

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 <i>PhD+MS, Electrical & Computer Engineering</i>	VMs, Compilers, Distributed/Edge Computing, OS, Networking	<i>Aug 2021 - Present</i> (Exp.: Jun 2026)
The University of Texas at Austin <i>BS, Electrical & Computer Engineering</i>	Comp. Arch., Algorithms, Embedded, RTOS, VLSI, HW/SW Parallelism	<i>Aug 2017-2021</i> GPA: 4.00

PUBLICATIONS

Empowering WebAssembly with Thin Kernel Interfaces <i>A. Ramesh, T. Huang, B. Titzer, A. Rowe</i>	 EuroSys '25 <i>Virtualization, OS</i>
Unveiling Heisenbugs with Diversified Execution <i>A. Ramesh, T. Huang, J. Riar, B. Titzer, A. Rowe</i>	 Talk  OOPSLA '25 <i>SW Testing, Edge Systems</i>
Silverline: Virtualization and Orchestration of Distributed Systems <i>A. Ramesh et. al (Bosch Research Team)</i>	 RTAS '25 <i>Distributed, Real-Time Edge</i>
Edge Runtime Prediction using Conformal Matrix Completion <i>T. Huang, A. Ramesh, E. Ruppel, N. Pereira, A. Rowe, C. Joe-Wong</i>	 MLSys '25 <i>Machine Learning, Edge Systems</i>

INVITED TALKS

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

HONORS AND SCHOLARSHIPS

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

ACADEMIC EXPERIENCE

University Teaching Assistant		
Virtual Machines and Managed Runtimes	<i>Ben Titzer, CMU</i>	<i>Fall '24</i>
Distributed Embedded Systems	<i>Anthony Rowe, CMU</i>	<i>Fall '22</i>
Computer Architecture	<i>Yale Patt, UT</i>	<i>Fall '20</i>
Introduction to Computing Systems	<i>Yale Patt, Ramesh Yerraballi, UT</i>	<i>Fall '19, '18</i>

INDUSTRY EXPERIENCE

Programmability Intern — <i>F5 Inc., Office of the CTO (San Jose, CA)</i>	<i>Jun-Aug 2025</i>
Built efficient record/replay feature in Wasmtime compiler to enable time-travel debugging	
IoT Cloud and Edge Integration Intern — <i>Bosch Research (Pittsburgh, PA)</i>	<i>Jun-Aug 2022</i>
Designed an edge-orchestration framework (Silverline) for real-time industrial automation	
GPU Design Verification Intern — <i>Apple Inc. (Austin, TX)</i>	<i>Jun-Aug 2020</i>
Memory hierarchy testing improvements (speed/coverage); UVM testbenches for M2 Graphics	
CPU Design Verification Intern — <i>Centaur Technology Inc. (Austin, TX)</i>	<i>May-Aug 2019</i>
Memory testing tools for x86/AVX-512 chip and live analysis of CPU exception events	
Software Engineering Intern — <i>Qube Cinema Inc. (Chennai, India)</i>	<i>Jun-Aug 2018</i>
RNN transfer learning for seat occupancy detection at movie theaters	
Machine Learning Intern — <i>Lucid Imaging Pvt. Ltd. (Bangalore, India)</i>	<i>Jun-Aug 2018</i>
Transfer learning of CNNs for polypropylene detection in cotton production lines	

TECHNICAL PROJECTS

Vision-Based Localization Framework	<i>Dec 2021</i>
Android app to localization of users on CMU campus using environment triangulation	 Talk  Poster
RISC-V CPU Design and ISA Extension	<i>Apr 2021</i>
Out-of-order RISC-V CPU with custom extensions to accelerate hashsets and graph search	 Talk  GH
Recreating the First FPGA (XC2064)	<i>Dec 2020</i>
8x8 CLB FPGA design in Structural Verilog with GUI-based bitstream generation tool	 GH
Cellular Automata Survey Paper	<i>May 2020</i>
Local 1D pattern formation and checkability theorems in cellular automata	 Paper
The JASP Cellular Phone	<i>Dec 2019</i>
Cellphone designed from scratch with call+text; Won the popular vote in class project showcase	 GH
RTOS Design on Bare-Metal Microcontroller	<i>Apr 2020</i>
Fully featured with process loading, priority scheduling, FAT filesystem, and wireless RPCs	 Talk
Texas CreateATHon (Building Innovative Solutions)	<i>Spr '19, Spr '18</i>
<i>RecycleMe</i> : Real-time waste segregation with offloaded CNN classification	<i>2019</i>  GH
<i>ChariIoT</i> : Localizable chair platform with IMU-based displaced tracking	<i>2018</i>  GH
Home-Unity App	<i>Feb 2019</i>
Ecosystem to improve food/shelter provisioning for homeless; Two 1 st place awards	 Dev  GH
Stick Fighter Embedded System Game Design	<i>Nov 2017</i>
Two-player fighter game (on TI μ C) with custom controller hardware, music, and graphics	 GH