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Ish Kumar Jain

Education

May 2022 (expected) **Doctor of Philosophy (PhD)**, *University of California–San Diego, Jacobs School of Engineering*, CA.
Major: Electrical Engineering, ***GPA: 4.0 (out of 4)***
- Graduate Research Assistant with Prof. Dinesh Bharadia.
- **Selected Courses:** Modern Communication Networks, Digital Communication, Communication Circuit Design, Algebraic Coding, Digital Signal Processing, Wavelets & Filter Design, AI & Pattern Analysis.

May 2018 **Master of Science (MS)**, *New York University, Tandon School of Engineering*, Brooklyn, NY.
Major: Electrical Engineering, ***GPA: 3.96 (out of 4)***
- Myron M. Rosenthal Commencement Award for the best MS Academic Achievement in ECE.
- **Teaching:** Machine Learning (Spring-2018 and Fall-2017) | TCP-IP Lab (Spring-2017).
- **Selected Courses:** Advanced Machine Learning, Massive-MIMO, Networks & Mobile Systems, Network Modeling and Analysis, Internet Architecture and Protocols, Probability and Stochastic Processes, Scientific Computing.

May 2016 **Bachelors of Technology (B.Tech.)**, *Indian Institute of Technology (IIT Kanpur)*, Kanpur, India.
Major: Electrical Engineering, ***GPA: 9.5 (out of 10)***
- Motorola Gold Medalist: Commencement award for the best all-round performance in Electrical Engineering.
- **Selected Courses:** Wireless Communications, Convex Optimization, Distributed Systems, Advanced Image Processing, Robotics, C Programming, and Data Structures.

Technical Skills

Programming: Python, C, C++
Software: Matlab (CVX), Mininet, OpenCV, GitHub, LaTeX, Shell scripting
Systems: 5G NR testbed, Wilocity wil6210 60GHz testbed, USRP, WARP, Quantenna

Research

Sep 2018–Ongoing **Facilitating Reliable Millimeter Wave Link**, *Supervisor: Prof. Dinesh Bharadia*.
- Developed a testbed for 5G NR using high sampling ADC/DAC on FPGA, IF mixer, and a 28GHz phased array.
- Established a wideband (400 MHz) OFDM link and individually characterized each component of the testbed.
- Designed a beam refinement procedure that exploits multipath components to establish a stable and reliable mmWave connection without a significant training overhead.
- Achieved close to 100% reliability in a dynamic environment with a mobile user and random blockages.
- Current progress includes reducing the form-factor of our testbed and perform a marathon of outdoor experiments.

July 2018–Ongoing **Wireless Virtual Reality**, *Supervisor: Prof. Dinesh Bharadia, Prof. Pamela Cosman*.
- Developed a new viewport-aware Truncated Square Pyramid (TSP) scheme for projecting 360^o videos for VR.
- Implemented an optimization framework to deliver VR videos over a wireless link (WiFi as well as 5G) with high reliability and low latency.
- Initial results indicate that high quality 360^o videos can be transmitted with high PSNR over varying wireless link.

Jan–June 2018 **[MS Thesis] Millimeter Wave Blockage Analysis**, *Supervisor: Prof. Shivendra Panwar*.
- Analyzed the impact of blockage by static buildings, mobile blockers, and self-blockage by the user on mmWave link reliability in an outdoor mmWave environment with macro-diversity (connectivity with multiple base stations).
- Our results indicate that the minimum density of BS required to satisfy the QoS for URLLC applications is mainly driven by reliability and latency constraints, rather than coverage or capacity requirements.

Internship

June–Aug 2017 **Nokia Bell Labs**, *Murray Hill, NJ, USA*.
Topic: **Millimeter Wave Beam Training Algorithm Design** | Mentor: Dr. Özge Kaya
- Developed an adaptive beam training algorithm for mobile multi-user scenario in outdoor mmWave cellular networks.
- Achieved an average of over 60% reduction in beam-steering delay over a sequential search baseline.

Publications

NSDI 2020 R Ayyalasomayajula, A Arun, C Wu, S Rajagopalan, S Ganesaraman, A Seetharaman, **I K Jain**, D Bharadia, "LocAP: Autonomous Millimeter Accurate Mapping of WiFi Infrastructure", *NSDI*, 2020.

MDPI 2019 A Choromanska, **I K Jain**, "Extreme Multiclass Classification Criteria", vol 7, issue 1, *MDPI Computation Journal*, 2019.

MobiCom 2018 A Ravichandran, **I K Jain**, R Hegazy, T Wei, D Bharadia , "[Poster] Facilitating Low Latency and Reliable VR over Heterogeneous Wireless Networks", *Mobicom*, 2018.

JSAC 2018 **I K Jain**, R Kumar, S Panwar, "The Impact of Mobile Blockers on Millimeter Wave Cellular Systems", *IEEE JSAC special issue on URLLC*, 2018.

ITC 2018 **I K Jain**, R Kumar, S Panwar, "Driven by Capacity or Blockage? A Millimeter-wave Blockage Analysis", *IEEE International Teletraffic Congress (ITC30)*, 2018.

Selected Projects

2018–2019 **Accurate Mapping of WiFi infrastructure (*Quantenna WiFi*)**, *with Prof. Dinesh Bharadia*, UCSD.
- Developed a novel algorithm to estimate Access Point attributes (antenna separation and orientation) leveraging an autonomous bot with a WiFi client that collects CSI data from thousands of anchor points.

Aug–Dec 2019 **Filter Bank for Multi-Carrier Communications (*Matlab*)**, *with Prof. Truong Nguyen*, UCSD.
- Studied and implemented FBMC (Filter Bank for Multi-Carrier) and Cosine modulated Filter Banks; analyzed perfect reconstruction conditions and design tradeoffs.

Feb 2017–Mar 2018 **Multi-class Classification Tree (*Matlab*)**, *with Prof. Anna Choromanska*, NYU.
- Contributed towards a theoretical proof of the boosting ability of a newly proposed objective function to reduce the overall misclassification error in a tree based classification framework.

Sep–Dec 2017 **Cell-Free Massive MIMO**, *with Prof. Thomas Marzetta*, NYU.
- Presented a critical analysis of precoding and power optimization techniques for cell-free Massive MIMO system.

Sep–Dec 2017 **Active Queue Management (AQM) (*Bash, GENI Testbed*)**, *with Prof. Shiv Panwar*, NYU.
- Implemented AQM schemes such as ARED, CoDel, and PIE on Geni testbed and compared their throughput, latency, and fairness performance with default FIFO and other fairness queuing schemes.

Feb–May 2017 **Programmable IoT Platform (*Mininet, Python*)**, *with Prof. Lakshmi, NYU Courant*.
- Simulated an IoT testbed (a controller and a large number of sensors) on Mininet and applied regression algorithms at the controller for an application to build the road-traffic-map of a city using sparse traffic data.

Leader/Volunteer

2019–2020 **Vice President, ECE graduate student council**, *UC San Diego*.
Responsible for providing communication between ECE students and the Council and organizing regular events such as seminars and coffee hours.

May 2017 **Volunteer, Commencement Ceremony**, *NYU Tandon School*.
Helped in the enforcement of law and management at the NYU Tandon commencement ceremony of above 1000 students at Barclay Center, Brooklyn, NYC.

2014–2015 **Coordinator, Fine Arts Club**, *IIT Kanpur*.
Organized institute level Fine Arts workshops and coordinated live performances such as on-stage *speed art* and *sand art* along with a team of 4 members and 25 volunteers.

Awards/Honours and Services

- Reviewer of IEEE Trans. Vehicular Technology (TVT) 2019, 2020.
- Artifact Evaluation Committee, ACM CoNEXT 2019.
- Awarded student travel grant for MobiCom, New Delhi 2018.
- Samuel Morse MS Fellowship (with full financial support during MS at NYU) 2016–2018.
- Academic Excellence Awards 2013–2015, 2017.
- Secured All India Rank 390 (amongst 0.5 million students) in IIT–Joint Entrance Exam 2012.