

Ish Kumar Jain

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Education

- May 2022 **Doctorate of Philosophy (PhD)**, *University of California San Diego, Jacobs School of Engineering*.
Major: Electrical Engineering
- May 2018 **Master of Science (MS)**, *New York University, Tandon school of Engineering*, Brooklyn, NY.
Major: Electrical Engineering, **GPA: 3.96 (out of 4)**
- Samuel Morse MS Fellowship 2016-2018 | Academic Excellence Award 2017.
 - Teaching:** Machine Learning, Spring-2018 and Fall-2017 | Internet Architecture and Protocols Lab, Spring-2017.
 - Selected Courses:** Advanced Machine Learning, Massive-MIMO, Networks & Mobile Systems, Network Modeling and Analysis, Probability and Stochastic Processes, Scientific Computing.
- May 2016 **Bachelors of Technology (B.Tech.)**, *Indian Institute of Technology (IIT Kanpur)*, India.
Major: Electrical Engineering, **GPA: 9.5 (out of 10)**
- Motorola Gold Medalist: Convocation award for the best all-round performance in Electrical Engineering 2016.
 - Academic Excellence Awardee (top 7% of the batch) in academic terms 2012-13, 2013-14, and 2014-15.
 - Selected Courses:** Wireless Communications, Convex Optimization, Distributed Systems, Communication Networks, Advanced Image Processing, Digital Signal Processing, Robotics, C Programming, and Data Structures.

Master's Thesis

Title *Millimeter Wave Line-Of-Sight Blockage Analysis*
Supervisor Prof. Shivendra Panwar

- Evaluated blockage rate of UE-BS link in terms of blockers density and link lengths with mobile blockers.
- Modeled blocked/unblocked periods as an alternating renewal process with exponential durations.
- Developed Markov models and evaluated state probabilities of simultaneous blockage of multiple BSs (Poisson Point Process) and calculated the average frequency and duration of those blockage events.
- Our model is useful in finding the optimal density, height and other design parameters of BSs in an area.

Technical Skills

Programming C, C++, Python (TensorFlow, Keras, Torch)
Software Matlab (CVX), Mininet, OpenCV, GitHub, L^AT_EX, Shell scripting

Research Internships

- 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 time over sequential search schemes.
- May–July 2015 **University of Victoria**, *BC, Canada*.
Topic: **Rendezvous for Cognitive Radio Networks** | Mentor: Prof. Jianping Pan, Dept. of Computer Science
- Derived channel availability probability for SUs based on PU power control and spectrum sensing in cellular systems.
 - Achieved an improvement in rendezvous performance when the channels are selected according to our model.
- May–July 2014 **Indian Institute of Technology**, *Kanpur, India*.
Topic: **MIMO Two-Way Relay Networks (TWRN)** | Mentor: Prof. Ajit Chaturvedi, Dept. of Electrical Engineering
- Applied precoding design techniques at the two end devices as well as a Decode-and-Forward (DF) relay.
 - Showed better diversity order and reduced bit error rate for DF scheme over the Amplified-and-Forward Protocol.

Publication

- TPAMI 2018 Anna Choromanska, **Ish Kumar Jain**, "Extreme Multiclass Classification Criteria", submitted to *IEEE Transactions On Pattern Analysis and Machine Intelligence*, 2018.
- GLOBECOM 2018 **Ish Kumar Jain**, Rajeev Kumar, Shivendra Panwar, "Limited by Capacity or Blockage? A Millimeter-wave Blockage Analysis", submitted to *IEEE International Teletraffic Congress (ITC30)*, 2018.

Selected Graduate Projects

- Feb2017–
Mar2018 **Multi-class Classification Tree**, *Research Project under Prof. Anna Choromanska.*
- Theoretically proving 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**, *Term Paper with Prof. Thomas Marzetta.*
- 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)**, *Course Project with Prof. Shiv Panwar.*
- 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)**, *Course Project with Prof. Lakshmi S., NYU Courant.*
- Simulated an IoT testbed (a controller and a large number of sensors) on Mininet
 - The devices could send sparse amount of data on demand of the controller to save the battery life and data usage.
 - Applied regression algorithms at the controller for an application to build the road-traffic-map of a city.

Selected Undergrad Projects

- Jan–Apr 2016 **Convex Optimization in MIMO Detection (MATLAB-CVX)**, *Term Paper, Convex Optimization.*
- Implemented Semi-Definite Relaxation (SDR) techniques via rank-1 approximation for 16-QAM MIMO Detection using MATLAB-CVX tool and compared the results with traditional zero-forcing based detection scheme.
- Jan–Apr 2016 **Tennis Ball Detection and Tracking using Kinect (C++, OpenCV)**, *Course Project, Robotics.*
- Implemented real-time algorithms for tennis ball detection using Kinect and applied Extended Kalman Filter for its prediction and tracking. This work is contributed towards a project to train a robot play table-tennis with humans.
- Jan–Apr 2016 **Content based Image Retrieval (Python)**, *Course Project, Advanced Image Processing.*
- Implemented an Image Retrieval technique, which includes formation of a clique of semantically similar images called *superimage* using a trained SVM, indexing of superimages using K-means clustering, and online retrieval of superimages for a given test image. Reported a 75% precision value of this scheme.

Leader/Volunteer

- May 2017 **Volunteer, Convocation Ceremony**, *NYU Tandon School.*
Helped in the enforcement of law and management at the NYU Tandon convocation ceremony of above 1000 students at Barclay Center, NYC.
- 2014–2015 **Coordinator, Fine Arts Club**, *IIT Kanpur.*
Organized Institute level Art Workshops, performed and coordinated stage performance like Speed Art and Sand Art along with a team of 4 members and 25 volunteers.
- 2013–2014 **Academic Mentor, Counselling Service**, *IIT Kanpur.*
Guided a group of academically weak students in elementary programming and electronics courses and helped them to adjust in the new academic environment.

Awards and Honours

- Awarded 1st Prize in 'Elec-trade', on-the-spot circuit design challenge, Techkriti, IIT Kanpur 2015.
- Selected for Indo European Winter Academy organized with FAU Erlangen & KTH Stockholm 2014.
- KVPY Scholar (Kishore Vaigyanik Protsahan Yojna), awarded to top 600 students in India 2012.
- Secured All India Rank 390 (amongst 0.5 million students) in IIT- Joint Entrance Exam 2012.
- Secured All India Rank 41 (amongst 0.15 million students) in NSTSE (National Science Talent Search Examination) 2012.