

Varun Gupta

CONTACT INFORMATION

Department of Electrical Engineering, Columbia University
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EDUCATION

Columbia University, School of Engineering and Applied Sciences New York, NY
Ph.D. Candidate, Electrical Engineering **Fall 2011 - May 2017 (Expected)**

- Research Interests: Wireless and Datacenter Networks and Systems, Video Streaming, Online Algorithms
- Advisor: Prof. Gil Zussman

Columbia University, School of Engineering and Applied Sciences New York, NY
M.S., Electrical Engineering **Sept. 2011 - Oct. 2012**

- Selected Coursework: Stochastic Processes, Probability Theory, Analysis, Optimization, Graph Theory, Approximation Algorithms, Complexity
- GPA 3.901/4.000

Indian Institute of Technology

B. Tech., Electrical Engineering

Delhi, India

July 2007 - May 2011

- Interest Areas: Image Processing, Machine Learning, Pattern Recognition, 3D Videos
- Thesis: Wide Angle 3D TV, Advisor: Prof. Santanu Chaudhary
- Merit certificate for being in top 7% of undergraduate class
- GPA 8.82/10.00

RESEARCH AND INDUSTRY EXPERIENCE

Graduate Research Assistant, Columbia University

Sept. 2011 - Present

Advisor: Prof. Gil Zussman

- **Adaptive Multicast Services (AMuSe)**: Designing an end-to-end system and algorithms for high quality video delivery to a large number of users in dense environments which leverages WiFi multicast. Experimentally evaluated the design and algorithms in the ORBIT testbed with 250 WiFi enabled Linux devices. Developing a system and theoretically optimal algorithms for adaptive video streaming on Android based devices.
- **Hybrid datacenter networks**: Developing architectures and resource allocation algorithms for hybrid datacenter networks that will support complex traffic patterns such as multicast, incast, etc. Evaluating the performance through simulations and through experiments in a testbed developed at the Lightwave Research Laboratory, Columbia University.
- **Datacenter congestion control**: Studying congestion control and load balancing algorithms for intra- and inter-datacenter networks. Evaluating the performance through simulations and analytical methods.
- **Congestion control for video over wireless**: Performance analysis and measurement of WebRTC protocol for real-time video communication over real wireless networks.

Research Intern, Google Inc., Mountainview, CA

Platforms Networking Group

Sept. 2014 - Dec. 2014

Hosts: Dr. Abdul Kabbani, Sridhar Raman

Developed congestion control algorithms for low-buffer Ethernet fabrics with the objective of improving datacenter network performance. Experimentally evaluated the algorithms in production-like datacenter testbeds.

Research Intern, Microsoft Research, Bengaluru, India

Mobility, Networks, and Systems

June 2014 - Aug. 2014

Hosts: Dr. Ramachandran Ramjee, Dr. Krishna Chintalapudi

Investigated low-energy and low-latency group discovery algorithms for wireless handshakes. Experimented with software-defined radio boards on various frequency bands to evaluate sensitivity of wireless handshakes to noise.

Visiting Scholar, Bell Labs, Alcatel Lucent, Murray Hill, NJ
Enabling Computing Technologies **June 2013 - Aug. 2013**
Hosts: Dr. Yigal Bejerano and Dr. Katherine Guo

Developed a framework for efficiently sending multicast traffic in WiFi networks while maintaining QoS guarantees. Implemented algorithms to provide feedback to network controller in multicast settings. Experimented in large scale real settings on the ORBIT testbed, collected and analyzed large datasets for performance evaluation.

Undergraduate Intern, Google Inc., Bengaluru, India
Video Processing Research Group **May 2011 - July 2011**
Host: Dr. Vivek Kwatra

Undergraduate Intern, IBM Research, Bengaluru, India
Service Delivery and Business Analytics **May 2010 - July 2010**

TEACHING
EXPERIENCE

Instructor, Networking Laboratory, Computer Science and Electrical Engineering
Columbia University **Spring 2015**

Taught a networking course where concepts and protocols are demonstrated in a lab setting. Topics included ARP, IP, OSPF, BGP, RIP, TCP, and UDP etc.

Teaching Assistant, Digital Communications, Electrical Engineering
Columbia University **Fall 2011, Fall 2012**

- Assisted senior undergraduate/graduate level students in a course in Digital Communications.
- Coordinated the on-campus class and Columbia Video Network (CVN) for distance learning, held review sessions, and graded homeworks.

Teaching Assistant, Computer Architecture, Electrical Engineering
IIT Delhi **Spring 2011**

Selected as one of the undergraduate students for academic excellence to teach sophomore level classes. Responsible for holding review sessions, office hours, and grading.

PUBLICATIONS

Conferences/Journals

V. Gupta, C. Gutterman, Y. Bejerano, and G. Zussman, "Experimental Evaluation of Large Scale WiFi Multicast Rate Control," (*under submission*) in *IEEE Transactions on Wireless Communications*, 2017.

Y. Bejerano, C. Raman, C. Yu, V. Gupta, C. Gutterman, T. Young, H. Infante, Y. Abdulmalek, and G. Zussman, "DyMo: Dynamic Monitoring of Large Scale LTE-Multicast Systems," (*under submission*) in *IEEE/ACM Transactions on Networking*, 2017 **Fast-tracked from IEEE INFOCOM'17**.

Y. Bejerano, C. Raman, C. Yu, V. Gupta, C. Gutterman, T. Young, H. Infante, Y. Abdulmalek, and G. Zussman, "DyMo: Dynamic Monitoring of Large Scale LTE-Multicast Systems," in *Proc. IEEE INFOCOM'17*, 2017 (accept. rate 20.9%) **Best Paper Runner Up**.

V. Gupta, Y. Bejerano, C. Gutterman, J. Ferragut, K. Guo, T. Nandagopal, and G. Zussman, "Light-Weight Feedback Mechanism for WiFi Multicast to Very Large Groups - Experimental Evaluation," *IEEE/ACM Transactions on Networking*, vol. 24, no. 6, pp. 3826–3840, Dec. 2016.

Y. Bejerano, V. Gupta, C. Gutterman, and G. Zussman, "AMuSe: Adaptive Multicast Services to very large groups – Project overview, in *Proc. ICCCN'16 (invited)*, 2016

V. Gupta, C. Gutterman, Y. Bejerano, and G. Zussman, "Experimental Evaluation of Large Scale WiFi Multicast Rate Control," in *Proc. IEEE INFOCOM'16*, 2016 (accept. rate 18.2%).

P. Samadi, V. Gupta, J. Xu, H. Wang, G. Zussman, and K. Bergman, "Optical Multicast System for Data Center Networks," *Optics Express*, vol. 23, no. 17, pp. 22162–22180, Aug. 2015.

P. Samadi, V. Gupta, B. Birand, H. Wang, R. Jensen, G. Zussman, and K. Bergman, "Software-Addressable Optical Accelerators for Data-Intensive Applications in Cluster-Computing Platforms," *In Proc. ECOC'14*, 2014.

Y. Bejerano, J. Ferragut, K. Guo, V. Gupta, C. Gutterman, T. Nandagopal, G. Zussman, "Experimental Evaluation of a Scalable WiFi Multicast Scheme on the ORBIT Testbed", *In Proc. GENI Research and Educational Experiment Workshop (GREE'14)*, 2014 (invited).

Y. Bejerano, J. Ferragut, K. Guo, V. Gupta, C. Gutterman, T. Nandagopal, G. Zussman, "Scalable WiFi Multicast Services for Very Large Groups", *In Proc. IEEE ICNP'13*, 2013 (accept. rate 18.3%).

Peer Reviewed Posters & Demonstrations

V. Gupta, L. Xu, B. Wu, C. Gutterman, Y. Bejerano, and G. Zussman "Evaluating Video Delivery over WiFi Multicast," *In Proc. IEEE INFOCOM'17 (Demo)*, 2017.

V. Gupta, R. Norwitz, S. Petridis, C. Gutterman, G. Zussman, and Y. Bejerano, "AMuSe: Large-scale WiFi Video Distribution - Experimentation on the ORBIT Testbed," *In Proc. IEEE INFOCOM'16 (Demo)*, 2016.

V. Gupta, R. Norwitz, S. Petridis, C. Gutterman, G. Zussman, and Y. Bejerano, "WiFi Multicast to Very Large Groups - Experimentation on the ORBIT Testbed," *In Demo at IEEE LCN'15*, 2015.

P. Samadi, V. Gupta, B. Birand, H. Wang, G. Zussman, and K. Bergman, "Accelerating Incast and Multicast Traffic Delivery for Data-Intensive Applications Using Physical Layer Optics," *In Poster Description Proc. ACM SIGCOMM'14*, 2014.

ACHIEVEMENTS AND AWARDS

IEEE INFOCOM'17 Best Paper Runner Up Award	2017
NYC Media Lab Combine Program Grant , 9 groups selected out of 60 applicants for \$25,000 funding to evaluate the commercialization potential of research results	2016
Second prize for AMuSe project demo , Annual NYC Media Lab Summit	2015
Best Major Project Thesis , Department of Electrical Engineering, IIT Delhi	2011
ÉGIDE Scholarship , Exchange program at Écoles Des Mines, Nancy, France	2009
Scholarship for Undergraduate Studies by <i>Central Board of Secondary Education, Delhi</i>	2007
Indian National Physics Olympiad Gold Medal in <i>National Physics Olympiad</i>	2007
Among national top 1% in National Chemistry Olympiad	2007
Secured All India rank 145 in All India <i>IIT Joint Entrance Examination</i>	2007
Ranked 151 nationally in <i>All India Engineering Entrance Examination</i>	2007

OTHER ACTIVITIES

Talks & Demos	
"Cross-Layer Design and Algorithms for Wireless and Datacenter Networks", <i>AT&T Labs, NJ (talk)</i>	Nov. 2016
"Cross-Layer Design and Algorithms for Wireless and Datacenter Networks", <i>Bell Labs, Murray Hill, NJ (talk)</i>	Nov. 2016
"AMuSe - Content Delivery in Crowded Areas Through Wireless Multicast", <i>IEEE NYC Area Communications Society, New York, NY (invited talk)</i>	Oct. 2016
"Interactive Adaptive Video Streaming on Smartphones", <i>NYC Media Lab Annual Summit, New York, NY (demo)</i>	Sept. 2016
"AMuSe - Content Delivery in Crowded Areas Through Wireless Multicast", <i>NYC Media Lab Combine Demo Day, New York, NY (talk)</i>	April 2016
"Large Scale Video Delivery over WiFi", <i>NSF Center for Integrated Access Networks (CIAN) (invited webinar)</i>	Mar. 2016
"Large Scale Video Delivery over WiFi", <i>Columbia University Data Science Institute Day, New York, NY (demo)</i>	Mar. 2016
"WiFi Multicast to Very Large Groups - Experimentation on the ORBIT Testbed", <i>GENI NICE, San Francisco, CA (demo)</i>	Nov. 2015

“Wireless Multimedia Content Distribution To Very Large Groups”, *NSF Center for Integrated Access Networks (CIAN) Annual Retreat, La Jolla, CA (talk)* **Nov. 2015**
 “AMuSe - Content Delivery in Crowded Areas Through WiFi Multicast”, *Razorfish Innovation Summit, New York, NY (invited demo)* **Sept. 2015**
 “AMuSe - Content Delivery in Crowded Areas Through WiFi Multicast”, *NYC Media Lab Annual Summit, New York, NY (demo)* **Sept. 2015**

Professional Activities

Student Member of *IEEE* and *NSF Center for Integrated Access Networks (CIAN) Engineering Research Center (ERC)* **2012 - Present**

Reviewer for *ACM Sigmetrics'17/'16/'15/'14/'13*, *ACM Mobihoc'17/'16/'15/'14*, *DRCN'15*, *IEEE INFOCOM'15/'14/'13*, *IFIP Networking'14*, *ACM PODC'14*, *IFIP Performance'13*, *IEEE/ACM Transactions on Mobile Computing*, *IEEE Wireless Communications Letters*, *IEEE/ACM Transactions on Networking*

Volunteer for *IEEE INFOCOM* and *ACM SIGMETRICS* TPC meetings, 2012

Mentoring and Advising

Andy Xu, *Columbia University Undergraduate Researcher* **Summer 2016 - Present**
 Timothy Goodwin, *Columbia University Undergraduate Researcher* **Spring, Fall 2016**
 Bohan Wu, *Duke University Undergraduate Researcher* **Summer 2016**
 Raphael Norwitz, *Columbia University Undergraduate Researcher* **Summer 2015 - Fall 2015**
 Savvas Petridis, *Columbia University Undergraduate Researcher* **Summer 2015 - Fall 2015**
 Josiah Hutchinson, *NSF CIAN ERC, Undergraduate Researcher* **Summer 2013**
 Rodda John, David Alvarez, Sohan Kumar, *High School Researchers* **Summer 2013 and 2016**

IIT Delhi Exchange Student

Ecole Des Mines, Nancy, France **Fall 2009**

Represented IIT Delhi in an international, cultural and academic exchange program.

Volunteer Intern

Hazards Center, New Delhi **Nov. 2008 - Jan. 2009**

Helped improve traffic conditions and safety by providing data based solutions to traffic problems

TECHNICAL SKILLS

Programming Languages: C, C++, Java, Python, MATLAB, VHDL

Enterprise and Mobile: Java EE, Android, Hadoop

Database: SQL, DB2, Oracle

Software: Xilinx, Eclipse, PSpice

LANGUAGES

English, Hindi, French.