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 [**??**], for live video uploads
2. Meta uses a my modification to BBR [**??**] (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

- *Synthesizing a Provably Performant Joint Controller for Low-Latency Video Streaming*
  Tony Pan, Anup Agarwal, Isil Dillig, Venkat Arun
  NSDI 2026

- *FRCC: Towards Provably Fair and Robust Congestion Control*
  Anup Agarwal, Venkat Arun, Srini Seshan
  NSDI 2026

- *Speculative Ad-hoc Querying*
  Haoyu Li, Srikanth Kandula, Maria Angels de Luis Balaguer, Aditya Akella, Venkat Arun
  arXiv 2025

- *Lightweight Automated Reasoning for Network Architectures*
  Rahul Bothra, Venkat Arun, Brighten Godfrey, Akshay Narayan, Ahmed Saeed
  HotNets 2024

- *Towards provably performant congestion control*
  Anup Agarwal, Venkat Arun, Devdeep Ray, Ruben Martins, and Srinivasan Seshan
  NSDI 2024

- *Hairpin: Rethinking packet loss recovery in edge-based interactive video streaming*
  Zili Meng, Xiao Kong, Jing Chen, Bo Wang, Mingwei Xu, Rui Han, Honghao Liu, Venkat Arun, Hongxin Hu, and Xue Wei
  NSDI 2024

- *Starvation in end-to-end congestion control*
  Venkat Arun, Mohammad Alizadeh, and Hari Balakrishnan
  SIGCOMM 2023
  Best student paper award

- *Quantitative Verification of Scheduling Heuristics*
  Saksham Goel, Benjamin Mikek, Jehad Aly, Venkat Arun, Ahmed Saeed, and Aditya Akella
  arXiv 2023

- *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, and Xue Wei
  NSDI 2023

- *Automating network heuristic design and analysis*
  Anup Agarwal, Venkat Arun, Devdeep Ray, Ruben Martins, and Srinivasan Seshan
  HotNets 2022

- *Privid: Practical, Privacy-Preserving Video Analytics Queries*
  Frank Cangialosi, Neil Agarwal, Venkat Arun, Srinivas Narayana, Anand Sarwate, and Ravi Netravali
  NSDI 2022

- *The case for an internet primitive for fault localization*
  William Sussman, Emily Marx, Venkat Arun, Akshay Narayan, Mohammad Alizadeh, Hari Balakrishnan, Aurojit Panda, and Scott Shenker
  HotNets 2022

- *Toward formally verifying congestion control behavior*
  Venkat Arun, Mina T. Arashloo, Ahmed Saeed, Mohammad Alizadeh, and Hari Balakrishnan
  SIGCOMM 2021
  Proposed a modification to BBR that Meta now uses for most of their production traffic

- *Throughput-fairness tradeoffs in mobility platforms*
  Arjun Balasingam, Karthik Gopalakrishnan, Radhika Mittal, Venkat Arun, Ahmed Saeed, Mohammad Alizadeh, Hamsa Balakrishnan, and Hari Balakrishnan
  MobiSys 2021

- *RFocus: Beamforming Using Thousands of Passive Antennas*
  Venkat Arun and Hari Balakrishnan
  NSDI 2020
  May be the largest antenna array ever used for a single communication link

- *Finding safety in numbers with secure allegation escrows*
  Venkat Arun, Aniket Kate, Deepak Garg, Peter Druschel, and Bobby Bhattacharjee
  NDSS 2020

- *Copa: Practical Delay-Based Congestion Control for the Internet*
  Venkat Arun and Hari Balakrishnan
  NSDI 2018
  Being used in production at Meta

- *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
  SIGCOMM 2017
  Best paper award

SELECTED PRESS COVERAGE

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