

Rishov Sarkar

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Summary

Current Georgia Tech Ph.D. ECE candidate advised by Dr. Cong (Callie) Hao with research interests in *agile hardware development*: bringing the ease of use of software development to hardware development, especially with high-level synthesis. Graduated with Georgia Tech B.S. CmpE degree and M.S. ECE degree, both with 4.0 GPA. Six published first-author/co-first-author conference papers, including one best paper runner-up. Recognized for excellence in teaching and research with two fellowships and an award for outstanding teaching assistantship. Experienced with C/C++ development, computer architecture, and machine learning.

Honors

Awarded Best Paper Runner-Up at [31st IEEE International Symposium on FCCM](#) May 2023

- [Rishov Sarkar](#), Cong Hao, "LightningSim: Fast and Accurate Trace-Based Simulation for High-Level Synthesis"

Winner of [2022 Qualcomm Innovation Fellowship](#) August 2022

- [Rishov Sarkar](#), Zhiwen Fan, "Real-time Visual Processing for Autonomous Driving via Video Transformer with Data-Model-Accelerator Tri-design"

Winner of [2022 CRNCH Ph.D. Fellowship](#) August 2022

- [Rishov Sarkar](#), Cong Hao, "Hyperscale Distributed GNN Training with Tri-Design: Near-Storage, Device, and System"

Awarded Best Demonstration 3rd Place at [University Demonstration at DAC 2022](#) July 2022

- [Rishov Sarkar](#), Hanxue Liang, Zhiwen Fan, Zhangyang Wang, Cong Hao, "Memory-Efficient FPGA Architecture for Multi-Task Vision Transformer using Mixture-of-Experts"

Publications

Accepted at [31st Asia and South Pacific Design Automation Conference \(ASP-DAC\)](#) January 2026

- Stefan Abi-Karam, [Rishov Sarkar](#), Suhail Basalama, Jason Cong, Cong Hao, "FIFOAdvisor: A DSE Framework for Automated FIFO Sizing of High-Level Synthesis Designs"

Published at [58th IEEE/ACM International Symposium on Microarchitecture \(MICRO\)](#) October 2025

- [Rishov Sarkar](#), Cong Hao, "OmniSim: Simulating Hardware with C Speed and RTL Accuracy for High-Level Synthesis Designs"

Published at [6th ACM/IEEE International Symposium on Machine Learning for CAD \(MLCAD\)](#) September 2024

- Stefan Abi-Karam, [Rishov Sarkar](#), Allison Seigler, Sean Lowe, Zhigang Wei, Hanqiu Chen, Nanditha Rao, Lizy John, Aman Arora, Cong Hao, "HLSFactory: A Framework Empowering High-Level Synthesis Datasets for Machine Learning and Beyond"
 - Awarded Best Paper
 - Nominated for Distinguished Artifact Award

Published at [32nd IEEE International Symposium on Field-Programmable Custom Computing Machines \(FCCM\)](#) May 2024

- [Rishov Sarkar](#), Rachel Paul, Cong Hao, "LightningSimV2: Faster and Scalable Simulation for High-Level Synthesis via Graph Compilation and Optimization"

Published at [42nd IEEE/ACM International Conference on Computer-Aided Design \(ICCAD\)](#) November 2023

- Stefan Abi-Karam*, [Rishov Sarkar*](#), Dejia Xu, Zhiwen Fan, Zhangyang Wang, Cong Hao, "INR-Arch: A Dataflow Architecture and Compiler for Arbitrary-Order Gradient Computations in Implicit Neural Representation Processing"
- [Rishov Sarkar](#), Hanxue Liang, Zhiwen Fan, Zhangyang Wang, Cong Hao, "Edge-MoE: Memory-Efficient Multi-Task Vision Transformer Architecture with Task-level Sparsity via Mixture-of-Experts"

Published at [31st IEEE International Symposium on Field-Programmable Custom Computing Machines \(FCCM\)](#) May 2023

- [Rishov Sarkar](#), Cong Hao, "LightningSim: Fast and Accurate Trace-Based Simulation for High-Level Synthesis"
 - Awarded Best Paper Runner-Up

Published at [29th IEEE International Symposium on High-Performance Computer Architecture \(HPCA\)](#) February 2023

- [Rishov Sarkar](#), Stefan Abi-Karam, Yuqi He, Lakshmi Sathidevi, Cong Hao, "FlowGNN: A Dataflow Architecture for Real-Time Workload-Agnostic Graph Neural Network Inference"

Published at [36th Conference on Neural Information Processing Systems \(NeurIPS\)](#) November 2022

- Hanxue Liang, Zhiwen Fan, [Rishov Sarkar](#), Ziyu Jiang, Tianlong Chen, Kai Zou, Yu Cheng, Cong Hao, Zhangyang Wang, "M³ViT: Mixture-of-Experts Vision Transformer for Efficient Multi-task Learning with Model-Accelerator Co-design"

Presented at [4th International Workshop on Domain Specific System Architecture \(DOSSA\)](#) April 2022

- [Rishov Sarkar](#), Cong Hao, "A Generic FPGA Accelerator Framework for Ultra-Fast GNN Inference"

Research

[Software/Hardware Co-Design for Intelligence and Efficiency \(SharC Lab\)](#) — Georgia Tech August 2021–present

Research in FPGA acceleration for machine learning models using high-level synthesis (HLS) and better tooling for HLS

- Developed first generic FPGA accelerator framework for graph neural network inference, up to 477× faster than GPU
- Developed first Vision Transformer implementation on FPGA
- Developed novel tools to simulate high-level synthesis designs up to two orders of magnitude faster

[Fiber-Wireless Integration and Networking \(FiWIN\)](#) — Georgia Tech January 2021–August 2021

Research in low-latency mobile edge computing systems for 5G and 6G mobile networks

- Wrote P4 code to generate responses to "blind-box" requests from autonomous cars
- Wrote pcap analysis tools in Python to evaluate system performance
- Worked on setting up a wireless testbed for future experiments

Education

[Georgia Institute of Technology](#) — Atlanta, GA August 2017–present

- Ph.D. program in Electrical and Computer Engineering (ongoing) — GPA: 4.0/4.0
 - Advisor: [Dr. Cong \(Callie\) Hao](#)
- Joint B.S./M.S. program in Computer Engineering
 - M.S. graduation in May 2021 — GPA: 4.0/4.0
 - B.S. graduation in May 2020, with Minor in Robotics — GPA: 4.0/4.0
 - Awarded Honors Program distinction
 - ECE Senior Scholar Award recipient

Experience

Engineering Internship at [Siemens EDA](#) — Wilsonville, OR May 2025–August 2025

Development of Catapult HLS, an industry-leading high-level synthesis tool for FPGA and ASIC chip design

- Worked on an experimental LLVM-based compilation flow for the Catapult HLS tool
- Presented an introductory lecture on LLVM to an audience of more than 20 engineers
- Developed novel tooling for visualizing an internal format used by Catapult HLS for its synthesis process

Engineering Internship at [AMD](#) — San Jose, CA May 2023–December 2024

Development of simulator for AMD's AI Engine, a programmable accelerator for machine learning applications

- Adapted concepts from LightningSim to accelerate simulation of AI Engine applications

Graduate Teaching Assistant for [Advanced Computer Architecture](#) — Atlanta, GA August 2021–December 2021

Georgia Tech's advanced architecture course: branch predictors, superscalar pipelines, out-of-order execution, multi-level caches...

- Sole TA for a class of nearly 70 students, including 8 distance-learning students
- Created all-new materials and presented them at weekly recitation sessions
- Received 2022 ECE Graduate Teaching Assistant of the Year award

Undergraduate Teaching Assistant for [C/MIPS Programming Course](#) — Atlanta, GA January 2019–May 2020

Georgia Tech's course for sophomores in ECE on C and MIPS assembly programming with a focus on efficiency

- Held office hours for one-on-one tutoring for a class of over 100 students
- Held review sessions for large groups of about 50 students
- Created resources to explain specific challenging topics that are still being used in the class today

- Software Engineering Internship at smash.gg — Atlanta, GA** May 2019–August 2019
Online esports platform used by thousands of organizers to run 30,000+ competitive gaming events per year
- Developed website frontend in React, backend in Node.js and PHP
 - Improved webpack build times by 50%
 - Integrated external payments platform to process payments directly on the site
- Software Engineering Internship at [Crystal](https://crystal.tv) — Duluth, GA** May 2018–August 2018
Development of web interface for next version of Crystal software for managing broadcast television
- Created plugins for Cockpit web interface on CentOS using React
 - Developed web UI as an Angular app featuring a custom dynamic module loader
 - Enhanced Node.js server for Angular web UI
- Production of server systems for processing of broadcast television and internet video* January 2017–July 2017
- Wrote internal knowledgebase articles to facilitate onboarding of new employees
 - Programmed software tools in Python to automate production processes
- Software Engineering Internship at [Flex](https://flex.com) — Norcross, GA** June 2016–August 2016
Development of the Box Enki, a smart home internet-of-things (IoT) gateway device for Leroy Merlin, France
- Programmed an IoT gateway in C and C++ to communicate wirelessly via EnOcean protocol
- Development of the Wink Hub, a smart home IoT gateway device for Home Depot* June 2014–August 2014
- Automated quality-assurance testing for an IoT gateway using bash shell scripts
- Software Engineering Internship at [HighPoints Learning](https://highpointslearning.com) — Duluth, GA** June 2013–July 2013
Development of online mathematics learning program
- Wrote HTML5, JavaScript, and CSS code to create interactive demos for math concepts

Coursework

- Reliability and Security in Computer Architecture — CS 7292 at Georgia Tech — Grade: A** Fall 2021
A course on approaches to hardware reliability and hardware security, including an independent research project evaluating the reliability of a hardened memory system
- Online Decision Making in Machine Learning — ECE 8803 ODM at Georgia Tech — Grade: A** Fall 2021
A course on the design of machine learning algorithms for online learning to make optimal decisions in real time, including a two-person research project evaluating the performance of multi-armed bandit algorithms
- Hardware-Oriented Security and Trust — ECE 8803 HST at Georgia Tech — Grade: A** Spring 2021
A course on hardware-based approaches to cybersecurity, involving coding C simulators and VHDL designs of cryptographic functions
- High Performance Computer Architecture — ECE 6100 at Georgia Tech — Grade: A** Fall 2020
A course on advanced computer architecture, involving programming C++ simulators for advanced CPU features like branch prediction, superscalar pipelines, out-of-order execution, and multi-level caches
- Advanced Programming Techniques — ECE 6122 at Georgia Tech — Grade: A** Fall 2020
A course on advanced C++ coding techniques, including multithreading, sockets, and GPU programming
- Embedded Systems Design — ECE 4180 at Georgia Tech — Grade: A** Spring 2020
A lab-based course on C and C++ programming of embedded devices, e.g., ARM mbed and Raspberry Pi
- Topics in Networks — ECE 4605 at Georgia Tech — Grade: A** Spring 2020
A course focused on applying machine learning concepts to problems in computer networks
- Introduction to Computer Vision — CS 4476 at Georgia Tech — Grade: A** Fall 2019
A course on computer vision techniques with a focus on practical machine-learning-based approaches using PyTorch
- Computer Architecture, Concurrency, and Energy — ECE 3056 at Georgia Tech — Grade: A** Spring 2019
A course on introductory computer architecture, including designing a pipelined MIPS processor in VHDL

Digital Design Lab — ECE 2031 at Georgia Tech — Grade: A	Fall 2018
<i>A hands-on introduction to hardware design, culminating in assembly programming of a custom CPU written in VHDL</i>	
Programming Hardware/Software Systems — ECE 2035 at Georgia Tech — Grade: A	Fall 2018
<i>A course on low-level programming using C and MIPS assembly with a focus on efficiency</i>	
Engineering Software Design — ECE 2036 at Georgia Tech — Grade: A	Fall 2018
<i>Georgia Tech's first course to introduce C++ programming concepts</i>	

Projects

<u>Web-based Software 3-D Renderer</u>	June 2020
<i>Built interactive in-browser 3-D engine using 2-D graphics APIs for class project only asking for code to draw static frames</i>	
• Wrote a NumPy-like library in TypeScript for high-performance matrix algebra • Personally commended by professor for “amazing” work	
<u>Conceptual Introduction to Machine Learning</u>	January 2020
<i>Authored a document explaining basic machine learning concepts, such as neurons, gradient descent, and training</i>	
• For classmates in ECE 4605 “Topics in Networks,” most of whom had no background in machine learning • Posted to the class’s Piazza forum and received positive feedback from classmates	
<u>T-Mobile “Closer to the Customer” Hackathon</u> — Placed 2 nd out of 22 entries	March 2019
<i>Built T-Gist, a web app that uses natural language processing to transcribe only the important lines of customer support calls and assess customer satisfaction, in a 21-hour time-limited competition</i>	
• Built using Microsoft Azure APIs, HTML5, JavaScript, CSS, WebSockets	
<u>HackGT Presents: BuildGT 2</u> — Placed 1 st out of 41 entries	March 2019
<i>Built ROOMBalling, a game of virtual bowling with a Roomba, in a 13-hour time-limited competition</i>	
• Integrated a Raspberry-Pi-controlled Roomba, a Kinect-based vision system, and a web UI • Built using Python, Processing, HTML5, JavaScript, CSS, WebSockets	
<u>Final Project for C/MIPS Programming Course</u>	December 2018
<i>Built Treasure Hunt, a quest game on the ARM mbed platform using several hardware modules</i>	
• Interfaces with an LCD screen, a speaker, an SD card reader, three push buttons, and an accelerometer • Features sound effects, over 20 image sprites, and a difficulty selector that changes a room’s layout • Developed using C code and custom Python scripts to generate C code for dialogue and image sprites	
<u>Digital Design Lab Final Project</u> — Placed 3 rd out of 45 teams	November 2018
<i>Programmed a robot to drive to a predetermined location inside a room</i>	
• Wrote assembly code to compute the robot’s position and heading based on sonar readings • Developed a simulator for the robot’s processor in TypeScript and React	
<u>HackGT Presents: BuildGT</u> — Recognized as best beginner project	March 2018
<i>Built Hole Blind, a VR game inspired by Hole in the Wall, in a 12-hour time-limited competition</i>	
• Integrated a Raspberry Pi server, a Kinect skeletal tracking system, and a VR app built in Unity • Built with C#, C++, Python, JavaScript, OpenCV, WebSockets	
<u>picoCTF 2017</u> — Placed 127 th out of several thousand competitors	April 2017
<i>Competed in Carnegie Mellon University’s cybersecurity capture-the-flag challenge aimed at teams of high schoolers</i>	
• Competed as an individual in my senior year of high school	
<u>RoboJackets TE Session</u>	October 2016
<i>Made a presentation to robotics teams on how to develop machine vision solutions for robots, which has 1.7K views</i>	
• Presented work in machine vision using OpenCV on Raspberry Pi to identify visual targets	

Skills

Programming: High-Level Synthesis, Python, C, C++, C#, Java, Node.js, Wolfram Language, MATLAB
Low-level: LLVM IR, MIPS Assembly, VHDL
Software: Vitis HLS, Vivado, PyTorch, Git, Perforce, LaTeX, Quartus II, ROS, Microsoft Office
Embedded: PYNQ, ARM mbed, Raspberry Pi, Arduino, BeagleBone Black, NVIDIA Jetson Nano, NI roboRIO
Web design: HTML5, CSS, JavaScript, TypeScript, PHP, React, Redux, Angular, Bootstrap, SQL (MySQL)
Platforms: Linux (Ubuntu, Debian, RHEL, CentOS), Windows, macOS, Cloudflare, AWS, GCP
Networking: HTTP, TCP, UDP, IP, DHCP, DNS, mDNS (Avahi/Zeroconf)