Arjun Ramesh

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RESEARCH STATEMENT

I specialize in **virtual machines** and **compilers** with an embedded systems flavor. Driven by a bottom-up approach, my research rethinks the software architecture for resource-constrained edge systems around bytecode virtualization to bring modern programmability and deep-stack observability at minimal performance costs.

EDUCATION

Carnegie Mellon University — VMs, Compilers, Distributed/Edge Computing, OS, Networking — *Aug 2021 - Present (Exp.: Jun 2026)*
PhD+MS, Electrical & Computer Engineering

The University of Texas at Austin — Comp. Arch., Algorithms, Embedded, RTOS, VLSI, HW/SW Parallelism — *Aug 2017-2021, GPA: 4.00*
BS, Electrical & Computer Engineering

PUBLICATIONS

Empowering WebAssembly with Thin Kernel Interfaces — *EuroSys '25*
A. Ramesh, T. Huang, B. Titzer, A. Rowe — *Virtualization, OS*

Unveiling Heisenbugs with Diversified Execution — *Talk* | *OOPSLA '25*
A. Ramesh, T. Huang, J. Riar, B. Titzer, A. Rowe — *SW Testing, Edge Systems*

Silverline: Virtualization and Orchestration of Distributed Systems — *RTAS '25*
A. Ramesh et. al (Bosch Research Team) — *Distributed, Real-Time Edge*

Edge Runtime Prediction using Conformal Matrix Completinon — *MLSys '25*
T. Huang, *A. Ramesh*, E. Ruppel, N. Pereira, A. Rowe, C. Joe-Wong — *Machine Learning, Edge Systems*

INVITED TALKS

Time Travel Debugging for WebAssembly	Wasm Research Day	*Oct '25*
Towards Holistic Observability of Edge CPS	Wasm Research Day	*Talk* | *Feb '25*
Unveiling CPS Heisenbugs at Scale	Bosch RDS Tech Colloquium	*Oct '24*
Leveraging WebAssembly as a Debugging Target	Wasm Research Day	*Talk* | *Jun '24*
Leveraging WebAssembly Instrumentation	Wasm Research Day	*Talk* | *Oct '23*
Giving the Cloud an Edge with WebAssembly	Wasm Research Day	*Oct '22*

HONORS AND SCHOLARSHIPS

Charles W. and Margaret A. Tolbert Scholarship	High Merit in Engineering	*Fall '20*
Centaur Technology Scholarship	Summer 2019 Internship Package	*Fall '19*
Ray Fisher Memorial Scholarship	High Merit University-Wide	*Fall '19*
UT Austin University Honors	Exemplary GPA (4.0) standing	*Fall '17 - Spr '20*

ACADEMIC EXPERIENCE

University Teaching Assistant

Virtual Machines and Managed Runtimes	*Ben Titzer, CMU*	*Fall '24*
Distributed Embedded Systems	*Anthony Rowe, CMU*	*Fall '22*
Computer Architecture	*Yale Patt, UT*	*Fall '20*
Introduction to Computing Systems	*Yale Patt, Ramesh Yerraballi, UT*	*Fall '19, '18*

Introduction to Embedded Systems *Jonathan Valvano, UT* *Spr '19*

INDUSTRY EXPERIENCE

Programmability Intern — *F5 Inc., Office of the CTO (San Jose, CA)* *Jun-Aug 2025*
Built efficient record/replay feature in Wasmtime compiler to enable time-travel debugging

IoT Cloud and Edge Integration Intern — *Bosch Research (Pittsburgh, PA)* *Jun-Aug 2022*
Designed an edge-orchestration framework (Silverline) for real-time industrial automation

GPU Design Verification Intern — *Apple Inc. (Austin, TX)* *Jun-Aug 2020*
Memory hierarchy testing improvements (speed/coverage); UVM testbenches for M2 Graphics

CPU Design Verification Intern — *Centaur Technology Inc. (Austin, TX)* *May-Aug 2019*
Memory testing tools for x86/AVX-512 chip and live analysis of CPU exception events

Software Engineering Intern — *Qube Cinema Inc. (Chennai, India)* *Jun-Aug 2018*
RNN transfer learning for seat occupancy detection at movie theaters

Machine Learning Intern — *Lucid Imaging Pvt. Ltd. (Bangalore, India)* *Jun-Aug 2018*
Transfer learning of CNNs for polypropylene detection in cotton production lines

TECHNICAL PROJECTS

Vision-Based Localization Framework *Dec 2021*
Android app to localization of users on CMU campus using environment triangulation Talk | Poster

RISC-V CPU Design and ISA Extension *Apr 2021*
Out-of-order RISC-V CPU with custom extensions to accelerate hashsets and graph search Talk | GH

Recreating the First FPGA (XC2064) *Dec 2020*
8x8 CLB FPGA design in Structural Verilog with GUI-based bitstream generation tool GH

Cellular Automata Survey Paper *May 2020*
Local 1D pattern formation and checkability theorems in cellular automata Paper

The JASP Cellular Phone *Dec 2019*
Cellphone designed from scratch with call+text; Won the popular vote in class project showcase GH

RTOS Design on Bare-Metal Microcontroller *Apr 2020*
Fully featured with process loading, priority scheduling, FAT filesystem, and wireless RPCs Talk

Texas CreateAThon (Building Innovative Solutions) *Spr '19, Spr '18*
RecycleMe: Real-time waste segregation with offloaded CNN classification *2019* | GH
ChariIoT: Localizable chair platform with IMU-based displaced tracking *2018* | GH

Home-Unity App *Feb 2019*
Ecosystem to improve food/shelter provisioning for homeless; Two 1st place awards Dev | GH

Stick Fighter Embedded System Game Design *Nov 2017*
Two-player fighter game (on TI μC) with custom controller hardware, music, and graphics GH