TANVIR HOSSAIN

+1(785) 424-0647 ⋄ Lawrence, KS
tanvir@ku.edu ⋄ linkedin.com/in/tanvir-hossain71/ ⋄ Google Scholar

OBJECTIVE

PhD researcher focused on protecting commercial hardware from malicious threats. Experienced in digital VLSI and ASIC design flow, including RTL design, verification, synthesis, and side-channel analysis.

EDUCATION

Doctor of Philosophy(Ph.D.) in Electrical Engineering, The University of Kansas — Expected 2026
Advisor: *Dr. Tamzidul Hoque, Assistant Professor, EECS, KU.*

Master's of Science (M.S.) in Electrical Engineering, The University of Kansas — May 2025
Advisor: *Dr. Tamzidul Hoque, Assistant Professor, EECS, KU.*

Bachelor of Science in Electrical and Electronic Engineering
Ahsanullah University of Science and Technology, Bangladesh, CGPA: 3.69 — 2016 - 2021

TECHNICAL SKILLS & STRENGTHS

Hardware Description Language:	Verilog, VHDL.
FPGA Design Tools:	Xilinx Vivado, ISE, SDK; Quartus.
Programming Languages:	Python, C, MATLAB, Assembly (MIPS).
Design & Verification Tools:	Cadence Virtuoso, Genus, Encounter; ModelSim; PSpice, HSPICE.
Simulation and Analysis Tools:	gem5, Intel VTune, McPAT.
Hardware Platforms:	**FPGA Boards:** HaHa Board (Intel MAX10), Altera DE2-115 FPGA, Basys 3 Artix-7, Nexys A7-100T. **Embedded Systems:** Raspberry Pi, Arduino, STM32.
Compilers and Toolchains:	LLVM.
Side-Channel Analysis:	Riscure EM Probe and Probe Station, Tektronix DPO70404C Oscilloscope, Analog Discovery 2.
Scripting:	Tcl (Tickle), Bash, Git.

WORK EXPERIENCE

Graduate Teaching Assistant — Aug 2024 - Dec 2024
Department of Electrical Engineering and Computer Science, The University of Kansas
Conducted lab sessions and graded assignments for undergraduate courses in digital logic and computer architecture, assisting in developing course materials and exams. Provided guidance in project-based learning using MARS MIPS and gem5 x86 simulators, enhancing student engagement and understanding.

Graduate Research Assistant — Jan 2022 - Aug 2024; Jan 2025 - Present
Department of Electrical Engineering and Computer Science, The University of Kansas
Conducted research on hardware security, focusing on detecting and mitigating hardware Trojans in microelectronic ICs. Developed a novel Trojan detection and data protection method using side-channel analysis, leading to publications in top-tier conferences and journals.

Reserach Mentor — Summer 2025
NSF Research Experience for Undergraduates (REU) Project
Mentored four undergraduate research assistants as part of the NSF-funded REU program, in collaboration with the University of Kansas and Wright State University.

Summer Camp Instructor — Summer 2023, 2024
Department of Electrical Engineering and Computer Science, The University of Kansas
Organized and conducted summer camps teaching high school students computer hardware fundamentals through gamified, hands-on projects using FPGAs and basic electronics. Fostered an engaging learning environment to teach electronics and programming concepts.

Co-Instructor — Fall 2023
The University of Kansas
Co-taught the course "Hands-On Introduction to Computer Hardware using FPGA and Microcontroller," where I developed modules using FPGAs, simulations, and the ESP32 embedded Aha Board to teach hardware fundamentals of computer systems.

RESEARCH EXPERIENCE AND PROJECTS

- **Side-Channel Assisted Runtime Integrity Monitoring:** Developed a method using contactless electromagnetic side-channel analysis to monitor control flow in multi-core commercial-of-the-self (COTS) processors, detecting hardware Trojans without requiring a golden reference. Implemented watermarking techniques to precisely locate attacked code blocks.
- **Side-Channel Assisted Verification for COTS:** Proposed an approach to detect sequential hardware Trojans in COTS processors by analyzing finite state machines through integrated power and EM side-channel data, enabling detection without proprietary design information.
- **Run-time Protection of Secrets in COTS:** Developed a software framework employing Residue Number Coding to keep sensitive data encoded during execution on untrusted microprocessors. This method protects against hardware Trojans and side-channel attacks with minimal overhead, suitable for embedded COTS processors.
- **Gamified Learning Framework for Computer Hardware Fundamentals:** Developed hardware-based games to teach fundamental concepts of computer hardware using Verilog, FPGA, and ESP32 development boards. *Funded by NSF, 2022 to present.*

SELECTED PUBLICATIONS (CITATIONS: 26)

Journal Articles:

1. **Tanvir Hossain**, Jonathan Cruz, Prabuddha Chakraborty, Swarup Bhunia, Tamzidul Hoque, **"Attacking the Protections under Zero Trust Model"**, *Under Review*
2. Ashutosh Ghimire, **Tanvir Hossain**, Fathi Amsaad, Tamzidul Hoque, **"ML-Assisted Approach for Hardware Trojan Detection without Golden Chip Signature"**, *Under Review*
3. **Tanvir Hossain**, Matthew Showers, Mahmudul Hasan, Tamzidul Hoque, **"HOACS: Homomorphic Obfuscation Assisted Concealing of Secrets to Thwart Trojan Attacks in COTS Processor"**, *Under Review*, Pre-print: arXiv:2402.09701.
4. Mashfiq Rizvee, Fairuz Shadmani Shishir & **Tanvir Hossain**, Tamzidul Hoque, Sumaiya Shomaji **" A Hierarchical Bloom Filter-based Framework for Scalable Authentication and Tracking of ICs"**, *Under Review*
5. **Tanvir Hossain**, Istiaque Rahman, **"Bandgap tuning and Variable Quantum Barrier of Armchair Graphene Nanoribbon by Inducing Antidote Topologies"**, Journal of Computational Electronics, *Publisher: Springer Nature*, DOI: 10.1007/s10825-023-02108-7.
6. **Tanvir Hossain**, Istiaque Rahman, Mahbub Alam, **"Antidote induced armchair graphene nanoribbon based resonant tunneling diodes"**, *Semiconductor Science and Technology*, *Publisher: IOP Publishing (Institute of Physics Publishing)* DOI: 10.1088/1361-6641/ac01fc .

Conference Proceedings:

1. S M Mojahidul Ahsan, Muhammad Sakib Shahriar, Mrittika Chowdhury, **Tanvir Hossain**, Md Sakib Hasan, and Tamzidul Hoque, **"Accurate, Yet Scalable: A SPICE-based Design and Optimization Framework for eNVM-based Analog In-memory Computing,"** accepted to *2024 ACM/IEEE International Conference on Computer-Aided Design (ICCAD)*, San Francisco, CA, USA.
2. **Tanvir Hossain**, S M Mojahidul Ahsan, and Tamzidul Hoque **"Potential and Pitfalls of Multilevel Logic Circuits for Hardware Security"**, *2023 IEEE 16th Dallas Circuits and Systems Conference (DCAS), Denton, TX, USA, 2023, pp. 1-6*, DOI: 10.1109/DCAS57389.2023.10130261
3. S M Mojahidul Ahsan, **Tanvir Hossain**, Md Sakib Hasan, and Tamzidul Hoque **"Resistive RAM based PUF: Challenges and Opportunities"**, *2023 IEEE 16th Dallas Circuits and Systems Conference (DCAS), Denton, TX, USA, 2023, pp. 1-6*, DOI: 10.1109/DCAS57389.2023.10130179
4. Ashutosh Ghimire, Fathi Amsaad, **Tanvir Hossain**, Tamzidul Hoque, Ahmed Sherif, **"FPGA Hardware Trojan Detection: Golden-Free Machine Learning Approach"**, *NAECON 2023 - IEEE National Aerospace and Electronics Conference, Dayton, OH, USA, 2023*, DOI: 10.1109/NAECON58068.2023.10365812
5. Andrea Ramirez-Salgado, **Tanvir Hossain**, Tamzidul Hoque, Swarup Bhunia, Mary Jo Koroly, Bradford Davey, Pavlo Antonenko **"Board 393: Supporting Hardware Engineering Career Choice in First-Year Engineering Students"**, *2024 ASEE Annual Conference & Exposition, Baltimore, Maryland.* https://peer.asee.org/46979.pdf
6. Andrea Ramirez-Salgado, **Tanvir Hossain**, Tamzidul Hoque, Swarup Bhunia, Mary Jo Koroly, Bradford Davey, Pavlo Antonenko **"Board 265: Engaging Students in Exploring Computer Hardware Fundamentals Using FPGA Board Games"**, *2023 ASEE Annual Conference & Exposition, Baltimore, Maryland.* https://peer.asee.org/42715

7. Fairuz Shadmani Shishir, Mashfiq Rizvee, **Tanvir Hossain**, Tamzidul Hoque, Sumaiya Shomaji **"A Persistent Hierarchical Bloom Filter-based Framework for Authentication and Tracking of ICs"**, *3RD IEEE International Workshop on Silicon Lifecycle Management*, DOI: 10.48550/arXiv.2408.16950

8. **Tanvir Hossain**, Md Shyeem Rahman, Md. Mushfiqur Rahman and Ahmed Rabbi Arini Dibbo, **"Performance Analysis of Graphene Nanoribbon Field Effect Transistor (GNRFET) based 6T and 7T SRAMs"**, *23rd International Conference on Computer and Information Technology (ICCIT), 2020, pp. 1-5*, DOI: 10.1109/ICCIT51783.2020.9392713, (**Best AUST paper award**)

GRANTS

Here is the list of Grants I have worked on as a Research Assistant.

March 2022 - Present	**Collaborative Research: Gamified Learning of Computing Hardware Fundamentals** Funding Agency: National Science Foundation, Award Number: 2142696
October 2024 - Present	**Collaborative Research: Engaging High Schoolers in Integrated Computer Science and Engineering Through Hands-On Experiences with Microelectronics and Artificial Intelligence** Funding Agency: National Science Foundation, Award Number: 2405375

SIGNIFICANT COURSES

Major Courses in B.Sc.:	VLSI - I, VLSI - II, Analog Integrated Circuit, Processing and Fabrication Technology, Computer Architecture, Compound Semiconductor and Hetero-Junction Devices.
Major Courses in Ph.D. :	Intro. Hardware Security, Advance Software Security, Modern Computer Architecture, Machine Learning, Embedded Machine Learning, Advance Data Science, Computer Vision.

RESEARCH TALKS & PRESENTATIONS

January 2025	**Leakage Unplugged: A Hands-On Tutorial on Power Side-Channel Attacks** Research Workshop in the I2S Student Research Symposium 2025
February 2024	**Power Side-Channel and Fault Attacks on ASCON and their Countermeasures** Information Advantage Scholars Visit at I2S, KU

HONORS & AWARDS

January 2024	**First Place (Poster Presentation)** In the I2S Student Research Symposium
May 2023	**Champion: Microelectronics Security Challenge (IP security)** IEEE International Symposium on Hardware Oriented Security and Trust (HOST 2023 Symposium)
May 2023	**National Science Foundation (NSF) Travel Grant** IEEE International Symposium on Hardware Oriented Security and Trust (HOST 2023 Symposium)
April 2023	**David D. and Mildred H. ROBB Award** Awarded by the EECS department of the University of Kansas
April 2023	**People's Choice Award (Poster Presentation)** Among 16 participants in the 2023 Research Showcase by the Graduate Engineering Association of KU
April 2023	**Third Place (Poster Presentation)** Among 16 participants in the 2023 Research Showcase by the Graduate Engineering Association of KU
March 2023	**Second Place (Research Showcasing)** Among 20 participants in the I2S Student Research Symposium
December 2022	**Bangladesh Sweden Trust Fund** (A travel grant for Graduate study in USA)
June 2022	**National Science Foundation (NSF) Travel Grant** IEEE International Symposium on Hardware Oriented Security and Trust (HOST 2022 Symposium)
March 2021	**Best AUST Paper Award** The 23rd International Conference on Computer and Information Technology (ICCIT 2020)
Fall 2019	**Tuition Waiver Award** (Based on the result of the top 8% students)
August 2018	**Runner-up** Hardware Exhibition, Inter University Software and Hardware Carnival-2018, University of Asia Pacific
April 2018	**Second Runner-up** Project Showcasing of Technival '18, Khulna University of Engineering and Technology (KUET)
February 2018	**Second Runner-up** Hardware of Engenius '18, Organized by AUST EEE Society
February 2018	**Champion** Hardware Showcasing of Technomania '18, AUST CSE Society