Rajath Shashidhara

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Education

University of Washington — **Seattle, WA**
Ph.D. Computer Science — *Starting Jan 2022*

The University of Texas at Austin — **Austin, TX**
Ph.D. Computer Science — *2021–2025*
Advisor: Dr. Simon Peter
Areas: Systems & Networking

The University of Texas at Austin — **Austin, TX**
M.S. Computer Science, GPA: 4.0/4.0 — *2019–2021*

Birla Institute of Technology and Science — **Pilani, India**
M.Sc. Physics + B.E. Computer Science, GPA: 9.01/10 Distinction Class — *2012–2017*
Awarded **Best Student of Batch 2017**
Advisors: Dr. Tapomoy Guha Sarkar & Prof. Sundar Balasubramaniam

Research Experience

The University of Texas at Austin — **Austin, TX**
Graduate Research Assistant — *2019–Present*
Advisor: Dr. Simon Peter

Flexible TCP offload to programmable SmartNICs with Fine-grained Parallelism (**in review**)
- Full stateful offload of TCP packet processing to SmartNIC – frees CPU cores from TCP overhead.
- Data transfer directly from application memory to wire, eliminating OS and context switch overheads.
- Memcached scales up to 38% better versus TAS, while saving 81% CPU cycles versus Chelsio ToE.

Distributed file systems with Client-Local NVMs
- Scaling client-local NVM filesystems like Assise beyond rack-scale.
- In-network caching, coordination and coherence mechanisms on programmable switches.

Distributed key-value store with co-located Serverless compute
- Aggregate compute and storage to exploit data locality.
- Improves execution time of serverless compilation workloads by 1.6x and 5x reduction in data movement compared to conventional disaggregated deployments.

SRoCE: Software RDMA over Commodity Ethernet
- Software-based flexible RDMA verbs implementation using high performance user-space TCP stack.
- Achieved 3x single-connection throughput for one-sided 1000 bytes RDMA ops as compared to H/W RDMA NICs.

Improving connection scalability of TAS: datacenter TCP stack
- Increased throughput by 10% at 100k connections by improving TCP pacing and congestion control.

Samsung Research — **Bangalore, India & Suwon, South Korea**
Senior Software Engineer (Research) — *2017–2019*
Advisors: Anshuman Nigam & Dr. Dojun Byun

5G Radio Access Network data-plane R&D
- Involved in the development of world's first pre-5G mobile user equipment.
- Data-plane technical support for the 5G demo at *Winter Olympics (South Korea, 2018).*
- *Parallelization, memory management and flow control* research: improved throughput, ultra-low latency reliable transport, and reduced memory footprint on 5G Distributed Units.

Reinforcement Learning based radio-resource schedulers
- Modeled scheduling as a Partially Observable Markov Decision Process to solve multi-objective optimization in stochastic input-driven environments. (GLOBECOM'20)

Birla Institute of Technology and Science **Pilani, India**
Research Student *2015–2016*
Advisor: Dr. Tapomoy Guha Sarkar
Studying Quantum Chaos in Aubry-André-Harper electron systems
- Studied phase transitions in Hofstadter's butterfly under time-varying magnetic field and the relationship between topological invariants and Hall conductivity. (PhysRevA'16)
- Simulated and computationally evaluated solutions to Schrodinger's equation for special quantum systems using perturbation methods and computational physics algorithms.

Advisor: Prof. Sundar Balasubramaniam
Fast semantic matching of strings in Context-Free Grammars
- Designed a framework to develop semantic hash functions of parse trees in domain-specific CFGs.
- Demonstrated the efficiency and expressiveness by finding semantic duplicates in a large XML DB.

National Central University **Zhongli, Taiwan**
Undergraduate Research Assistant *Summer 2015*
Advisor: Dr. Ko Chung-Ming
Gravitational lensing in elliptical galaxies
- Analytically derived the gravitational lensing equation for elliptical galaxies.
- Developed a *distributed recursive sub-gridding* algorithm to numerically simulate the lensing.

Industry Experience

Confluent **Mountain View, CA**
Software Engineering Intern *Summer 2020*
Kubernetes control plane for deployment life-cycle management of Kafka clusters.
Designed *safe and seamless live migration* of Kafka deployments with no service disruption.

Symantec **Bangalore, India**
Software Engineering Intern *Spring 2017*
Designed a proof-of-concept cloud-ready web application to automate purchase, delivery & installation of SSL certificates for services hosted on Amazon AWS.

Microsoft R&D **Hyderabad, India**
Software Engineering Intern *Summer 2016*
Integrated Azure AD cloud authentication/authorization service into ASP.NET Core.

Bhaskaracharya Institute for Space Applications and Geoinformatics **Gujarat, India**
Summer Intern *Summer 2014*
Developed image processing software for stitching and geo-registration of large satellite images.

Google Summer of Code **Apache Software Foundation**
Open-source Intern *Summer 2013*
Document version-control toolbar integrated with cloud repositories in Apache OpenOffice.

Projects

IoT enabled Laboratory Environment: Project SmartLAB **BITS, Pilani**
Undergraduate Researcher *2012-2013*
Proactive lab monitoring and activity tracking using sensor networks, speech and gesture recognition
- Awarded *Prof. I J Nagrath Student Project Fund* by Dept. of Electrical Engineering, BITS Pilani.
- Won 2nd place in *Siemens Home Automation challenge*.
- Blog: https://smartlabbits.wordpress.com

Awards

Best Student of Batch 2017: adjudged by Dept. of Physics, BITS Pilani

BITS Pilani MCN Scholarship: 80% tuition fee waiver for all semesters (top 5% in a batch of 800 students)

Prof. I J Nagrath Student Project Fund: awarded by BITSAA & Dept. of EE, BITS Pilani

Samsung Annual Excellence Awards: organization-wide award for technical excellence

Samsung Professional Software Competency: held by $< 10\%$ employees globally when obtained

Service

EuroSys 2022: Shadow PC

Preprints

Rajath Shashidhara, Timothy Stamler, Antoine Kaufmann, and Simon Peter.
FlexTOE: Flexible TCP Offload with Fine-Grained Parallelism.
arXiv: 2110.10919, Oct 2021.

Publications

Jitender Singh Shekhawat, Rishabh Agrawal, K Gautam Shenoy, and Rajath Shashidhara.
A Reinforcement Learning framework for QoS-driven radio resource scheduler.
IEEE Global Communications Conference (GLOBECOM), Dec 2020.
DOI: 10.1109/GLOBECOM42002.2020.9322182

Tridev Mishra, Rajath Shashidhara, Tapomoy Guha Sarkar and Jayendra N. Bandyopadhyay.
Phase transition in an Aubry-André system with a rapidly oscillating magnetic field.
APS Physical Review A, Nov 2016.
DOI: 10.1103/PhysRevA.94.053612

Theses

TASNIC: a flexible TCP offload with programmable SmartNICs.
Master's Thesis, *The University of Texas at Austin*, May 2021.
DOI: 10.26153/tsw/14442

Driven Aubry-André-Harper systems.
Master's Thesis, *Birla Institute of Technology and Science, Pilani*, Dec 2016

Skills

Languages: C/C++, Java, Python (+numpy/matplotlib/PyTorch), Go, Julia, LaTeX, P4, JavaScript

Frameworks: MPI, OpenMP, Pthreads, DPDK, NodeJS, Kubernetes

Tools: git, gdb, make, valgrind, strace, perf, qemu–kvm

Last updated on October 28, 2021.