

Arjun V. Balasingam

Contact Information	32 Vassar Street, 32-G982 Cambridge, MA 02139	https://mit.edu/arjunvb arjunvb@mit.edu
Research Interests	Mobile computing, sensor networks, cellular networks, computer networking	
Education	Massachusetts Institute of Technology	Sep 2018 - Jan 2024
	Ph.D. in Computer Science <i>Advisor: Hari Balakrishnan</i>	
	Thesis: Application-Aware Scheduling Architectures for Mobile Systems Committee: Hari Balakrishnan, Mohammad Alizadeh, Victor Bahl, Radhika Mittal	
	Massachusetts Institute of Technology	Oct 2020
	S.M. in Computer Science <i>Advisor: Hari Balakrishnan</i>	
	Stanford University	Jun 2018
	B.S. in Electrical Engineering Minor in Computer Science <i>With honors and distinction</i>	
Honors and Awards	<ul style="list-style-type: none">• MIT-Pillar AI Collective Grant• NSF Graduate Research Fellowship• MIT Jacobs Presidential Fellowship• Phi Beta Kappa, Stanford University• Barry M. Goldwater Scholarship• ACM Student Research Competition 1st Place Winner, ACM MobiCom• Tau Beta Pi, Stanford University	2023 2018 2018 2018 2017 2017 2016
Preprints	<ul style="list-style-type: none">• MicroTel: A Platform to Measure Micromobility Stress Arjun Balasingam, Joseph Chandler, Chenning Li, Zhoutong Zhang, Hari Balakrishnan. <i>Technical Report.</i>	
Publications	<ul style="list-style-type: none">• DriveTrack: A Benchmark for Long-Range Point Tracking in Real-World Videos Arjun Balasingam, Joseph Chandler, Chenning Li, Zhoutong Zhang, Hari Balakrishnan. <i>To appear at CVPR 2024.</i>• Application-level Service Assurance with 5G RAN Slicing Arjun Balasingam, Manikanta Kotaru, Paramvir Bahl. <i>To appear at USENIX NSDI 2024.</i>• 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.

- **Toward a Marketplace for Aerial Computing**
Arjun Balasingam, Karthik Gopalakrishnan, Radhika Mittal, Mohammad Alizadeh, Hamsa Balakrishnan, Hari Balakrishnan.
ACM DroNet 2021.
- **MIRIS: Fast Object Track Queries in Video**
Favyen Bastani, Songtao He, **Arjun Balasingam**, Karthik Gopalakrishnan, Mohammad Alizadeh, Hari Balakrishnan, Michael Cafarella, Tim Kraska, Sam Madden.
ACM SIGMOD 2020.
- **BeeCluster: Drone Orchestration via Predictive Optimization**
Songtao He, Favyen Bastani, **Arjun Balasingam**, Karthik Gopalakrishnan, Ziwen Jiang, Mohammad Alizadeh, Hari Balakrishnan, Michael Cafarella, Tim Kraska, Sam Madden.
ACM MobiSys 2020.
- **Detecting if LTE is the Bottleneck with BurstTracker**
Arjun Balasingam, Manu Bansal, Rakesh Misra, Kanthi Nagaraj, Rahul Tandra, Sachin Katti, Aaron Schulman.
ACM MobiCom 2019.
- **Poster: Broadcast LTE Data Reveals Application Type**
Arjun Balasingam, Manu Bansal, Rakesh Misra, Rahul Trandra, Aaron Schulman, Sachin Katti.
ACM MobiCom 2017.
Awarded 1st Place in ACM MobiCom Student Research Competition.
- **Enabling Robust, Secure, and Efficient Cellular Networks with Fine-Grained Radio-Layer Analytics**
Arjun Balasingam.
Stanford University Digital Repository, 2018.
- **Rapid Co-Optimization of Processing and Circuit Design to Overcome Carbon Nanotube Variations**
Gage Hills, Jie Zhang, Max Shulaker, Hai Wei, Chi-Shuen Lee, **Arjun Balasingam**, H.-S. Philip Wong, Subhasish Mitra.
IEEE Transactions on Computer Aided Design, 2015.

Research Experience

- **Measuring stress and safety for micromobility users**
Micromobility vehicles such as bicycles, e-bikes, and electric scooters are emerging as popular modes of transportation. The safety of the riders of these vehicles is vital. We are developing MicroTel, a platform that uses artificial intelligence to accurately measure stress and risk levels of micromobility riders using mobile sensing capabilities on smartphones and smartwatches. We also develop new methods for long-range keypoint tracking in videos.
Code: <https://drivetrack.csail.mit.edu>
- **App-level service assurance with 5G RAN slicing**
Proposed the idea of provisioning connectivity in 5G radio access networks to simultaneously guarantee quality-of-service to a diverse range of apps, including video conferencing, VR, v2x, and video streaming. This work is a collaboration with Microsoft Azure for Operators.
- **Resource fairness in mobility platforms**
Formalized the idea of fair access to mobility platforms—such as ridesharing systems, food delivery services, and drones-as-a-service platforms. Developed new routing algorithms—inspired by resource allocation and optimization techniques in computer systems—so customers can share

vehicle resources, while minimizing travel or flying time.
Code: <https://github.com/mobius-scheduler>

- **Measuring road congestion with drones**
Built a drone computing system. Designed new algorithms to determine when and where drones should sample the environment to build real-time maps of road traffic.
- **Debugging application performance on cellular networks**
Developed LTE bottleneck-detection algorithm that estimates downlink capacity using client-side measurements of resource allocation. Applied to improve performance of mobile video streaming.
Code: <https://github.com/arjunvb/bursttracker>
- **Measurement study of LTE scheduling**
Designed, implemented, and validated passive LTE sniffer that characterizes the congestion state of cell tower. Explored questions centering on privacy violations of broadcast LTE data.
- **Statistical learning for motor control**
Applied statistical ML framework to isolate underlying motion to required to perform daily tasks. Internship at University of Edinburgh, sponsored by Stanford Bing Overseas Studies Program.
- **Underwater humanoid robotics**
Developed communication software and control algorithms for semi-autonomous avatar diver. Robot deployed in Mediterranean, and recovered treasures from *La Lune*, flagship of Louis XIV.
- **Energy-Efficient VLSI design**
Developed fast models to rapidly explore different manufacturing and design options that preserve the ideal energy efficiency benefits of carbon nanotube-based circuits.

Patents

- **5G admission by verifying slice SLA guarantees**
Manikanta Kotaru, **Arjun Balasingam**, Paramvir Bahl.
U.S. Patent No. 11,706,658, issued 2023.
- **Compute-aware resource configurations for a radio access network**
Manikanta Kotaru, **Arjun Balasingam**, Paramvir Bahl.
U.S. Patent No. 11,665,589, issued 2023.
- **Learned scheduler for flexible resource allocation**
Arjun Balasingam, Manikanta Kotaru, Paramvir Bahl.
U.S. Patent App. 17/356,161, pending.
- **Dynamic 5G network slicing to maximize spectrum utilization**
Manikanta Kotaru, **Arjun Balasingam**, Paramvir Bahl.
U.S. Patent No. 11,540,161, issued 2022.
- **Flexure-Enhancing System for Improved Power Generation in a Wind-Powered Piezoelectric System**
Arjun Balasingam, James M. Janky.
U.S. Patent No. 9,735,711, issued 2017.

Industry Experience

- **Microsoft Azure for Operators** **Jun 2021 - Feb 2023**
Part-time research intern working on building programmability into 5G resource allocation algorithms.
- **Microsoft Research** **Jun 2020 - Aug 2020**
Worked on a new software stack for the 5G radio access network that processes physical layer signals on commodity servers. Modeled the relationship between 5G workload and compute required to run processing pipeline in real-time.

- **Uhana, Inc. (acquired by VMWare)** **Jun 2016 - Jun 2018**
Developed auto-provisioning and auto-scaling scheme to support real-time network analytics engine. Designed new video streaming algorithms that incorporate measurements of cellular network to improve user experience.
- **Red Lotus Technologies** **Jun 2012 - Oct 2012**
Worked on a training tool for humanitarian demining (for deployment training sites in Cambodia and Sri Lanka).

Presentations

- **Throughput-Fairness Tradeoffs in Mobility Platforms**
 - INFORMS, Anaheim, October 2021
 - ACM MobiSys, Virtual, June 2021
 - MIT CSAIL Alliances Meetup, June 2021
 - Microsoft Azure for Operators, Redmond, June 2021
 - Microsoft Azure Global, Redmond, November 2020
- **Detecting if LTE is the Bottleneck with BurstTracker**
 - ACM MobiCom, Los Cabos, October 2019

Teaching Experience

- **Instructor, Splash!**, Stanford University
Developed course materials and taught class on programming LED displays.
- **Instructor, Design_Code_Build**, Computer History Museum, Mountain View, CA
Taught programming fundamentals using the Raspberry Pi platform to middle school students.

Community Leadership

- **Web Chair**, Sidney Pacific Graduate Dormitory, MIT
- **Resident Computer Consultant**, Toyon Hall, Stanford University
- **Vice Chair (Academics)**, Stanford IEEE Chapter
- **Recruiting Officer**, Stanford Spicmacay (Indian Classical music group)
- **Curator**, David Rumsey Map Center, Stanford University
- **Student Advisory Board Member**, Introductory Seminars, Stanford University

Leisure

Squash (racquet sport), Carnatic violin, Hiking, World travel