

Shubham Tiwari

PhD student, University of Washington

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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, 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 Anshumaan, Sriram Balasubramanian, Shubham Tiwari, Nagarajan Natarajan, Sundararajan Sellamanickam, and Venkata N. Padmanabhan
37th AAAI 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 queueing delay in OpenFlow networks** [link]
 Sandhya Rathee, Shubham Tiwari, K Haribabu, and Ashutosh Bhatia
Journal of Communications and Networks **JCN'22**

Projects

- BlendMesh: Optimizing Service Mesh Deployments** Oct 2023 - Present
 Advisors: Simon Peter, Ratul Mahajan
 > Studying various service-mesh deployments to identify performance bottlenecks and the trade-off's involved.
- LEOScope: Enabling Experimentation Across Low-Earth Orbit (LEO) Satellite Networks** July 2022 - Present
 Advisors: Debopam Bhattacharjee, Venkat Padmanabhan [code]
 > Leading 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.
 > Driving 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]