Aruna Jayasena

Hardware Security Researcher

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archfx.github.io

Interests

◇ **Hardware Verification** ◇ **Firmware Verification** ◇ **Trusted Execution** ◇ **Side-channel** ◇ **Embedded Systems** ◇ **Computer Architecture** ◇ **FPGA**

Education

University of Florida — Gainesville, FL, USA
Doctor of Philosophy, Computer Engineering — 2021-Present
GPA: 3.95/4.0

University of Moratuwa — Moratuwa, SL
Honours Degree of Bachelor of the Science of Engineering — 2015-2019
Specialisation: Computer Science and Engineering
Sub specialization: Integrated Computer Engineering
GPA: 3.74/4.0

Work Experience

Jan 2024-Present	Synopsys Inc (DesignWare Group) *Embedded Systems Engineer* | *Research and development of security engine for the automated implementation of secure silicon (AISS) project*
Jan 2021-Dec 2023	Embedded Systems Lab (University of Florida) *Graduate Research Assistant* | *Hardware security researcher (Research grants: SRC, NSF and DARPA).*
Feb-Dec 2020	Intellisense Lab (University of Moratuwa) *Graduate Research Assistant* | *Register-transfer-level designer (Research grant: AHEAD).*
June-Dec 2018	JLanka Power and Energy (Pvt) Ltd *Research Engineer* | *Power harvesting and optimizing regeneration process for lightweight hybrid propulsion systems, Real-time kinematics for sub centimeter-level accurate positioning of UAVs.*
Feb-May 2018	Peo TV- Charana Tech Talks *Program host and demonstrator* | *Discussion TV series of 7 episodes about UAVs with live demonstrations.*
Jan-Jun 2019	QEMU *Opensource Contributor* | *Code debugging, optimizing, and cleanup for several releases of the QEMU hardware virtualization platform.*

Academic Experience

Feb-Dec 2020	Teaching Assistant for CS4362: Hardware Description Languages *Department Of Computer Science and Engineering, University of Moratuwa*
Feb-Dec 2020	Project Advisor for CS3282: Industrial Computer Engineering Project *Department Of Computer Science and Engineering, University of Moratuwa*

Peer-Reviewed Journal Articles

1. Aruna Jayasena and Prabhat Mishra, "HIVE: Scalable Hardware-Firmware Co-Verification using Scenario-based Decomposition and Automated Hint Extraction", IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD), 2024.
2. Hasini Witharana, Aruna Jayasena, and Prabhat Mishra. "Sequence-Based Incremental Concolic Testing of RTL Models." ACM Transactions on Design Automation of Electronic Systems (TODAES) (2024).
3. Aruna Jayasena and Prabhat Mishra, "Directed Test Generation for Hardware Validation: A Survey", ACM Computing Surveys (CSUR), 2024.
4. Aruna Jayasena, Emma Andrews and Prabhat Mishra, "TVLA*: Test Vector Leakage Assessment on Hardware Implementations of Asymmetric Cryptography Algorithms" in IEEE Transactions on Very Large Scale Integration (VLSI) Systems, 2023.
5. Aruna Jayasena and Prabhat Mishra, Scalable "Detection of Hardware Trojans using ATPG-based Activation of Rare Events", IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD), 2023.
6. Aruna Jayasena, Binod Kumar, Subodha Charles, Hasini Witharana and Prabhat Mishra, "Network-on-Chip Trust Validation using Security Assertions", Journal of Hardware and Systems Security (HASS), 2022.
7. Hasini Witharana, Aruna Jayasena Andrew Whigham and Prabhat Mishra, "Automated Generation of Security Assertions for RTL Models", Journal on Emerging Technologies in Computing Systems (JETC), 2022.
8. Aruna Jayasena, "Register Transfer Level Disparity Generator with Stereo Vision", Journal of Open Research Software (JORS), 2021.

Conference Proceedings

1. Aruna Jayasena, Richard Bachmann and Prabhat Mishra, "EvilCS: An Evaluation of Information Leakage through Context Switching on Security Enclaves", Design Automation and Test in Europe (DATE), 2024.
2. Aruna Jayasena and Prabhat Mishra, "Design for Trust utilizing Rareness Reduction", International Conference on VLSI Design (VLSID), 2024.

3. Aruna Jayasena and Prabhat Mishra, "Towards Formal Verification of Hardware-Firmware Implementations", Semiconductor Research Corporation (SRC-TECHCON), 2023.
4. Aruna Jayasena, Khushboo Rani and Prabhat Mishra, "Efficient Finite State Machine Encoding for Defending Against Laser Fault Injection Attacks", 40th IEEE International Conference on Computer Design (ICCD), 2022.
5. Aruna Jayasena and Prabhat Mishra, "Assertion-based Security Validation of Network-on-Chip Architectures", Semiconductor Research Corporation (SRC-TECHCON), 2022.
6. Hasini Witharana, Aruna Jayasena and Prabhat Mishra, "Automated Generation of Security Assertions for RTL Models", Semiconductor Research Corporation (SRC-TECHCON), 2021.

Books

1. A. Jayasena, S. Charles and P. Mishra, Chapter "Network-on-Chip Security and Trust Verification" in Network-on-Chip Security and Privacy, Springer, 2021.

Patents

1. Prabhat Mishra, Aruna Jayasena Ranhotige, Scalable Detection of Hardware Trojans using ATPG-based Activation of Rare Events, U.S. Provisional Patent Application No. 63/582,388, filed Sept 13, 2023.
2. Prabhat Mishra, Aruna Jayasena Ranhotige, Emma Andrews, Test Vector Leakage Assessment of Asymmetric Cryptography Algorithms, U.S. Provisional Patent Application No. 63/467,784, filed May 19, 2023.
3. S. Sooriyaarachchi, C. Gamage, C. de Silva, S. Pallemulla, S. Dharmaratna, S. Ranathunga, A. Jayasena, K. Ratnayake and S. Kahawala, "Computer Vision Based Multi spectral Automatic Fabric Quality Inspection Machine with Physical Color Referencing", National ID LK/P/13468, Apr. 09, 2021.
4. S. Sooriyaarachchi, C. Gamage, C. de Silva, S. Pallemulla, S. Dharmaratna, S. Ranathunga, A. Jayasena, K. Ratnayake and S. Kahawala, "Method and Apparatus for Detecting Surface Defects", PCT International Application PCT/IB2021/052945, Apr. 09, 2021.
5. S. Sooriyaarachchi, C. Gamage, C. de Silva, S. Pallemulla, S. Dharmaratna, S. Ranathunga, A. Jayasena, K. Ratnayake and S. Kahawala, "Method and Apparatus for Detecting Surface Defects", National Patent LK/P/21709, Apr 08, 2021.

Preprints

1. Yuntao Liu, Aruna Jayasena, Prabhat Mishra and Ankur Srivastava. "Logic Locking based Trojans: A Friend Turns Foe" arXiv preprint arXiv:2302.08984 (2023).

Posters

1. Aruna Jayasena and Prabhat Mishra, Efficient Activation of Stealthy Triggers in Hardware Trojans, GOMACTech Conference, San Diego, March 20-23, 2023.
2. Khushboo Rani, Emma Andrews, Aruna Jayasena and Prabhat Mishra, Defending Elliptic Curve Cryptography against Laser Fault injection Attacks, GOMACTech Conference, San Diego, March 20-23, 2023.

Talks and Guest Lectures

1. Security Validation of Systems Implementations, PhD Forum, Design, Automation and Test in Europe Conference (DATA'24) (25 March 2024)
2. Hardware Verification and Validation: Guest Lecture (CS1050), University of Moratuwa, Department of Computer Science and Engineering, (8 June 2023)
3. Efficient Finite State Machine Encoding for Defending Against Laser Fault Injection Attacks: Talk, in IEEE International Conference on Computer Design (ICCD), Lake Tahoe, CA, (23 Oct 2022)
4. Assertion-based Security Verification of Network-on-Chips: Talk, in TECHCON 23 by Semiconductor Research Corporation (SRC), Austin, TX, (18 Sept 2022)
5. FPGA and Processor Design: Guest Lecture (CS2052), University of Moratuwa, Department of Computer Science and Engineering, (20 July 2022)
6. Future of Computer Engineering: Invited Talk, Organized by Athugalpura Leo Club, Sri Lanka, (21 Aug 2021)
7. Hardware Description Languages: Guest Lecture (CS4362), University of Moratuwa, Department of Computer Science and Engineering, (17 July 2021)
8. Drones and Future: Invited Talk, Robotics Club, University of Moratuwa, (30 Sept 2020)
9. Building Your Career as a Researcher: Invited Talk, ACM Chapter, University of Moratuwa, (10 Aug 2020)
10. Autonomous Drones in Past, Present and Future: Invited Talk, Leo Club, University of Moratuwa, Sri Lanka, (12 Sept 2018)

Professional Services

Reviewer

ACM/IEEE International Conference on Hardware/Software Codesign and System Synthesis (CODES+ISSS), 2022
IEEE Transactions on Very Large Scale Integration (VLSI) Systems, 2022
IEEE International Symposium on Hardware Oriented Security and Trust (HOST), 2023
Design, Automation and Test in Europe Conference (DATE), 2023
Springer Nature, The Journal of Supercomputing, 2024

Chairperson

Careers day : Computer Science Engineering department of University of Moratuwa , 2019
eSports gaming competition powered by gamer.lk hosted by Rotaract club of University of Moratuwa, 2017

Organizer

IESL RoboGames powered by Sri Lanka Telecom/Mobitel , 2017

Skillset

Languages:	Verilog | C | C++ | Python | Racket | Ruby | VHDL | C#
EDA Tools :	VCS | Yosys | Rosette | DC_shell | TetraMax | nextpnr | ISE | QEMU | Vivado | Quartus
CAD Tools :	Altium | KiCad | EasyEDA | EaglePCB | SolidWorks
Other :	LaTeX | Git | CI-CD | ROS | PX4 | RTOS | Jekyll | Docker | Zephyr OS | WolfSSL | ZcBor

Awards & Achievements

2024:	Gartner Group Graduate Fellowship 2024 - for outstanding CISE Ph.D. students by CISE-UF
2023:	Gartner Group Graduate Fellowship 2023 - for outstanding CISE Ph.D. students by CISE-UF
2022:	Gartner Group Graduate Fellowship 2022 - for outstanding CISE Ph.D. students by CISE-UF
2021-2025:	Full assistantship - for PhD program in Computer Science (CISE) from the University of Florida.
2018:	Million Worth Idea innovation Competition (e.i. Shark Tank) - for UAV hybrid propulsion system - 2nd runner up
2019:	Sky of Icarus Drone Competition hosted by IESL- Runner up
2015-2019:	Mahapola merit scholarship to pursue undergraduate studies by the government of Sri Lanka.
2017:	IEEEXtreme 11.0 Competition 10th place in Sri Lanka