






Shubham Tiwari

PhD student, University of Washington

 sbhtwr.github.io  tshubham@cs.washington.edu  github.com/sbhtwr  Google Scholar
 +1 (206) 853-0284

Research Interests

Broadly interested in the intersection of distributed systems and machine learning. Recently, I have been working on improving the efficiency of serving models. Previously, I have worked on a broad spectrum of problems, for example: memory management optimizations in hypervisors, network measurement, and congestion control ([LEOScope](#), [iBox](#)).

Education

University of Washington, Seattle Sept 2023 - Present
Ph.D. in Computer Science (*ongoing*)
Advisors: Simon Peter, Ratul Mahajan

Birla Institute of Technology and Science (BITS), Pilani Aug 2016 - July 2021
B.E. Computer Science and M.Sc. Mathematics, CGPA: 8.52
Thesis: *Data-Driven Network Simulation with iBox*

Experience

Microsoft Research, Redmond June 2024 - Sept 2024
Research Intern with Ishai Menache
Project: Improvements to Azure Compute's VM allocation service.

Microsoft Research, Bangalore Aug 2021 - Aug 2023
Research Fellow with Debopam Bhattacharjee, Venkat Padmanabhan
Projects: LEO Satellite Networks ([LEOScope](#)), Data-Driven Network Simulation ([iBox](#))

Microsoft Research, Bangalore Jan 2021 - July 2021
Research Intern with Venkat Padmanabhan, Nagarajan Natarajan
Project: iBox

VMware, Bangalore Aug 2020 - Dec 2020
Intern, xLabs with Jayneel Gandhi
Project: Page-table Replication ([Mitosis](#))

Samsung Research, Bangalore May 2020 - July 2020
Research Intern with Shital Bhatia
Project: Cellular Network Planning

Software-Defined Networking Lab, BITS Pilani Jan 2019 - Dec 2019
Research Assistant with K. Hari Babu
Project: Passive Estimation of Link Latency ([qMon](#))

Publications

C=Conference, J=Journal, P=Preprint

- C.1 **Boosting Application Performance using Heterogeneous Virtual Channels: Challenges and Opportunities**
[link]
Talal Touseef, William Sentosa, Milind Kumar Vaddiraju, Debopam Bhattacharjee, Balakrishnan Chandrasekaran, Brighten Godfrey, [Shubham Tiwari](#)
22nd ACM Workshop on Hot Topics in Networks HotNets'23

- P.1 T3P: Demystifying Low-Earth Orbit Satellite Broadband** [link]
 Shubham Tiwari, Saksham Bhushan, Aryan Taneja, Mohamed Kassem, Cheng Luo, Cong Zhou, Zhiyuan He, Aravindh Raman, Nishanth Sastry, Lili Qiu, Debopam Bhattacharjee
Working paper arXiv'23
- C.2 Simulating Network Paths with Recurrent Buffering Units** [link]
 Divyam Anshuman, Sriram Balasubramanian, Shubham Tiwari, Nagarajan Natarajan, Sundararajan Sellamanickam, and Venkata N. Padmanabhan
 37th AAI Conference on Artificial Intelligence AAAI'23
- C.3 Data-Driven Network Path Simulation with iBox** [link]
 Sachin Ashok, Shubham Tiwari, Nagarajan Natarajan, Venkata N. Padmanabhan, and Sundararajan Sellamanickam
 ACM SIGMETRICS / IFIP PERFORMANCE 2022 SIGMETRICS'22
- J.1 qMon: A method to monitor queuing delay in OpenFlow networks** [link]
 Sandhya Rathee, Shubham Tiwari, K Haribabu, and Ashutosh Bhatia
 Journal of Communications and Networks JCN'22

Projects

Retrify: Memory-Management Strategies for Efficient Serving of Models in Compound AI Systems April 2024 - Present

Advisors: Simon Peter, Ratul Mahajan

- › Evaluated various memory-management techniques to improve the performance of long-context requests in Compound AI Systems.
- › Developed a prototype of a serving-system interacting with an external environment to simulate performance of workloads under various traffic conditions (bursty, variable API call durations).

Optimizations to Azure Compute's VM Allocation Service June 2024 - Sept 2024

Advisors: Ishai Menache

- › Evaluated the impact of enabling fine-grained VM placement strategies at scale.
- › Proposed changes to resource allocation service with the potential of saving (> \$1M) in operational costs.

LEOScope: Enabling Experimentation Across Low-Earth Orbit (LEO) Satellite Networks July 2022 - Present

Advisors: Debopam Bhattacharjee, Venkat Padmanabhan [code]

- › Lead an effort with **Azure Space**, **MSRA**, and academic collaborators to build a platform of a global scale for experimentation across Low-Earth Orbit Satellite networks.
- › Drove the effort through engineering challenges such as platform architecture, implementation of experiment scheduler, executor, and the central orchestrator.
- › Initiated large-scale measurements based on ping and iperf to characterize satellite network paths.

iBox: Internet in a Box Jan 2021 - June 2022

Advisors: Venkat Padmanabhan, Nagarajan Natarajan [website]

- › Built a data-driven network simulator that uses data to recreate end-to-end behavior of a network path.
- › Leveraged a combination of internet measurement data and ML models to capture the impact of complex network phenomena such as cross-traffic and packet reordering.
- › Integrated iBox with ns-2, ns-3, netem and **Microsoft Teams's** in-house network simulator.
- › Resulting papers published at **SIGMETRICS'22** and **AAAI'23**.

qMon: Passive Delay Monitoring in SDNs Jan 2019 - Dec 2019

Advisor: K. Hari Babu [paper] [code]

- › Devised **qMon**, a scalable latency monitoring technique with zero data plane footprint.
- › Developed an Open vSwitch based prototype to fetch queue length information using OpenFlow and passively estimate link latency.
- › Evaluated qMon on a physical testbed under various traffic scenarios.
- › Resulting paper published at **JCN 2022**.

Mitosis: Enabling Page-Table Replication in ESXi

Aug 2020 - Dec 2020

Advisor: Jayneel Gandhi

- > Implemented page-table replication (Mitosis) in VMware's core virtualization product – ESX.
- > Developed prototypes to disambiguate the design and code needed to support page table replication in the ESX kernel.
- > Conducted workload profiling to estimate the performance benefits of page-table replication; realized gains of upto **17%** in workload execution time.

Miscellaneous

- > Awarded a grant of 50,000 INR by AUGSD, BITS Pilani for developing a miniature autonomous driving vehicle.
- > Demonstrated iBox at TAB – MSR India's annual technical event.
- > Presented iBox at SIGMETRICS'22. [video]