

HAMED SEYEDROUDBARI

US Citizen

hamed@gatech.edu | +1 (424) 777-5443 | hamedsey.github.io

OBJECTIVE

Seeking full-time opportunities to research and develop forms of in-network computing to accelerate latency-sensitive datacenter workloads.

EDUCATION

2019 - present Ph.D. - Electrical and Computer Engineering – **GPA 4.0**

- Georgia Institute of Technology, Atlanta, GA
- Research Advisor: Dr. Alexandros Daglis
- Topic: Enabling an efficient network with SmartNICs to accelerate latency-critical online services.

2015 - 2019 B.S. - Computer Engineering – **GPA 3.93**

- California State University, Northridge (CSUN), Northridge, CA

EMPLOYMENT

2020 - present Graduate Research Assistant – Georgia Tech, Atlanta, GA

Exploring in-network compute offloads onto SmartNICs

1. Load Balancing μ s-scale RPCs (published at HPCA'23)
 - Insight: μ s-scale RPCs require immediate load imbalance detection and remediation mechanism operating on a per-packet granularity.
 - Adaptive load balancing intelligently steers packets to user space queues at line rate, improving throughput under SLO and reducing tail latency.
 - Implemented on Mellanox Innova Flex-4 FPGA SmartNIC
 - Evaluated on RDMA (UD/UC/RC) microbenchmark and Masstree-RDMA key-value store with various service time distributions.
2. Data Movement (on ArXiv)
 - Insight: Moving packets across PCIe increases contention and PCIe interface latency.
 - Shallow network functions only require packet header for processing.
 - Implemented FPGA emulation of mechanism to slice packet into header and payload on ingress, sending only the header to the host, storing payload on the NIC. Payload is spliced back to header on egress.
 - Enabling payload slicing eliminates PCIe data movement bottlenecks between the NIC and server, reducing tail response latency.
3. Notification mechanism to assist CPU in handling RDMA connections
 - Insight: Locating work is expensive with RDMA queues. Polling, inter-core synchronization overheads are prohibitive in handling μ s-scale services.
 - Designed and implemented SmartNIC mechanism to notify cores of active RDMA connections, and balance RDMA connections across CPU cores.

- 2024 Research Scientist – Microsoft (Remote)
- Optimize RDMA networks to extract peak network utilization for AI workloads by investigating loss recovery mechanisms when packets arrive mis-ordered.
 - Develop simulator in SystemC to simulate and analyze NIC-based loss recovery mechanisms (i.e., go-back-n, selective retransmit) for a RDMA/RoCE network.
 - Analyze performance by tuning simulator knobs (e.g., receiver queue depth, memory latency, link latency, timeout) and observing metrics such as flow completion time and tail latency.
 - Propose NIC architectural optimizations to enable support for recovery from multi-path packet losses.
- 2022 Research Intern (Systems) – Arm Research, Austin, TX
- Developed high performance RDMA, RoCE based microbenchmark to identify system bottlenecks (outperforming state-of-the-art perfest from NVIDIA UCX library).
 - Characterized performance of BlueField-2 DPU in terms of peak sustainable throughput and communication latency and gauged its potential as a candidate for accelerating latency critical workloads.
 - Demonstrated the Bluefield-2 DPU can boost server’s peak sustained throughput by 66% without incurring additional cost for cloud service provider.

TECHNICAL SKILLS

Programming Language : C, C++, SystemC, Python
HDL : Verilog, SystemVerilog
Toolchain : Xilinx Vivado, HLS, Vitis, Synopsys VCS, Design Compiler
NIC Platforms : Mellanox InnoVA Flex-4 SmartNIC, Bluefield-2 DPU
Computer Networks : Ethernet, RDMA, RoCE, IBVerbs, BGP, TCP/IP, UDP

FELLOWSHIPS/AWARDS

2019 President’s Fellowship, Georgia Tech
2019 Outstanding Graduating Senior Award, CSUN
2018 Outstanding Student Employee Award, CSUN
2018 STEM Advantage Scholar
2018 Robert Sprague Foundation Scholarship
2017, 2018 University Scholarship, CSUN
2016 James R. Simpson Merit Scholarship, CSUN
2015 Honors at Entrance Scholarship, CSUN

PUBLICATIONS

[Turbo: SmartNIC-enabled Dynamic Load Balancing of \$\mu\$ s-scale RPCs](#)

H. Seyedroudbari, S. Vanavasam, A. Daglis

IEEE International Symposium on High-Performance Computer Architecture (HPCA 2023)

[NFSlicer: Data Movement Optimization for Shallow Network Functions](#)

A. Sarma, **H. Seyedroudbari**, H. Gupta, U. Ramachandran, A. Daglis

ArXiv, March 2022