

Ali Hamza Malik

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SKILLS

Programming Languages: Python, C/C++, Julia, Rust, JavaScript, Kotlin, MATLAB

Formal Methods: Symbolic Execution, Linear Temporal Logic (LTL), Finite State Automata (FSA), Model Checking, SMT encoding, Model Checking (TLA+, nuXMV, STORM), Theorem Proving (Coq, Lean)

Generative AI/ML: Huggingface, Transformers, PyTorch, TensorFlow, Keras, SFT, DPO, RLHF, RLAF (RL-Automated Feedback), LoRA, QLoRA, RAG, Specification-Aware Fine-Tuning, Agentic AI

DevOps & Cloud: Git/GitHub, Docker, Shell Scripting, CMake, AWS (EC2, Route 53), MongoDB, N8N

RELEVANT EXPERIENCE

Graduate Research Assistant, Khwarizmi Lab

September 2023 – Present

University of Massachusetts Amherst

- Analyzed U.S. ACH direct payment systems via bounded model checking, discovering and mitigating 3 critical access control vulnerabilities tied to \$10,000+ in financial losses.
- Designed a formal analysis framework to rigorously audit QKD network specifications, successfully identifying and resolving undocumented vulnerabilities in quantum-classical interactions.

Undergraduate Research Assistant, Communication Systems and Networks Lab

September 2022 – July 2023

National University of Sciences & Technology

- Built an event-driven coordination system using C++ and MAVLink for multi-UAV aerial swarms on Raspberry Pi and Pixhawk hardware stack to enable autonomous multi-agent mission planning
- Optimized leader-follower formation control algorithms (flock, line, helical) with dynamic reconfiguration, reducing formation-switching latency to under 2 minutes

Hardware Security Intern, IC Design Lab

June 2022 – September 2022

National University of Sciences & Technology

- Developed ENIGMA, an automated Python framework for inserting logic-locking defenses into Verilog HDL designs for reducing IP reverse-engineering risk
- Developed SAT-based attack algorithms that successfully recovered logic-locking keys from obfuscated circuits in under 6 hours to expose weaknesses in 2 commercial logic-locking schemes

Machine Learning Intern, TUKL Deep Learning Lab

June 2021 - September 2021

National University of Sciences & Technology

- Built an automated ETL pipeline using Python and regex to process 10,000+ PDF raw court documents to fine-tune NLP transformer models (BERT and RoBERTa) for verdict prediction of court cases

EDUCATION

PhD in Electrical & Computer Engineering

Expected May 2028

University of Massachusetts Amherst

Teaching Assistant: ECE 304: Junior Design Project, ECE 361: Fundamentals of Electrical Engineering

BE in Electrical Engineering and Minor in Computer Science

Completed June 2023

National University of Sciences and Technology

Capstone Project: Optimized security-cost tradeoffs of hardware obfuscation on a proprietary RISC-V microprocessor

Funded Project: Grant-funded research implementing a low-latency control system for distributed aerial robotics

RELEVANT PROJECTS

LogicTune for LLM-Generated Controllers — Python, PyTorch, LLM, RLAF, DPO, LoRA, Model Checking

- Improved autonomous driving safety from 60% to 90% with DPO and feedback from model checking.

SDN-Based Machine Learning IDS — Python, SDN, Cloud Computing, ML, OpenFlow, CloudLab

- Achieved 99.87% accuracy and 6.7M samples/second throughput by integrating ML with SDN switches.

HONORS AND AWARDS

2023 - Rector's Gold Medal: Awarded for best senior project, National University of Sciences & Technology

2022 - 2nd Place, CSAW'22 LLC: For a global security hackathon competition, NYU School of Engineering