone Fall 2023

Arccos Golf

- Created a custom user map correction feature for industry partner Arccos Golf to be integrated into their Arccos Caddie product line.

Publications

[1] **A. Raza** and Z. Zhang, "carroot: A Secure TEE-Based Automotive ECU," USENIX VehicleSec (unpublished).

[2] **A. Raza** and Z. Zhang, "A Secure Automotive ECU for Connected Vehicles," Honors Thesis, Sch. of Comp., Clemson Univ., Clemson, SC, USA, 2024. Available: https://ahmerr.com/pdf/Honors_Thesis_Ahmer_Raza.pdf

Posters & Presentations

[1] **A. Raza** et al., "ROAR-E: a Winning Autonomous Robot for the IEEE SoutheastCon 2024 Hardware Competition," Clemson Focus on Creative Inquiry, Clemson University, Watt Family Innovation Center, Apr. 3, 2024. Available: https://ahmerr.com/pdf/Robotics_FoCI_Poster.pdf

[2] **A. Raza** et al., "Nanotechnology for Emerging Applications," Clemson Focus on Creative Inquiry, Clemson University, Watt Family Innovation Center, Apr. 4, 2024.

[3] **A. Raza** et al., "Circuit Cellar," Clemson Focus on Creative Inquiry, Clemson University, Watt Family Innovation Center, Apr. 5, 2024.

Honors & Awards

SoutheastCon 2024 Hardware Competition March 2024
1st place in Hardware Competition at SoutheastCon 2024

Garrison Family Annual Scholarship 2023 – 2024

Frank M. Gunby Memorial Scholarship 2023 – 2024

South Carolina LIFE Enhancement 2022 – 2024

South Carolina LIFE Scholarship 2021 – 2024

Clemson University Scholarship 2021 – 2023

Clemson University President's List Fall 2021 – Spring 2024
Awarded President's List for all semesters at Clemson

GaSTC Gold Medal March 2019
1st place in Project Programming at the Georgia Student Technology Competition

Outreach

VEX V5 Fall 2024

Robotics Mentor & Referee

- Mentoring and refereeing VEX V5 teams from more than 6 high schools, middle schools, and elementary schools.
- Teaching and helping transition to Python for robot programming.

Pickens County Career & Technology Center Fall 2024

Python Teacher

- Organizing interactive Python workshops at the PCCTC to teach Python to high school students.

XPR Robotics Outreach Fall 2024

Robotics Teacher

- Launched a formal robotics initiative to teach middle and high school students hands-on, practical robotics.
- Robots provided through IEEE XPR donation.

Memberships

IEEE Clemson Student Branch Leadership Spring 2024

Webmaster for the IEEE Student Branch at Clemson

IEEE Student Member Spring 2024 – present

ACM Student Member Spring 2024 – present

Alpha-Lambda-Delta Honor Society Spring 2022 – present

Clemson University Honors College Fall 2021 – Spring 2024

Projects

MIPS Simulator

- Cycle-accurate command-line simulation of a MIPS pipelined processor.
- Handles `lw`, `sw`, `beq`, `add`, `sub`, `and`, `or`, `slt`, and `j` instructions.
- Dynamically detects and handles data and control hazards.

C-Natural

- Custom programming language and transpiler made to facilitate beginners' learning of advanced programming concepts. Developed for CUHackit 2023.

C Server

- Simple HTTP parser and web server written in C.
- Serves a single file, buffered in memory or unbuffered using sockets.

Periodic Table

- Interactive Java-based Periodic Table app with extensive information about each element.
- Won 1st place in Project Programming at GaSTC 2019.

Skills

Programming Languages

- C/C++
- Java
- Python
- JavaScript/TypeScript
- HTML/CSS

Software Tools

- Git/GitHub
- NodeJS/NPM platform
- Intel Quartus II Design Software
- Xilinx Vivado Design Suite

- Solidworks 3D design
- KiCad/EasyEDA

Hardware Experience

- Through-hole and SMD PCB soldering
- Digilent Arty A7-100T with Xilinx Artix-7 FPGA
- Raspberry Pi 4 computer
- Raspberry Pi Pico MCUs
- Arduino/PlatformIO
- 3D printing

Soft Skills

- Written and verbal communication
- Teamwork and collaboration
- Problem solving
- Problem resolution
- Attention to detail
- Dependable and responsible