VENKAT ARUN

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RESEARCH INTEREST AND VISION

Today's networked systems perform well most of the time, but not all the time. A key reason for this is that they use heuristics whose behavior is poorly understood. I use automated reasoning in new ways to augment human ability to understand the behavior of widely deployed heuristics. My tools prove performance properties of network heuristics and uncover unexpected ways in which they fail in the real world. I have applied this technique to many areas with the bulk of my work focusing on congestion control. Going forward, I will use this approach to design systems that are provably performant and robust.

EDUCATION

Massachusetts Institute of Technology (MIT) *2019-2023*
Ph.D. Dept. of EECS
Advisors: Hari Balakrishnan and Mohammad Alizadeh

Massachusetts Institute of Technology (MIT) *2017-2019*
Master of Science, Dept. of EECS
Advisors: Hari Balakrishnan and Mohammad Alizadeh

Indian Institute of Technology Guwahati (IIT-G) *2013-2017*
B.Tech. in Computer Science & Engineering
President of India Gold Medal

INDUSTRY IMPACT

1. Meta uses my congestion control algorithm (CCA), Copa [3], for live video uploads
2. Meta uses a my modification to BBR [2] (a CCA designed by Google) for a vast majority of their user-facing traffic

HONORS AND AWARDS

- MIT EECS G. M. Sprowls PhD Thesis Award in Computer Science (2024)
- ACM SIGCOMM Doctoral Dissertation Award Runner-Up (2024)
- Marconi Society Young Scholar Award (2023)
- ACM SIGCOMM best student paper award (2022)
- ACM SIGCOMM best paper award (2017)
- MIT Jacobs Presidential Fellowship (2017)
- President of India Gold Medal - IIT Guwahati (2017)
- KVPY Government of India Scholarship (2013)

PUBLICATIONS

1. *Starvation in End-to-End Congestion Control*
   Venkat Arun, Mohammad Alizadeh, Hari Balakrishnan
   ACM SIGCOMM 2022
   Best Student Paper Award
   https://dl.acm.org/doi/10.1145/3544216.3544223

2. *Toward Formally Verifying Congestion Control Behavior*
   Venkat Arun, Mina Arashloo, Ahmed Saeed, Mohammad Alizadeh, Hari Balakrishnan
   ACM SIGCOMM 2021
   Being used at Meta
   https://dl.acm.org/doi/10.1145/3452296.3472912

3. *Copa: Practical Delay-Based Congestion Control for the Internet*
   Venkat Arun, Hari Balakrishnan
   USENIX NSDI 2018
   Being used at Meta
   `https://web.mit.edu/copa/`

4. *RFocus: Practical Beamforming for Small Devices*
   Venkat Arun, Hari Balakrishnan
   USENIX NSDI 2020
   Largest antenna array ever used for a single communication link
   `https://people.csail.mit.edu/venkatar/rfocus.html`

5. *Finding Safety in Numbers with Secure Allegation Escrows*
   Venkat Arun, Aniket Kate, Deepak Garg, Peter Druschel, Bobby Bhattacharjee
   NDSS Symposium 2020
   `https://arxiv.org/abs/1810.10123`

6. *Language-Directed Hardware Design for Network Performance Monitoring*
   Srinivas Narayana, Anirudh Sivaraman, Vikram Nathan, Prateesh Goyal, **Venkat Arun**, Mohammad Alizadeh, Vimalkumar Jeyakumar, and Changhoon Kim
   ACM SIGCOMM 2017
   Best Paper Award
   `https://web.mit.edu/marple/`

7. *Automating Network Heuristic Design and Analysis*
   Anup Agarwal, **Venkat Arun**, Devdeep Ray, Ruben Martins, Srini Seshan
   ACM SIGCOMM HotNets 2022
   `https://conferences.sigcomm.org/hotnets/2022/papers/hotnets22_agarwal.pdf`

8. *Quantitative Verification of Scheduling Heuristics*
   Saksham Goel, Benjamin Mikek, Jehad Aly, **Venkat Arun**, Ahmed Saeed, Aditya Akella
   In Submission
   `https://arxiv.org/abs/2301.04205`

9. *Privid: Practical, Privacy-Preserving Video Analytics Queries*
   Frank Cangialosi, Neil Agarwal, **Venkat Arun**, Junchen Jiang, Srinivas Narayana, Anand Sarwate, Ravi Netravali
   USENIX NSDI 2022
   `https://arxiv.org/pdf/2106.12083.pdf`

10. *Throughput-Fairness Tradeoffs in Mobility Platforms*
    Arjun Balasingam, Karthik Gopalakrishnan, Radhika Mittal, **Venkat Arun**, Ahmed Saeed, Mohammad Alizadeh, Hamsa Balakrishnan, Hari Balakrishnan
    ACM MobiSys 2021
    `https://people.csail.mit.edu/arjunvb/pubs/mobius-mobisys21-paper.pdf`

11. *Enabling High Quality Real-Time Communications with Adaptive Frame-Rate*
    Zili Meng, Tingfeng Wang, Yixin Shen, Bo Wang, Mingwei Xu, Rui Han, Honghao Liu, **Venkat Arun**, Hongxin Hu, Xue Wei
    USENIX NSDI 2023

12. *The Case for an Internet Primitive for Fault Localization*
    Will Sussman, Emily Marx, **Venkat Arun**, Akshay Narayan, Mohammad Alizadeh, Hari Balakrishnan, Aurojit Panda, Scott Shenker
    ACM SIGCOMM HotNets 2022
    `https://conferences.sigcomm.org/hotnets/2022/papers/hotnets22_sussman.pdf`

SELECTED PRESS COVERAGE

Starvation in CC [1]	MIT News, IEEE Spectrum, APNIC Blog, The Register, Extreme Tech
RFocus [4]	MIT News, BBC Radio, Tech Crunch, Venture Beat, Engadget, Tech Spot, Digital Trends
Privid [9]	MIT News, IEEE Spectrum, Hacker News, Sci Tech Daily, MarkTechPost