Sushovan Das
Curriculum Vitae

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🌐 Website | 🎓 Google Scholar | in LinkedIn

Research Summary

My research focuses on rethinking cloud and cluster networking so that communication substrates align with the structured, high-volume patterns of modern distributed workloads. Emerging AI/ML training, HPC, and large-scale graph analytics generate predictable, long-lived collectives, yet today's datacenter networks remain built around a packet abstraction optimized for short, bursty traffic. At the same time, CMOS packet-switch ASICs are hitting power and cost limits, making energy the dominant bottleneck for next-generation clusters.

I explore how optical technologies, hybrid circuit–packet fabrics, and application-aware control can jointly deliver high performance at significantly lower energy. During my Ph.D. at Rice University, I developed all-optical architectures— *Shufflecast*, *OSSV*, and *Phoenix*—that integrate optical primitives with system-level control to add native multicast, mitigate traffic skewness, and overcome circuit reconfiguration downtime.

My current work at ETH Zürich and long-term agenda extend these ideas along three directions: (1) a **hardware vision** for switch substrates that fuse packet ASICs with optical circuits, elastic multi-lane transceivers, and emerging co-packaged optics; (2) an **architecture vision** for predictable, energy-efficient DCNs using optical circuit-switching principles; and (3) a **cross-domain vision** applying structured-communication and constrained-reconfiguration ideas to LEO satellite networks and hybrid classical–quantum clouds. Across these efforts, I bridge **ECE and CS**, combining device-level intuition with architectural design to build scalable, energy-proportional infrastructures. My work has appeared in *IEEE INFOCOM*, *IEEE/ACM ToN*, *USENIX NSDI*, *ACM HotNets*, *IEEE/Optica JLT*, and *IEEE ICC*.

Research Interests

Optical Networks; Next Generation Datacenter Networks; LEO satellite Networks; Quantum Networks.

Education

2024–present	**Postdoctoral Researcher**, *ETH Zürich*, Switzerland Advisor: Prof. Laurent Vanbever.
2017–2024	**Ph.D. in Computer Science**, *Rice University*, Houston, USA Advisor: Prof. T. S. Eugene Ng; GPA: 3.87/4.0. Thesis: *Towards All-Optical Circuit-Switched Datacenter Network Architectures with Low Energy and High Performance.*
2015–2017	**M.Tech. in Telecommunication Systems Engineering**, *Indian Institute of Technology Kharagpur*, India Advisor: Prof. Debasish Datta; GPA: 9.81/10.0 (Rank: 1st). Thesis: *Packet-switched WDM Ring Networks: Performance Analyses of Physical and MAC Layers.*
2011–2015	**B.Tech. in Electronics & Telecommunication Engineering**, *Jadavpur University*, Kolkata, India GPA: 9.64/10.0 (Rank: 4th).

Research Experience and Vision

2024–present	**Postdoctoral Researcher**, *NSG Lab, ETH Zürich*, Switzerland ○ Designing low-energy, high-performance multi-ASIC packet switches using optical circuit indirection. ○ Developing opto-electrical substrates and elastic transceiver abstractions for next-generation AI/HPC clusters. ○ Exploring structured-communication–aware routing for hybrid (circuit–packet) network substrates.
2017–2024	**Graduate Research Assistant**, *BOLD Lab, Rice University*, USA ○ Designed reconfigurable optical edges to mitigate traffic skewness and improve tail latency in OCS cores. ○ Developed physical-layer multicast architectures for energy-efficient, high-throughput collective communication. ○ Studied congestion control and fine-grained network abstractions for emerging cloud and ML applications.

Publications — First Author

Sushovan Das, Arlei Silva, T. S. Eugene Ng, "Rearchitecting Datacenter Networks: A New Paradigm with Optical Core and Optical Edge", *IEEE INFOCOM*, 2024.

Sushovan Das, Debasish Datta, "Revisiting Packet-switched WDM Rings for Metro Networks: A Comprehensive Cross-Layer Assessment", *IEEE/Optica Journal of Lightwave Technology*, 2023.

Sushovan Das, Arlei Silva, T. S. Eugene Ng, "Near Non-blocking Performance with All-optical Circuit-switched Core", *ACM SIGCOMM Poster Program*, 2023 (Third Place).

Sushovan Das, Afsaneh Rahbar, Xinyu Crystal Wu, Zhuang Wang, Weitao Wang, Ang Chen, T. S. Eugene Ng, "Shufflecast: An optical, data-rate agnostic and low-power multicast architecture for next-generation compute clusters", *IEEE/ACM Transactions on Networking*, 2022.

Sushovan Das, Weitao Wang, T. S. Eugene Ng, "Towards All-optical Circuit-switched Datacenter Network Cores: The Case for Mitigating Traffic Skewness at the Edge", *ACM SIGCOMM Workshop on Optical Systems (OptSys)*, 2021.

Sushovan Das, Soumallya Chatterjee, Amitava Mukherjee, Mrinal Kanti Naskar, "Generic network infrastructure for nano-communication", U.S. Patent No. US10,084,551B2, 2018.

Publications — Co-author

Shalini Choudhury, **Sushovan Das**, Sanjoy Paul, Prasanthi Maddala, Ivan Seskar, Dipankar Raychaudhuri, "MEC-Intelligent Agent Support for Low-Latency Data Plane in Private NextG Core", *IEEE ICC*, 2024.

Shalini Choudhury*, **Sushovan Das***, Sanjoy Paul, Ivan Seskar, Dipankar Raychaudhuri, "Intelligent Agent Support for Achieving Low Latency in Cloud-Native NextG Mobile Core Networks", *ACM ICDCS*, 2023.

Weitao Wang, Dingming Wu, **Sushovan Das**, Afsaneh Rahbar, Ang Chen, T. S. Eugene Ng, "RDC: Energy-Efficient Data Center Network Congestion Relief with Topological Reconfigurability at the Edge", *USENIX NSDI*, 2022.

Weitao Wang, **Sushovan Das**, Xinyu Crystal Wu, Zhuang Wang, Ang Chen, T. S. Eugene Ng, "MXDAG: A Hybrid Abstraction for Emerging Applications", *ACM HotNets*, 2021.

Weitao Wang, **Sushovan Das**, T. S. Eugene Ng, "Abstractions for Reconfigurable Hybrid Network Update and A Consistent Update Approach", *ACM SIGCOMM Workshop on Optical Systems (OptSys)*, 2021.

Teaching Experience

2024–present **Co-Instructor**, *ETH Zürich*, Switzerland
Upcoming lecture titled "Networking for ML: The Optics Chapter" in the Advanced Networking.
Hosted Seminar in Computer Networks. Selected relevant papers, hosted seminars and office hours.

2018–2023 **Teaching Assistant**, *Rice University*, USA
Computer Networks; Design and Analysis of Algorithms; Data Privacy and Security. Conducted tutorials, graded assignments and exams, hosted office hours.

2016–2017 **Teaching Assistant**, *IIT Kharagpur*, India
Modern Digital Communication Techniques; Telecommunication Systems Engineering Lab; Lightwave Networks. Conducted tutorials; Designed and graded assignments and exams.

Internships

2022 Accenture Technology Labs, USA — Low-latency NextG mobile core design (Advisor: Dr. Sanjoy Paul).

2015 VECC, Kolkata — Real-time pulse processing & archival subsystem (Advisor: Mr. Madhusudan Dey).

2014 ISI, Kolkata — Efficient software implementations of stream ciphers (Advisor: Prof. Subhamoy Maitra).

2014 IBM, Kolkata — Molecular communication channel modeling (Advisor: Dr. Amitava Mukherjee).

Academic Coursework

Ph.D. (CS), Rice Advanced Computer Networks; Mathematical Cryptography; Computer Architecture; Algorithms; AI; Automata; Bioinformatics.

M.Tech. (TSE), IIT KGP Modern Digital Communication; Telecom Switching & Networks; Optical Communication; Lightwave Networks; Mobile Communication & Fading; Information Theory & Coding; Secure Communications.

B.Tech. (ETCE), JU Signal & Noise; Analog & Digital Communication; Switching Systems; Computer Networks; Optical Fiber Communication; Satellite/Mobile/Personal Communication.

Technical Skills

C/C++; Python; MATLAB; Network Simulators; LaTeX.