

Rahul Bothra

<https://rahul-bothra.github.io>

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Education **Birla Institute of Technology and Science, Pilani** Aug. 2016 - Dec. 2019
B.E. in Computer Science (GPA: 8.09/10.00)

Experience **Research Fellow, Microsoft Research** 2021 - Present

Advisors: [Dr. Venkat Padmanabhan](#), [Dr. Ranjita Bhagwan](#)

Project: Optimizing resource efficiency for Microsoft Teams

- Designed peak-aware resource provisioning and allocation, and time-aware redundancy planning, which led to estimated cost savings of about 120M\$/year and latency improvement of about 50%. Work **under submission at SIGMETRICS 2023**.
- Started large-scale measurements comparing Azure WAN performance with the Internet, whose insights helped Teams to make informed routing decisions, and Azure Edge to plan future network building.

Project: Quantifying network sensitivity of video conferencing applications

- Devised user engagement metrics, which are in addition to user feedback (MOS), useful in understanding user experience for video conferencing applications. These metrics are now being used by Teams to improve their MOS prediction models.
- Quantified the impact of network performance on user engagement, as well as by other non-networking factors. Identified potential applications for improved traffic engineering, congestion control, and server allocation techniques. Work **under submission at PAM 2023**.

Advisors: [Dr. Ramachandran Ramjee](#), [Dr. Muthian Sivathanu](#)

Project: Identifying communication bottlenecks in ML training

- Fixed bottlenecks in the application/kernel interface in popular DL communication frameworks (NCCL, gloo) which improved communication performance by upto 60%.
- Identified ephemeral congestion in All Reduce ring patterns, degrading performance by upto 28%. Solved the issues by a) changing the allReduce topology ordering, and b) removing some nodes from the cluster.

Software Engineer, Azure Migrate 2020

Managers: Priyank Gaharwar, Charumathy Srinivasan

- Designed components to scale-out and orchestrate migration from multiple servers for customers with large in-house datacenters.
- Built in-application debugging for network and authentication issues, and improved the user interface, both of which improved the SLA from 96% to 99.5% and generated strong positive customer feedback.

Projects **P4-TrafficTool** 2020

Advisor: [Prof. Ben Leong](#), NUS Singapore

Understood the p4c compiler pipeline and added support in P4-Traffictool to handle more variations of P4 programs to generate protocol and packet templates for tools like Scapy, MoonGen, Wireshark, etc. [Source](#).

	Heuristical approach to Clustered Orienteering 2019 Advisor: Prof. Abhishek Mishra, BITS Pilani , Prof. Pramod Tanwar, CSIR CEERI Clustered Orienteering is an exponentially harder variation of the Travelling Salesman Problem. I designed a GA and Swarm Optimization based heuristic which improved performance by 38% and accuracy by 5% than state of the art.
	Reducing image distortion via object aware Seam Carving 2019 Advisor: Prof. Pramod Tanwar, CSIR CEERI Identified conditions under which important parts of an image can get distorted by Seam Carving and designed an object-aware technique to reduce these distortions. We are working towards a patent filing.
	Google Summer of Code - Sugar Labs 2018 Advisor: Walter Bender, Founder - MIT Media Lab Implemented cross version Python support for the Sugar Operating System, dependant UX frameworks, and the networking architecture, motivated by the deprecation of Python 2. Tested the system with different hardwares like OLPC laptops, and Raspberry Pi's, and ensured package consistency across distributions (Debian, Fedora) and Python versions (2.3 to 3.7).
	Hyperloop India, SpaceX Global Challenge 2017 Designed and manufactured the halfbach array design using Neodymium magnets to levitate our Hyperloop pod. Our design had the most cost efficient Lift to Drag performance in the competition.
Teaching Positions	Teaching Assistant, BITS Pilani 2017 - 2019 Professors: Jagat Sesh., Sundaresan Raman. et. al. Courses: Logic in Computer Science (CS F211), and Programming (CS F111)
	Mentor, Google Open Source Programs 2018 - 2020 Mentored university and high school students in working with open source projects.
	Lecturer, CSD course, BITS Pilani 2019 Introduced and led an audit course <i>Data Science with Python</i> . Designed course content and evaluative components, and taught over 50 students.
Academic Honors	KVPY Fellowship by Dept. of Science and Techonology, Govt of India NTSE Scholarship by NCERT Council, Govt of India