

## Rahul Bothra

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

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<b>Education</b>	<b>Birla Institute of Technology and Science, Pilani</b> B.E. in Computer Science (GPA: 8.09/10.00)	2016 - 2020
<b>Experience</b>	<b>Research Fellow, Microsoft Research</b> Advisors: Dr. Venkat Padmanabhan, Dr. Ranjita Bhagwan Project: Optimizing resource efficiency for Microsoft Teams <ul style="list-style-type: none"><li>• 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%.</li><li>• 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.</li><li>• Work under submission at SIGMETRICS 2023.</li></ul> Project: Understanding network sensitivity for video conferencing <ul style="list-style-type: none"><li>• 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.</li><li>• 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.</li><li>• Work under submission at PAM 2023.</li></ul> Advisors: Dr. Ramachandran Ramjee, Dr. Muthian Sivathanu Project: Identifying communication bottlenecks in ML training <ul style="list-style-type: none"><li>• Fixed bottlenecks in the application/kernel interface in popular DL communication frameworks (NCCL, gloo) which improved communication performance by upto 60%.</li><li>• Identified scenarios of ephemeral congestion in the ring All Reduce patterns when scaled to large number of nodes, both in Azure and AWS, and built tools to mitigate the bottleneck.</li></ul>	2020 - Present
	<b>Software Engineer, Azure Migrate</b> Managers: Priyank Gaharwar, Charumathy Srinivasan <ul style="list-style-type: none"><li>• Designed components to scale-out and orchestrate migration from multiple servers for customers with large in-house datacenters.</li><li>• Built in-application debugging for network and authentication related issues, and improved the user interface, both of which improved the SLA from 99% to 99.99% and generated strong positive customer feedback.</li></ul>	2020
<b>Projects</b>	<b>P4-TrafficTool</b> Advisor: Prof. Ben Leong, NUS Singapore Improved the parser to support more P4 programs, to generate protocol and packet templates for debugging tools like Scapy, MoonGen, Wireshark, etc. Understood the P4 compiler pipeline, and improved the parsing intervention to be more robust.	2020

**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. We 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** 2018  
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.

**Hyperloop India, SpaceX Global Challenge** 2017  
Designed and manufactured the halbach 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** 2018 - 2019  
Professors: Shan B., Sundaresan R. 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

**Academic Honors** KYPY Fellowship by Dept. of Science and Techonology, Govt of India  
NTSE Scholarship by NCERT Council, Govt of India