Sundeep Rangan

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EDUCATION

University of California, Berkeley, California:
- Ph.D. in Electrical Engineering, December 1997
  - Thesis: "Robust Identification and Control of Multimodel Systems with Applications to Semiconductor Manufacturing"
  - Advisors: Kameshwar Poolla, Costas Spanos
- M.S. in Electrical Engineering, 1995

University of Waterloo, Waterloo, Canada
- B.A.Sc. Electrical Engineering, May 1992
- Options in physics and mathematics

PROFESSIONAL EXPERIENCE

Feb 2010–present: **New York University**, Brooklyn, NY
Professor, Electrical and Computer Engineering.

- Professor, Sept 2018 – present.
- Associate Professor with tenure, Sept 2016 to Sept 2018.
- Associate Professor without tenure, Feb 2010 – Sept 2016.
- Associate Director, NYU WIRELESS, Sept 2018 to present.
- Director, NYU WIRELESS, Sept 2016 to Sept 2018
- Faculty position with focus in wireless communications, signal processing and information theory.

Feb 2006–Feb 2010: **Qualcomm Technologies**, Senior Director of Engineering, Bridgewater, NJ.

- Supervised advanced research and development group of approximately 12 employees in cellular communication products.
- Performed lead engineering roles in high performance base station ASICs for both the 3GPP Long-Term Evolution (LTE) and earlier 3GPP2 Universal Mobile Broadband (UMB) systems. Contributions included supervision of all PHY and MAC algorithms, development of the ASIC simulation and verification methodology and tools and MAC-layer software lead.
- Led feasibility study, architectural planning and early development for a 4G femotcell ASIC. The system-on-chip (SoC) was a multimode device supporting 3G and 4G cellular standards, peak rates in excess of 300 Mbps DL and 120 Mbps UL, and contained several processors and DSPs.

Oct 2000–Feb 2006: **Flarion Technologies**, Director and Co-Founder, Bedminster, NJ.

- Co-founded (with four others) Flarion Technologies to commercialize Flash-OFDM, one of the first cellular OFDM data systems. Flash-OFDM was a precursor to later 4G standards including WiMAX and LTE. The company grew to over 150 employees with trials with tier 1 carriers worldwide. Flarion was sold to Qualcomm for $800 million in 2006.
- Supervised the design, simulation and testing of virtually every aspect of the PHY and MAC layers of the system through three generations of mobile and base station products. My work also included involvement in numerous field trials, ASIC tapeouts, and standardization efforts.

Revised November 2, 2024

Aug 1998–Feb 2000: **Bell Labs, Lucent Technologies**, Postdoctoral Member of Technical Staff, Murray Hill, NJ.

- Initial high-level system design and simulation of the Flash-OFDM wireless system. The project was spun off to become Flarion Technologies.

Sep 1997–Aug 1998: **University of Michigan**, Ann Arbor, MI. Postdoctoral Research Fellow, Dept. of Electrical Engineering,

- Principal research investigator for the development of a commercial MATLAB toolbox for system identification. The toolbox incorporated advanced computational modeling tools for dynamical systems and a SimuLink-based graphical user interface. Project funded by an NSF Small Business Research Initiative (SBRI) for commercialization of promising new technologies.

Sep 1992–May 1997: **University of University of California**, Berkeley, CA Research Assistant, Dept. of Electrical Engineering.

- Researched various theoretical problems in nonlinear system identification, control and model validation.
- Developed spectroscopic scanner with motorized sweeping and real-time signal processing for monitoring plasma etch processing. Work sponsored by Texas Instruments in conjunction with the Semiconductor Research Center.

May 1992–Sep 1992: **STRACO**, Assistant Engineer, Compiègne, France.

- Finite-element analysis software for electromagnetic field, acoustic and structural analysis

1990-1991: **University of Waterloo**, Waterloo, ON. Undergraduate Research Assistant, VLSI Group, Dept. of Electrical Engineering.

- Developed sigma-delta A/D decimation filter design software and prototype for high-resolution multibit quantizers
- Assisted programming of automated BiCMOS analog circuit design package.

1989: **Ontario Hydro**, Student Engineer, Toronto, ON. Transmission Lines Department.

- Analyzed safety procedures for high-voltage 500kV live-line work.

1989: **Bell Northern Research**, Student Engineer, Digital Switching Department, Nepean, ON.

- Designed and functionally simulated a real-time protocol analyzer for fiber-optic and twisted pair digital telephone switches.

1988: **Gandalf Data**, Student Engineer, Quality Assurance, Nepean, ON.

- Configured and tested PBXs. Designed remote control test equipment.

CONSULTING

- Technical advisor, Pi-Radio, Brooklyn, NY. 2018–present. Pi-Radio develops advanced software defined radios (SDRs) for wireless research and development.
- Kirkland-Ellis, Expert witness retained by Motorola Solutions in *Motorola Solutions vs. Hytera Corporation, No. 1:17-cv-01973* in U.S. District Court for the Northeast District of Illinois Eastern Division. Prepared expert reports, gave depositions and testified in trial. 2024.
- Kirkland-Ellis, Expert witness retained by Lenovo in *Certain Mobile Phones, Components Thereof, and Products Containing Same, No. 337-TA-1375(I.T.C.)* on US patent 11,317,342 and 10,306,669. Prepared expert reports and testified in trial. 4/2024 to 7/2024.
- Wilmer Hale, Expert retained by Apple in *Apple vs. Lionra Technologies* before *U.S. Patent Trial and Appeal Board, Inter Partes Review, Case No. IPR2017–00671.* Began expert report until case settled, 2023.
- E-Rise, Expert witness retained by Apple vs. Ericsson in *Inter Partes Review of U.S. Patent 9,888,486* before the Patent Trial and Appeal Board. Prepared expert reports and gave a deposition. 2022.
- Kirkland-Ellis, Expert witness retained by Motorola Solutions in *Motorola Solutions vs. Hytera Corporation, No. 1:17-cv-01973* in U.S. District Court for the Northeast District of Illinois Eastern Division. Prepared expert reports, gave depositions and testified in trial. 2019 to 2020.

- Kirkland-Ellis, Expert witness retained by Motorola Solutions in *Motorola Solutions vs. Hytera Corporation, No. 1:17-cv-01973* in U.S. District Court for the Northeast District of Illinois Eastern Division. Prepared expert reports, gave depositions and testified in trial. 2019 to 2020.
- Herbert Smith Freehills, Expert witness retained by Motorola Solutions in *Motorola Solutions vs. Hytera Corporation*, New South Wales, Australia. Prepared expert reports and testified in trial. 2018 to 2020.
- Kirkland-Ellis, Expert witness retained by Motorola Solutions in *Certain Two-Way Radio Equipment an Systems, Related Software and Components Thereof, No. 337-TA-1053 (I.T.C.)* on U.S. patent 7,369,869. Prepared expert reports, gave depositions and testified in trial. 2017 to 2018.
- Wilmare-Hale, Expert witness retained by T-Mobile, Inc. before *U.S. Patent Trial and Appeal Board, Trial IPR2017–00671*, in U.S. patent 8,638,750. Prepared expert reports and gave a deposition, 2017.
- Kirkland-Ellis, Expert witness retained by Samsung in *Certain Wireless Communications Equipment and Articles Therein, No. 337-TA-866 (I.T.C.)* on US patent 8,228,827. Prepared expert reports and testified in trial. 3/2013 to 4/2014.
- Kandou Technologies, Lausanne, Switzerland. 2011–2013.
- Microsoft Research, 2010.
- Technical Advisory Board, Phazr, Inc., 2016–2018.

AWARDS

- NYU Tandon School of Engineering Distinguished Teaching Award, 2022.
- IEEE Signal Processing Society Donald G. Fink Overview Best Paper Award, 2020.
- Advisor for IEEE ISIT Student Best Paper Award, 2019.
- IEEE Communication Systems Integration and Modelling (CSIM) Best Paper Award, 2019.
- IEEE Signal Processing Society Best Paper Award, 2017.
- Invited representative for EU-US NAE Frontiers of Engineering, Chantilly, France, June 2013.

MAJOR SERVICE ACTIVITIES

- Guest Editor, IEEE J. Special Topics in Millimeter Wave Networking, Jan 2020. (Lead editor Joerg Widmer)
- Guest Editor, IEEE Communications Magazine 5G Radio Access Architecture and Technologies, November 2016. (Lead editor David Soldani)
- Guest Editor, IEEE J. Special Topics in Signal Processing in Millimeter Wave Wireless Communication, December 2015. (Lead editor Robert Heath)
- Workshop Co-Chair, IEEE Globecom, Austin, Texas, December 2014.
- Associate Editor, IEEE Signal Processing Letters, 2012 to 2013.
- Guest Editor, IEEE J. Selected Areas in Communications Special Issue on Femtocell Networks, April 2012. (Lead editor, Jeffery Andrews)

SHORT BIOGRAPHY

Sundeep Rangan received the B.A.Sc. at the University of Waterloo, Canada and the M.Sc. and Ph.D. at the University of California, Berkeley, all in Electrical Engineering. He has held postdoctoral appointments at the University of Michigan, Ann Arbor and Bell Laboratories, Murray Hill, NJ. In 2000, he co-founded (with four others) Flarion Technologies, a spin off of Bell Labs that developed Flash OFDM, one of the first cellular OFDM data systems and pre-cursor to modern 4G cellular systems such as 3GPP LTE. In 2006, Flarion was acquired by Qualcomm Technologies where Dr. Rangan was a Senior Director of Engineering involved in OFDM infrastructure products. He joined the NYU Tandon School of Engineering (formerly NYU Polytechnic Institute) in 2010, where he is currently a Professor of Electrical and Computer Engineering and an Associate Director of NYU Wireless, a leading academic-industry research center on development of future wireless systems. He is the recipient of the 2020 IEEE Signal Processing Society Donald G. Fink Overview Best Paper Award, the 2017 IEEE Signal Processing Society Best Paper Award, and was an advisor for the 2019 IEEE ISIT Jack K. Wolf Student Best Paper Award. His research interests are in wireless communications, signal processing, and information theory.

PUBLICATIONS

Google scholar page: `https://scholar.google.com/citations?user=fzSHXS8AAAAJ&hl=en&oi=ao` (2022/4/6):

Citation indices	All	Since 2017
Citations	22204	14164
h-index	67	48
i10-index	185	145

Web of Science citation report (2022/4/6):

Results found	181
Sum of times cited:	8959
Sum of times cited without self-citations:	6910
h-index	36

Notes:

- PhD students at NYU that I funded or partially funded are indicated by [PhD].
- **Bold** numbers indicates Google scholar data for the most highly cited papers current as of Dec 13, 2020.

Journal papers

1. Kang, Seongjoon, Marco Mezzavilla, Sundeep Rangan, Arjuna Madanayake, Satheesh Bojja Venkatakrishnan, Gregory Hellbourg, Monisha Ghosh, Hamed Rahmani, and Aditya Dhananjay. "Cellular wireless networks in the upper mid-band." *IEEE Open Journal of the Communications Society*, 2024.
2. Pegoraro, Jacopo, Jesus O. Lacruz, Tommy Azzino, Marco Mezzavilla, Michele Rossi, Joerg Widmer, and Sundeep Rangan. "JUMP: Joint communication and sensing with Unsynchronized transceivers Made Practical," *IEEE Transactions on Wireless Communications*, 2024.
3. Giuliani, Amedeo, Rasoul Nikbakht, Giovanni Geraci, Seongjoon Kang, Angel Lozano, and Sundeep Rangan. "Spatially Consistent Air-to-Ground Channel Modeling via Generative Neural Networks." *IEEE Wireless Communications Letters,* 2024.
4. Hu, Q., Azar, G. A., Fletcher, A., Rangan, S., Atashzar, S. F. "ViT-MDHGR: Cross-day Reliability and Agility in Dynamic Hand Gesture Prediction via HD-sEMG Signal Decoding," *IEEE Journal of Selected Topics in Signal Processing*, 2024.
5. Chen, T., Maddala, P., Skrimponis, P., Kolodziejski, J., Adhikari, A., Hu, H., Gao, Z., Paidimarri, A., Valdes-Garcia, A., Lee, M. and Rangan, S, "Open-access millimeter-wave software-defined radios in the PAWR COSMOS testbed: Design, deployment, and experimentation," *Computer Networks*, 234, p.109922, 2023.
6. Lozano, Angel, and Sundeep Rangan. "Spectral vs Energy Efficiency in 6G: Impact of the Receiver Front-End," *IEEE BITS the Information Theory Magazine*," 2023.
7. Pizzo, A., Lozano, A., Rangan, S., Marzetta, T. L. "Wide-Aperture MIMO via Reflection off a Smooth Surface," *IEEE Transactions on Wireless Communications*, 2023.
8. Syed Hashim Ali Shah [PhD], and Sundeep Rangan, "Multi-cell multi-beam prediction using auto-encoder LSTM for mmWave systems," *IEEE Transactions on Wireless Communications*," 21, no. 12 pp.10366-10380, 2022.
9. Giovanni Geraci, Adrian Garcia-Rodriguez, M. Mahdi Azari, Angel Lozano, Marco Mezzavilla, Symeon Chatzinotas, Yun Chen, Sundeep Rangan, and Marco Di Renzo, "What will the future of UAV cellular communications be? A flight from 5G to 6G," *IEEE communications surveys & tutorials*, 24, no. 3, pp. 1304-1335, 2022.
10. C. Slezak [PhD]and S. Rangan, "Measurement-Based Indoor Millimeter Wave Blockage Models," in *IEEE Transactions on Wireless Communications*, 2022.
11. Xia, W. [PhD], Rangan, S., Mezzavilla, M., Lozano, A., Geraci, G., Semkin, V., Loianno, G., "Generative neural network channel modeling for millimeter-wave UAV communication," *IEEE Transactions on Wireless Communications*, 21(11), 9417-9431, 2022.
12. Zhongzheng Yuan, Tommy Azzino [PhD], Yu Hao, Yixuan Lyu, Haoyang Pei, Alain Boldini, Marco Mezzavilla, Mahya Beheshti, Maurizio Porfiri, Todd E. Hudson, William Seiple, Yi Fang, Sundeep Rangan, Yao Wang, John-Ross Rizzo, "Network-Aware 5G Edge Computing for Object Detection: Augmenting Wearables to 'See' More, Farther and Faster," in *IEEE Access*, vol. 10, pp. 29612-29632, 2022.

13. Mingsheng Yin [PhD], Akshaj Kumar Veldanda, Amee Trivedi, Jeff Zhang, Kai Pfeiffer, Yaqi Hu [PhD], Siddharth Garg, Elza Erkip, Ludovic Righetti, Sundeep Rangan, "Millimeter Wave Wireless Assisted Robot Navigation With Link State Classification," *IEEE Open Journal of the Communications Society*, vol. 3, 2022.
14. Sourjya Dutta [PhD], C. Nicolas Barati, David Ramirez, Aditya Dhananjay, James F. Buckwalter, Sundeep Rangan, "A Case for Digital Beamforming at mmWave," IEEE Transactions on Wireless Communications, vol. 19, 2020.
15. Syed Hashim Ali Shah [PhD], Sundar Aditya, Sundeep Rangan, "Power-Efficient Beam Tracking During Connected Mode DRX in mmWave and Sub-THz Systems,"
16. Panagiotis Skrimponis [PhD], Navid Hosseinzadeh, Abbas Khalili, Elza Erkip, Mark J. W. Rodwell, James F. Buckwalter, Sundeep Rangan, "Towards Energy Efficient Mobile Wireless Receivers Above 100 GHz," *IEEE Access*, 2020.
17. Semkin, V., Haarla, J., Pairon, T., Slezak, C. [PhD], Rangan, S., Viikari, V., and Oestges, C, "Analyzing Radar Cross Section Signatures of Diverse Drone Models at mmWave Frequencies," *IEEE Access*, vol. 8, pp. 48958-48969, 2020.
18. C.N. Barati [PhD], S. Dutta [PhD], S. Rangan, A. Sabharwal, "Energy and Latency of Beamforming Architectures for Initial Access in mmWave Wireless Networks," Journal of the Indian Institute of Science, vol.100, no.2, May 2020.
19. M. Giordani, Michele Polese, Marco Mezzavilla, Sundeep Rangan, and Michele Zorzi, "Toward 6G networks: Use cases and technologies." *IEEE Communications Magazine*, vol. 58, no. 3:55-61, 2020.
20. Pandit, Parthe, Mojtaba Sahraee-Ardakan, Sundeep Rangan, Philip Schniter, and Alyson K. Fletcher, "Inference with deep generative priors in high dimensions," *IEEE Journal on Selected Areas in Information Theory*, 2020.
21. P. Pandit, M. Sahraee-Ardakan, A. A. Amini, S. Rangan and A. K. Fletcher, "Generalized Autoregressive Linear Models for Discrete High-dimensional Data," *IEEE Journal on Selected Areas in Information Theory*, 2020.
22. Alyson K. Fletcher, Parthe Pandit, Mojtaba Sahraee-Ardakan, Sundeep Rangan, Subrata Sarkar, Philip Schniter, "Plug in estimation in high dimensional linear inverse problems a rigorous analysis," Journal of Statistical Mechanics-Theory and Experiment, Dec. 2019.
23. Carlo Fischione, Dimitrios Koutsonikolas, Sundeep Rangan, Ljiljana Simic, Joerg Widmer, Xinyu Zhang, Anfu Zhou , "Guest Editorial Millimeter-Wave Networking," *IEEE Journal on Selected Areas in Communications*, 37:12, 2019.
24. S. Dutta [PhD], C. N. Barati [PhD], D. Ramirez, A. Dhananjay, J. F. Buckwalter, and S. Rangan, "A case for digital beamforming at mmWave", IEEE Transactions on Wireless Communications, 19(2), pp.756-770, 2019.
25. S. Sarkar, A. K. Fletcher, S. Rangan and P. Schniter, "Bilinear Recovery Using Adaptive Vector-AMP," *IEEE Transactions on Signal Processing*, vol. 67, no. 13, pp. 3383-3396, 1 July 2019.
26. S. Rangan, P. Schniter and A. K. Fletcher, "Vector Approximate Message Passing," *IEEE Transactions on Information Theory*, June 2019.
27. Zhang, Menglei, Michele Polese, Marco Mezzavilla, Jing Zhu, Sundeep Rangan, Shivendra Panwar, and Michele Zorzi. "Will TCP Work in mmWave 5G Cellular Networks?", *IEEE Communications Magazine* 57, no. 1 pp, 65-71, Jan 2019.
28. Slezak, C., Semkin, V., Andreev, S., Koucheryavy, Y., Rangan, S. (2018). "Empirical Effects of Dynamic Human-Body Blockage in 60 GHz Communications," *IEEE Communications Magazine*, 56(12), 60-66, Dec 2018.
29. Giordani, M., Mezzavilla, M., Rangan, S., Zorzi, M. "An Efficient Uplink Multi-Connectivity Scheme for 5G Millimeter-Wave Control Plane Applications," IEEE Transactions on Wireless Communications, 17(10), 6806-6821, October 2018.
30. Fletcher, Alyson K., and Sundeep Rangan. "Iterative reconstruction of rank-one matrices in noise," Information and Inference: A Journal of the IMA 7.3: 531-562, July 2018.
31. Mezzavilla, Marco, Michele Polese, Andrea Zanella, Aditya Dhananjay, Sundeep Rangan, Coitt Kessler, Theodore S. Rappaport, and Michele Zorzi, "Public safety communications above 6 GHz: Challenges and opportunities." IEEE Access 6 , 316-329, June 2018.
32. Mezzavilla, Marco, Menglei Zhang, Michele Polese, Russell Ford, Sourjya Dutta, Sundeep Rangan, and Michele Zorzi, "End-to-end simulation of 5G mmWave networks." IEEE Communications Surveys and Tutorials, 2093), pp. 2237-2263, March 2018.

- **2019 IEEE Communication Systems Integration and Modelling (CSIM) Best Paper Award**

33. Gomez-Cuba, Felipe, Elza Erkip, Sundeep Rangan, and Francisco Javier Gonzalez-Castano, "Capacity Scaling of Cellular Networks: Impact of Bandwidth, Infrastructure Density and Number of Antennas." *IEEE Transactions on Wireless Communications* 17, no. 1 pp. 652-666, Jan 2018.
34. Michele Polese; Marco Giordani; Marco Mezzavilla; Sundeep Rangan; Michele Zorzi, "Improved Handover Through Dual Connectivity in 5G mmWave Mobile Networks," *IEEE Journal on Selected Areas in Communications*, 35(9), pp 2068–2084, 2017.
35. S. Rangan, A. K. Fletcher, V. K. Goyal, E. Byrne and P. Schniter, "Hybrid Approximate Message Passing," *IEEE Transactions on Signal Processing*, vol. 65, no. 17, pp. 4577-4592, Sept.1, 1 2017.
36. M. Borgerding, P. Schniter and S. Rangan, "AMP-Inspired Deep Networks for Sparse Linear Inverse Problems," *IEEE Transactions on Signal Processing*, vol. 65, no. 16, pp. 4293-4308, Aug.15, 15 2017.
37. M. Rebato, F. Boccardi, M. Mezzavilla, S. Rangan and M. Zorzi, "Hybrid Spectrum Sharing in mmWave Cellular Networks," *IEEE Transactions on Cognitive Communications and Networking*, vol. 3, no. 2, pp. 155-168, June 2017.
38. P. A. Eliasi [PhD], S. Rangan, and T. S. Rappaport, "Low-Rank Spatial Channel Estimation for Millimeter Wave Cellular Systems," *IEEE Trans. Wireless Communications*, vol. 16, no. 5, pp. 2748–275, May 2017
39. Sourjya Dutta [PhD], Marco Mezzavilla, Russell Ford [PhD], Menglei Zhang [PhD], Sundeep Rangan, Michele Zorzi, "Frame Structure Design and Analysis for Millimeter Wave Cellular Systems," *IEEE Transactions on Wireless Communications*, vol.PP, no.99, 2017.
40. R. Ford [PhD], M. Zhang [PhD], M. Mezzavilla, S. Dutta [PhD], S. Rangan and M. Zorzi, "Achieving Ultra-Low Latency in 5G Millimeter Wave Cellular Networks," *IEEE Communications Magazine*, vol. 55, no. 3, pp. 196-203, March 2017.
41. S. Rangan, A. K. Fletcher, P. Schniter, U. S. Kamilov, "Inference for Generalized Linear Models via Alternating Directions and Bethe Free Energy Minimization," *IEEE Transactions on Information Theory*, vol.63, no.1, pp.676–697, 2017
42. C. N. Barati Nt. [PhD], S. A. Hosseini, M. Mezzavilla, T. Korakis, S. S. Panwar, S. Rangan, M. Zorzi, "Initial Access in Millimeter Wave Cellular Systems," *IEEE Transactions on Wireless Communications*, vol.15, no.12 pp.7926–7940, Dec. 2016.
43. S. Rangan, P. Schniter, E. Riegler, A. K. Fletcher and V. Cevher, "Fixed Points of Generalized Approximate Message Passing With Arbitrary Matrices," *IEEE Transactions on Information Theory*, vol. 62, no. 12, pp. 7464-7474, Dec. 2016.
44. Heath R.W., Gonzalez-Prelcic N, Rangan S, Roh W, Sayeed AM. "An overview of signal processing techniques for millimeter wave MIMO systems," *IEEE Journal of Selected Topics in Signal Processing*,10(3):436-53, Apr 2016.
45. Heath R.W., Gonz'alez-Prelcic N, Rangan S, Roh W, Sayeed A. Introduction to the Special Issue on Signal Processing for Millimeter Wave Wireless Communications. *IEEE Journal of Selected Topics in Signal Processing,* 10(3):433-5, Apr 2016.
    - **2020 IEEE Signal Processing Society Donald G. Fink Overview Paper Award**
    - **1357 citations**

The following works predate promotion to Associate Professor with tenure

46. C. N. Barati [PhD], S. A. Hosseini, S. Rangan, P. Liu, T. Korakis, S. S. Panwar, and T. S. Rappaport, "Directional Cell Search for Millimeter Wave Cellular Networks," *IEEE Trans. Wireless Communications*, vol. 14, no. 12, pp. 6664–6678, 2015.
47. Wonju Lee, Osvaldo Simeone, Joonhyuk Kang, Sundeep Rangan, Petar Popovski, "HARQ Buffer Management: An Information-Theoretic View," *IEEE Trans. Comm.*, vol. PP, no. 99, 2015.
48. J. García-Rois, F. Gómez-Cuba, F. J. González-Castaño, J. C. Burguillo-Rial, M. R. Akdeniz [PhD], S. Rangan, "On the Analysis of Scheduling in Dynamic Duplex Multi-Hop mmWave Cellular Systems," *IEEE Trans. Wireless Communications*, vol. 99, June 2015.
49. P. Schniter and S. Rangan, "Compressive Phase Retrieval via Generalized Approximate Message Passing," *IEEE Trans. Signal Processing*, vol. 63, no. 4, pp.1043–1055, Feb. 2015
50. S. Sun, T. S. Rappaport, R. W. Heath, A. Nix, and S. Rangan, "MIMO for Millimeter Wave Wireless Communications: Beamforming, Spatial Multiplexing, or Both?," *IEEE Communications Magazine*, vol. 52, no. 12, pp. 110–121, December 2014.

- **One of the IEEE top 100 downloaded papers, December 2014**

51. M. R. Akdeniz [PhD], Y. Liu, M. K. Samimi, S. Sun, S. Rangan, T. S. Rappaport, and E. Erkip, "Millimeter Wave Channel Modeling and Cellular Capacity Evaluation," *IEEE J. Selected Areas in Communications*, vol. 32, no. 6, pp. 1164–1179, June 2014.
    - **1529 citations**
52. U. S. Kamilov, S. Rangan, A. K. Fletcher, and M. Unser, "Approximate Message Passing with Consistent Parameter Estimation and Applications to Sparse Learning," *IEEE Trans. Information Theory*, vol. 60, no. 5, pp. 2969–2985, May 2014.
53. S. Rangan, T. S. Rappaport and E. Erkip, "Millimeter Wave Cellular Networks: Potentials and Challenges," *Proceedings of the IEEE*, vol. 102, no. 3, pp. 366–385, March 2014.
    - **One of the IEEE top 50 downloaded papers, March 2014**
    - **2046 citations**

The following works predate the midterm tenure review

54. Y. Barbotin, A. Hormati, S. Rangan, and M. Vetterli, "Estimation of Sparse MIMO Channels with Common Support," *IEEE Trans. Communications*, vol. 60, no. 12, pp. 3705–3716, December 2012.
55. U. S. Kamilov, V. K. Goyal, and S. Rangan, "Message-Passing De-Quantization with Applications to Compressed Sensing," *IEEE Trans. Signal Processing*, vol. 60, no. 11, pp. 6270–6281 December 2012.
    - **IEEE Signal Processing Society Best Paper Award, 2017**
56. A. K. Fletcher, S. Rangan, and V. K. Goyal, "Ranked Sparse Signal Support Detection," *IEEE Trans. Signal Processing*, vol. 60, no. 11, pp. 5919–5931, November 2012.
57. S. Rangan and R. K. Madan, "Belief Propagation Methods for Femtocellular Interference Coordination in Femtocell Networks," *IEEE J. Selected Areas in Communications—Special Issue on Femtocellular Networks*, vol. 30, no. 3, pp. 631–630, April 2012.
58. J. G. Andrews, H. Claussen, M. Dohler, S. Rangan, and M. C. Reed, "Femtocells: Past, Present, and Future," *IEEE J. Selected Areas in Communications—Special Issue on Femtocellular Networks*, vol. 30, no. 3, pp. 497–508, April 2012.
    - **1308 citations**
59. S. Rangan, A. K. Fletcher, and V. K. Goyal, "Asymptotic Analysis of MAP Estimation via the Replica Method and Applications to Compressed Sensing," *IEEE Trans. Information Theory*, vol. 58, no. 3, pp. 1902–1923, March 2012.
60. A. K. Fletcher and S. Rangan, "Orthogonal Matching Pursuit: A Brownian Motion Analysis," *IEEE Trans. Signal Proc.*, vol. 60, no. 3, pp. 1010–1021, March 2012.

The following works predate joining NYU-Poly

A. K. Fletcher, S. Rangan, and V. K. Goyal, "Necessary and Sufficient Conditions on Sparsity Pattern Recovery," *IEEE Trans. Information Theory*, vol. 55, no. 12, pp. 5758–5772, December 2009.

61. K. Hsu, T. Vincent, G. Wolodkin, S. Rangan, and K. Poolla, "An LFT Approach to Parameter Estimation," *Automatica*, vol. 44, no. 12, pp. 3087–3092, December 2008.
62. P. Hande, S. Rangan, Mung Chiang, and X. Wu, "Distributed Uplink Power Control for Optimal SIR Assignment in Cellular Data Networks," *IEEE/ACM Trans. Networking*, vol. 16, no. 6, pp. 1420–1433, December 2008.
63. V. K. Goyal, A. K. Fletcher, and S. Rangan, "Compressive Sampling and Lossy Compression," *IEEE Signal Processing Mag.*, vol. 25, no. 2, pp. 48–56, March 2008.
64. A. K. Fletcher, S. Rangan, V. K. Goyal, and K. Ramchandran, "Robust Predictive Quantization: Analysis and Design via Convex Optimization," *IEEE J. Selected Topics in Signal Processing*, vol. 1, no. 4, pp. 618–632, December 2007.
65. A. K. Fletcher, S. Rangan, V. K. Goyal, and K. Ramchandran, "Denoising by Sparse Approximation: Error Bounds Based on Rate-Distortion Theory," *EURASIP J. Applied Signal Processing*, vol. 2006, no. 1, pp. 1–19, March 2006.
66. S. Rangan and V. K. Goyal, "Recursive Consistent Estimation with Bounded Noise," *IEEE Trans. Information Theory*, vol. 47, no. 1, pp. 457–464, January 2001.

67. S. Rangan, "Multiobjective H^∞ Problems: Linear and Nonlinear Control," *Systems and Control Letters*, vol. 32, no. 3, pp. 135–141, November 1997.

68. S. Rangan and K. Poolla, "Weighted Optimization for Multiobjective Full-Information Control Problems," *Systems and Control Letters*, vol. 31, no. 4, pp. 207–213, September 1997.

69. R. Smith, G. Dullerud, S. Rangan, and K. Poolla, "Model Validation for Dynamically Uncertain Systems," *Mathematical Modelling of Systems*, vol. 3, no. 1, pp. 43–58, January 1997.

70. S. Rangan and K. Poolla, "Time-Domain Validation for Sample-Data Uncertainty Models," *IEEE Trans. Automatic Control*, vol. 41, no. 7, pp. 980–991, July 1996.

71. S. Rangan and B. Leung, "Quantization Noise Spectrum of Double-Loop Sigma-Delta Converter with Sinusoidal Input," *IEEE Trans. Circuits and Systems II: Analog and Digital Signal Processing*, vol. 41, no. 2, pp. 168–173, February 1996.

Papers in highly selective conferences

1. Becker, E., Pandit, P., Rangan, S., Fletcher, A. K., "Instability and Local Minima in GAN Training with Kernel Discriminators," Proc. Neural Information Processing Systems, New Orleans, Dec. 2022.
2. Emami, M.; Sahraee-Ardakan, M.; Rangan, S; Fletcher, A. K., "Input-Output Equivalence of Unitary and Contractive RNNs," Proc. Neural Information Processing Systems, Montreal, Canada, December 2019
(Acceptance rate=21.6%)
3. Pandit, P., Sahraee-Ardakan, M., Amini, A., Rangan, S. and Fletcher, A. "Sparse Multivariate Bernoulli Processes in High Dimensions," Proc. Artificial Intelligence and Statistics (AISTATS), April 2019.
4. Alyson K. Fletcher, Parthe Pandit, Sundeep Rangan, Subrata Sarkar, and Philip Schniter. "Plug-in estimation in high-dimensional linear inverse problems: A rigorous analysis." Proc. Neural Information Processing Systems, Montreal, Canada, December 2018
(Acceptance rate=20.8%)
5. Alyson K. Fletcher, Mojtaba Sahraee-Ardakan, Sundeep Rangan, Philip Schniter "Rigorous Dynamics and Consistent Estimation in Arbitrarily Conditioned Linear Systems," Proc. Neural Information Processing Systems (NIPS), Long Beach, CA December 2017.
(Acceptance rate: 678/3240=21%
6. A. K. Fletcher and S. Rangan, "Scalable Inference for Neuronal Connectivity from Calcium Imaging," Proc. 28th Ann. Conf. Neural Information Processing Systems (NIPS), Montréal, Canada, December 2014.
(Acceptance rate: 414/1678=25%, Oral and oral spotlight: 82/1678, **top 4.9%**)

The following works predate the midterm tenure review

7. U. S. Kamilov, S. Rangan, A. K. Fletcher, and M. Unser, "Approximate Message Passing with Consistent Parameter Estimation and Applications to Sparse Learning," Proc. 26th Ann. Conf. Neural Information Processing Systems (NIPS), Lake Tahoe, CA, December 2012.
(Acceptance rate: 25%)
8. A. K. Fletcher, S. Rangan, L. Varshney, and A. Bhargava [PhD], "Neural Reconstruction via Approximate Message Passing," Proc. 25th Ann. Conf. Neural Information Processing Systems (NIPS), Grenada, Spain, pp. 2555–2563, December 2011.
(Acceptance rate: 22%)
9. S. Rangan and R. K. Madan, "Belief Propagation Methods for Intercell Interference Coordination," Proc. 30th IEEE Int. Conf. on Computer Communications (INFOCOM), Shanghai, China, pp. 2543–2551, April 2011.
(Acceptance rate: 16%)

The following works predate joining NYU-Poly

10. A. K. Fletcher and S. Rangan, "Orthogonal Matching Pursuit from Noisy Measurements: A New Analysis," Proc. 23rd Ann. Conf. Neural Information Processing Systems (NIPS), Vancouver, Canada, pp. 540–548, December 2009.
(Acceptance rate: 263/1105=24%, Oral and oral spotlight: 87/1105, **top 8%**)
11. S. Rangan, A. K. Fletcher, and V. K. Goyal, "Asymptotic Analysis of MAP Estimation via the Replica Method and Applications to Compressed Sensing," Proc. 23rd Ann. Conf. Neural Information Processing Systems (NIPS), Vancouver, Canada, pp. 1545–1553, December 2009.
(Acceptance rate: 263/1105=24%, Oral and oral spotlight: 87/1105, **top 8%**)
12. P. Hande, Mung Chiang, R. Calderbank, and S. Rangan, "Network Pricing and Rate Allocation with Content Provider Participation," Proc. 28th IEEE Int. Conf. on Computer Communications (INFOCOM), Rio de Janeiro, Brazil, pp. 990–998, April 2009.
(Acceptance rate: 20%)
13. A. K. Fletcher, S. Rangan, and V. K. Goyal, "Resolution Limits of Sparse Coding in High Dimensions," Proc. 22nd Ann. Conf. Neural Information Processing Systems (NIPS), Vancouver, Canada, December 2008.
(Acceptance rate: 24%)
14. P. Hande, S. Rangan, and Mung Chiang, "Distributed Uplink Power Control for Optimal SIR Assignment Cellular Data Networks," Proc. 25th IEEE Int. Conf. on Computer Communications (INFOCOM), Barcelona, Spain, pp. 1–13, April 2006.
(Acceptance rate: 18%)

15. A. K. Fletcher, S. Rangan, and V. K. Goyal, "Estimation from Lossy Sensor Data: Jump Linear Modeling and Kalman Filtering," Proc. Third Int. Symp. on Information Processing in Sensor Networks (IPSN), Berkeley, CA, pp. 251–258, April 2004.
(Acceptance rate: 17%)

Edited books, expository articles and book chapters

1. S. Rangan, "New strategies for femto-macro cellular interference control," in *Small Cell Networks: Deployment, PHY Techniques, and Resource Management*, T. Q. S. Quek, G. de la Roche, I. Güvenç and M. Kountouris, eds., Cambridge University Press, 2013.
2. Jinsong Wu, S. Rangan, and Honggang Zhang, eds., *Green Communications: Theoretical Fundamentals, Algorithms and Applications*, CRC Press, 2012.
3. V. K. Goyal, A. K. Fletcher, and S. Rangan, "Distributed Coding of Sparse Signals," in *Distributed Source Coding: Theory, Algorithms and Applications*, P. L. Dragotti and M. Gastpar, eds., Academic Press, 2009.
4. V. K. Goyal, A. K. Fletcher, and S. Rangan, "Compressive Sampling and Lossy Compression," *IEEE Signal Processing Magazine*, vol. 25, no. 2, pp. 48–56, March 2008.

Conference, symposium, and workshop papers

1. Chen, Tingjun, Prasanthi Maddala, Panagiotis Skrimponis, Jakub Kolodziejski, Xiaoxiong Gu, Arun Paidimarri, Sundeep Rangan, Gil Zussman, and Ivan Seskar. "Programmable and open-access millimeter-wave radios in the PAWR COSMOS testbed." In Proceedings of the 15th ACM Workshop on Wireless Network Testbeds, Experimental Evaluation and Characterization, pp. 1-8. 2022.
2. S. Dutta [PhD], A. Khalili, E. Erkip and S. Rangan, "Capacity Bounds for Communication Systems with Quantization and Spectral Constraints," Proc. IEEE International Symposium on Information Theory (ISIT), Los Angeles, CA, USA, 2020.
3. Panagiotis Skrimponis [PhD], Sourjya Dutta [PhD], Marco Mezzavilla, Sundeep Rangan, Seyed Hadi Mirfarshbafan, Christoph Studer, James Buckwalter, Mark Rodwell, "Power Consumption Analysis for Mobile MmWave and Sub-THz Receivers," Proc. IEEE 6G Wireless Summit (6G SUMMIT), Levi, Finland, 2020.
4. S. H. A. Shah, M. Sharma and S. Rangan, "LSTM-Based Multi-Link Prediction for mmWave and Sub-THz Wireless Systems," Proc. IEEE International Conference on Communications (ICC), Dublin, Ireland, 2020, pp. 1-6.
5. W. Xia [PhD], V. Semkin, M. Mezzavilla, G. Loianno and S. Rangan, "Multi-Array Designs for mmWave and Sub-THz Communication to UAVs," Proc. IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC), Atlanta, GA, USA, 2020.
6. Syed Hashim Ali Shah [PhD], Sarankumar Balakrishnan, Liangxiao Xin, Mohamed Abouelseoud, Kazuyuki Sakoda, Ken Tanaka, Christopher Slezak [PhD], Sundeep Rangan, Shivendra Panwar, "Beamformed mmWave System Propagation at 60 GHz in an Office Environment," Proc. IEEE International Conference on Communications (ICC), Dublin, Ireland, 2020
7. W. Xia [PhD], M. Polese, M. Mezzavilla, G. Loianno, S. Rangan and M. Zorzi, "Millimeter Wave Remote UAV Control and Communications for Public Safety Scenarios," Proc. IEEE International Conference on Sensing, Communication, and Networking (SECON), Boston, MA, USA, 2019.
8. Pandit, Parthe, Mojtaba Sahraee, Sundeep Rangan, and Alyson K. Fletcher. "Asymptotics of MAP inference in deep networks," Proc. IEEE International Symposium on Information Theory (ISIT), pp. 842-846. 2019.
   - **Jack K. Wolf Student Best Paper Award**
9. G. Bielsa, M. Mezzavilla, J. Widmer and S. Rangan, "Performance Assessment of Off-The-Shelf Mm Wave Radios for Drone Communications," Proc. IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM), Washington, DC, USA, 2019.
10. S. H. Ali Shah [PhD], S. Aditya, S. Dutta [PhD], C. Slezak [PhD]and S. Rangan, "Power Efficient Discontinuous Reception in THz and mmWave Wireless Systems," Proc. IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC), Cannes, France, 2019
11. M. Zhang [PhD], M. Mezzavilla, S. Rangan and S. Panwar, "Improving Google's BBR for Reduced Latency and Increased Fairness," Proc. IEEE INFOCOM - IEEE Conference on Computer Communications Workshops (INFOCOM WKSHPS), Paris, France, 2019.
12. A. K. Fletcher, S. Rangan and P. Schniter, "Inference in Deep Networks in High Dimensions," Proc. IEEE International Symposium on Information Theory (ISIT), Vail, CO, pp. 1884-1888, 2018.
13. C. Slezak [PhD], M. Zhang [PhD], M. Mezzavilla and S. Rangan, "Understanding End-to-End Effects of Channel Dynamics in Millimeter Wave 5G New Radio," Proc. IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC), Kalamata, 2018.
14. Christopher Slezak [PhD], Aditya Dhananjay, Sundeep Rangan, "60 GHz Blockage Study Using Phased Arrays," Proc. IEEE Asilomar Conference on Signals, Systems and Computers, Pacific Grove, CA, April 2017.
15. S. Dutta [PhD], N. Barati [PhD], A. Dhananjay, S. Rangan, "5G Millimeter Wave Cellular System Capacity with Fully Digital Beamforming," Proc. IEEE Asilomar Conference on Signals, Systems and Computers, Pacific Grove, CA, April 2017.
   - **Third place in Student Best Paper Award**
16. R. Ford, A. Sridharan, R. Margolies, R. Jana and S. Rangan, "Provisioning low latency, resilient mobile edge clouds for 5G," Proc. IEEE Conference on Computer Communications Workshops (INFOCOM WKSHPS), pp. 169-174, Atlanta, GA, USA, 2017.
17. S. Rangan, P. Schniter, A.K.Fletcher, "Vector Approximate Message Passing," to appear in Proc. IEEE International Symposium on Information Theory (ISIT), Aachen, Germany, 2017.

18. F. Fund, S. Shahsavari, S. S. Panwar, E. Erkip and S. Rangan, "Resource sharing among mmWave cellular service providers in a vertically differentiated duopoly," Proc. IEEE International Conference on Communications (ICC), Paris, France, 2017, pp. 1-7.
19. S. Goyal, M. Mezzavilla, S. Rangan, S. Panwar and M. Zorzi, "User Association in 5G mmWave Networks," 2017 IEEE Wireless Communications and Networking Conference (WCNC), San Francisco, CA, 2017, pp. 1-6.
20. R. Ford [PhD], S. Rangan, E. Mellios, D. Kong and A. Nix, "Markov Channel-Based Performance Analysis for Millimeter Wave Mobile Networks," Proc. IEEE Wireless Communications and Networking Conference (WCNC), San Francisco, CA, 2017, pp. 1-6.
21. P. Schniter, S. Rangan and A. K. Fletcher, "Vector approximate message passing for the generalized linear model," Proc. IEEE Asilomar Conference on Signals, Systems and Computers, Pacific Grove, CA, 2016, pp. 1525-1529.
22. F. Fund, S. Shahsavari, S. S. Panwar, E. Erkip and S. Rangan, "Do open resources encourage entry into the millimeter wave cellular service market?," Proc. IEEE Sarnoff Symposium, Newark, NJ, 2016, pp. 1-2.
23. S. Dutta [PhD], M. Mezzavilla, R. Ford [PhD], M. Zhang [PhD], S. Rangan and M. Zorzi, "MAC layer frame design for millimeter wave cellular system," Proc. IEEE European Conference on Networks and Communications (EuCNC), Athens, 2016, pp. 117-121.
24. M. Mezzavilla, S. Goyal, S. Panwar, S. Rangan and M. Zorzi, "An MDP model for optimal handover decisions in mmWave cellular networks," Proc. IEEE European Conference on Networks and Communications (EuCNC), Athens, 2016, pp. 100-105.
25. M. Zhang et al., "Transport layer performance in 5G mmWave cellular," Proc. IEEE Conference on Computer Communications Workshops (INFOCOM WKSHPS), San Francisco, CA, 2016, pp. 730-735.
26. M. Rebato, M. Mezzavilla, S. Rangan and M. Zorzi, "Resource sharing in 5G mmWave cellular networks," 2016 IEEE Conference on Computer Communications Workshops (INFOCOM WKSHPS), San Francisco, CA, 2016, pp. 271-276.
27. A. K. Fletcher, M. Sahraee-Ardakan, S. Rangan and P. Schniter, "Expectation consistent approximate inference: Generalizations and convergence," Proc. IEEE International Symposium on Information Theory (ISIT), Barcelona, 2016, pp. 190-194.
28. M. Giordani, M. Mezzavilla, S. Rangan and M. Zorzi, "Multi-connectivity in 5G mmWave cellular networks," 2016 Mediterranean Ad Hoc Networking Workshop (Med-Hoc-Net), Vilanova i la Geltru, 2016, pp. 1-7.
29. S. Sun et al., "Propagation Path Loss Models for 5G Urban Micro- and Macro-Cellular Scenarios," Proc. IEEE Vehicular Technology Conference (VTC Spring), Nanjing, 2016, pp. 1-6.
30. M. Rebato, M. Mezzavilla, S. Rangan, F. Boccardi and M. Zorzi, "Understanding Noise and Interference Regimes in 5G Millimeter-Wave Cellular Networks," Proc. IEEE European Wireless Conference, Oulu, Finland, 2016, pp. 1-5.
31. M. Giordani, M. Mezzavilla, A. Dhananjay, S. Rangan and M. Zorzi, "Channel Dynamics and SNR Tracking in Millimeter Wave Cellular Systems," Proc. IEEE European Wireless Conference, Oulu, Finland, 2016, pp. 1-8.
32. M. Giordani, M. Mezzavilla, C. N. Barati [PhD], S. Rangan and M. Zorzi, "Comparative analysis of initial access techniques in 5G mmWave cellular networks," Proc. IEEE Annual Conference on Information Science and Systems (CISS), Princeton, NJ, 2016, pp. 268-273.

The following works predate promotion to Associate Professor with tenure

33. C. N. Barati [PhD]et al., "Directional initial access for millimeter wave cellular systems," Proc. Asilomar Conference on Signals, Systems and Computers, Pacific Grove, CA, 2015, pp. 307-311.
34. P. A. Eliasi [PhD]and S. Rangan, "Stochastic dynamic channel models for millimeter cellular systems," Proc. IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP), Cancun, 2015, pp. 209-212.
35. O. Orhan, E. Erkip and S. Rangan, "Low power analog-to-digital conversion in millimeter wave systems: Impact of resolution and bandwidth on performance," Proc. Information Theory and Applications Workshop (ITA), San Diego, CA, 2015, pp. 191-198.
36. A. K. Fletcher, J. Viventi and S. Rangan, "Neural mass spatio-temporal modeling from high-density electrode array recordings," Proc. IEEE Information Theory and Applications Workshop (ITA), San Diego, CA, 2015, pp. 319-321.

37. S. Rangan, P. Schniter, A. K. Fletcher and U. Kamilov, "Inference for Generalized Linear Models via Alternating Directions and Bethe Free Energy Minimization," Proc. IEEE ISIT, Hong Kong, June 2015.
38. Wonju Lee, Osvaldo Simeone, Joonhyuk Kang, Sundeep Rangan, Petar Popovski, "HARQ Buffer Management: An Information-Theoretic View," Proc. IEEE ISIT, Hong Kong, June 2015.
39. Rohit Gupta, Bjoern Bachmann, Russell Ford, Sundeep Rangan, Nikhil Kundargi, Amal Ekbal, Karamvir Rathi, Maria Isabel Sanchez Bueno, Antonio De La Oliva and Arianna Morelli, "NS-3-based Real-time emulation of LTE Testbed using LabVIEW platform for Software Defined Networking (SDN) in CROWD," Proc. ACM Workshop on ns3, Barcelona, May 2015.
40. O. Orhan, E. Erkip, S. Rangan, "Low Power Analog-to-Digital Conversion in Millimeter Wave Systems: Impact of Resolution and Bandwidth on Performance," Proc. ITA, San Diego, Feb. 2015
41. R. Gupta, B. Bachman, N. Kundargi, A. Ekbal, A. Morelli, V. Mancuso, V. Sciancalepore, R. Ford [PhD], and S. Rangan, "Demo: LabVIEW based platform for prototyping dense LTE networks," Proc. ACM Workshop on Prototyping Wireless Network Testbeds, 2014.
42. P. Schniter, S. Rangan, and A. K. Fletcher, "Statistical Image Recovery: A Message-Passing Perspective," Int. Biomedical & Astronomical Signal Processing Frontiers Workshop, Villars-sur-Ollon, Switzerland, January 2015.
43. C. Kim, R. Ford [PhD], Yanjia Qi, and S. Rangan, "Joint Interference and User Association Optimization in Cellular Wireless Networks," Conf. Rec. Asilomar Conf. on Signals, Systems and Computers, Pacific Grove, CA, November 2014.
44. P. A. Eliasi [PhD], Li Feng, Ricardo Otazo, S. Rangan, "Fast Magnetic Resonance Parametric Imaging via Structured Low-Rank Matrix Reconstruction," Conf. Rec. Asilomar Conf. on Signals, Systems and Computers, Pacific Grove, CA, November 2014.
45. F. Gomez-Cuba, S. Rangan, and E. Erkip, "Scaling Laws for Infrastructure Single and Multihop Wireless Networks in Wideband Regimes," Proc. IEEE Int. Symp. Information Theory (ISIT), Honolulu, Hawaii, pp. 76–80, July 2014.
46. S. Rangan, P. Schniter, and A. K. Fletcher, "On the Convergence of Approximate Message Passing with Arbitrary Matrices," Proc. IEEE Int. Symp. Information Theory (ISIT), Honolulu, Hawaii, pp. 236–240, July 2014.
47. R. Gupta, T. Vogel, N. Kundargi, A. Ekbal, A. Morelli, V. Mancuso, V. Sciancalepore, R. Ford [PhD], and S. Rangan, "LabVIEW based Platform for prototyping dense LTE Networks in CROWD Project," Proc. Eur. Conf. Networking and Communications, Bologna, Italy, pp. 1–5, June 2014.
48. C. N. Barati [PhD], S. A. Hosseini [PhD], S. Rangan, Pei Liu, T. Korakis, and S. S. Panwar, "Directional Cell Search for Millimeter Wave Cellular Systems," Proc. IEEE Signal Processing Advances in Wireless Communications (SPAWC), Toronto, Canada, pp. 120–124, June 2014.
49. M. R. Akdeniz [PhD] and S. Rangan, "Millimeter Wave Picocellular System Evaluation for Urban Deployments," Proc. IEEE Globecomm Workshop on Emerging Technologies for LTE-Advanced and Beyond-4G, Atlanta, GA, pp. 105–110, December 2013.
50. R. Ford, C. Kim [PhD], and S. Rangan, "Opportunistic Third-Party Backhaul for Cellular Wireless Networks," Conf. Rec. Asilomar Conf. on Signals, Systems and Computers, Pacific Grove, CA, pp. 1594–1600, November 2013.
51. A. K. Fletcher and S. Rangan, "Hybrid approximate message passing for generalized group sparsity," Proc. SPIE Wavelets & Sparsity XV, San Diego, CA, September 2013.
52. S. Rangan, P. Schniter, E. Riegler, A. K. Fletcher, and V. Cevher, "Fixed Points of Generalized Approximate Message Passing with Arbitrary Matrices," Proc. IEEE Int. Symp. Information Theory (ISIT), Istanbul, Turkey, pp. 664–668, July 2013.
53. M. R. Akdeniz [PhD]and S. Rangan, "Optimal Wireless Scheduling with Interference Cancellation," Proc. IEEE Int. Symp. Information Theory (ISIT), Istanbul, Turkey, pp. 246–250, July 2013.

The following works predate the midterm tenure review

54. P. Schniter and S. Rangan, "Compressive Phase Retrieval via Generalized Approximate Message Passing," Proc. 50th Ann. Allerton Conf. on Communication, Control, and Computing, Monticello, IL, pp. 815–822, October 2012.
55. J. Ziniel, S. Rangan, and P. Schniter, "A Generalized Framework for Learning and Recovery of Structured Sparse Signals," Proc. IEEE Statistical Signal Processing Workshop (SSP), Ann Arbor, MI, pp. 325–328, August 2012.

56. S. Rangan and A. K. Fletcher, "Iterative Estimation of Constrained Rank-One Matrices in Noise," Proc. IEEE Int. Symp. Information Theory (ISIT), Cambridge, MA, pp. 1246–1250, July 2012.
57. S. Rangan, A. K. Fletcher, V. K. Goyal, and P. Schniter, "Hybrid Generalized Approximate Message Passing with Applications to Structured Sparsity," Proc. IEEE Int. Symp. Information Theory (ISIT), Cambridge, MA, pp. 1236–1240, July 2012.
58. S. Rangan and E. Erkip, "Hierarchical Mobility via Relaying in Dense Wireless Networks," Proc. IEEE Global Telecommunications Conf. (GLOBECOM), Houston, TX, pp. 1–6, December 2011.
59. U. Kamilov, V. K. Goyal, and S. Rangan, "Generalized Approximate Message Passing Estimation from Quantized Samples," Proc. 4th IEEE Int. Workshop on Computational Advances in Multi-Sensor Adapative Processing (CAMSAP), San Juan, Puerto Rico, pp. 401–404, December 2011.
    - Finalist for Student Best Paper Award
60. S. Rangan, "Generalized Approximate Message Passing for Estimation with Random Linear Mixing," Proc. IEEE Int. Symp. Information Theory (ISIT), St. Petersburg, Russia, pp. 2168–2172, July–August 2011.
61. U. Kamilov, V. K. Goyal, and S. Rangan, "Optimal Quantization for Compressive Sensing Under Message Passing Reconstruction," Proc. IEEE Int. Symp. Information Theory (ISIT), St. Petersburg, Russia, pp. 459–463, July–August 2011.
62. U. Kamilov, V. K. Goyal, and S. Rangan, "Message-Passing Estimation from Quantized Samples," Proc. 4th Workshop on Signal Process. with Adaptive Sparse Structured Representations (SPARS), Edinburgh, United Kingdom, p. 58, June 2011.
63. Y. Barbotin, A. Hormati, S. Rangan, and M. Vetterli, "Estimating Sparse MIMO Channels having Common Support," Proc. IEEE Int. Conf. Acoustics, Speech, and Signal Processing (ICASSP), Prague, Czech Republic, pp. 2920–2923. May 2011.
64. Y. Barbotin, A. Hormati, S. Rangan, and M. Vetterli, "Sampling of Sparse Channels with Common Support," Proc. 9th Int. Conf. Sampling Theory & Applications (SampTA), Singapore, May 2011.
65. S. Rangan, "Femto-Macro Cellular Interference Control with Subband Scheduling and Interference Cancelation," Proc. IEEE GLOBECOM Workshops, Miami, FL, pp. 695–700, December 2010.

The following works predate joining NYU-Poly

66. S. Rangan, A. K. Fletcher, and V. K. Goyal, "Extension of Replica Analysis to MAP Estimation with Applications to Compressed Sensing," Proc. IEEE Int. Symp. Information Theory (ISIT), Austin, TX, pp. 459–463, June 2010.
67. S. Rangan, "Estimation with Random Linear Mixing, Belief Propagation and Compressed Sensing," Proc. 44th Ann. Conf. Information Sciences and Systems (CISS), Princeton, NJ, pp. 1–6, March 2010.
68. A. K. Fletcher, S. Rangan, and V. K. Goyal, "A Sparsity Detection Framework for On–Off Random Access Channels," Proc. Wavelets XIII, San Diego, CA, pp. 744607-[1–15], August 2009.
69. A. K. Fletcher, S. Rangan, and V. K. Goyal, "A Sparsity Detection Framework for On–Off Random Access Channels," Proc. IEEE Int. Symp. Information Theory (ISIT), Seoul, South Korea, pp. 169–173, June–July 2009.
70. A. K. Fletcher, S. Rangan, and V. K. Goyal, "On Subspace Structure in Source and Channel Coding," Proc. IEEE Int. Symp. Information Theory (ISIT), Toronto, Canada, pp. 1982–1986, July 2008.
71. A. K. Fletcher, S. Rangan, and V. K. Goyal, "Rate-Distortion Bounds for Sparse Approximation," Proc. 14th IEEE Statistical Signal Processing Workshop (SSP), Madison, WI, pp. 254–258, August 2007.
72. A. K. Fletcher, S. Rangan, and V. K. Goyal, "On the Rate-Distortion Performance of Compressed Sensing," Proc. IEEE Int. Conf. Acoustics, Speech, and Signal Processing (ICASSP), Honolulu, HI, vol. 3, pp. 885–888, April 2007.
73. A. K. Fletcher, S. Rangan, V. K. Goyal, and K. Ramchandran, "Causal and Strictly Causal Estimation for Jump Linear Systems: An LMI Analysis," Proc. 40th Ann. Conf. Information Sciences & Systems (CISS), Princeton, NJ, pp. 1302–1307, March 2006.
74. A. K. Fletcher, S. Rangan, V. K. Goyal, and K. Ramchandran, "Analysis of Denoising by Sparse Approximation with Random Frame Asymptotics," Proc. IEEE Int. Symp. Information Theory (ISIT), Adelaide, Australia, pp. 1706–1710, September 2005.
75. A. K. Fletcher, S. Rangan, and V. K. Goyal, "Sparse Approximation, Denoising, and Large Random Frames," Proc. SPIE Wavelets XI, San Diego, CA, SPIE vol. 5914, pp. 172–181, August 2005.

76. A. K. Fletcher, S. Rangan, and V. K. Goyal, "Optimized Filtering and Reconstruction in Predictive Quantization with Losses," Proc. IEEE Int. Conf. Image Processing (ICIP), Singapore, vol. 5, pp. 3245–3248, October 2004.
77. A. K. Fletcher, S. Rangan, and V. K. Goyal, "Robust Predictive Quantization: A New Analysis and Optimization Framework," Proc. IEEE Int. Symp. Information Theory (ISIT), Chicago, IL, p. 427, June–July 2004.
78. R. Laroia, J. Li, S. Rangan, and M. Srinivasan, "Enhanced Opportunistic Beamforming," Proc. IEEE Vehicular Technology Conf., Orlando, FL, vol. 3, pp. 1762–1766, October 2003.
79. S. Rangan and K. Poolla, "Model Validation for Structured Uncertainty Models," Proc. Amer. Control Conf. (ACC), Philadelphia, PA, vol. 1, pp. 629–633, June 1998.
80. S. Rangan and K. Poolla, "Robust Hypothesis Testing for Structured Uncertainty Models," Proc. Amer. Control Conf. (ACC), Philadelphia, PA, vol. 3, pp. 1434–1438, June 1998.
81. S. Rangan and K. Poolla, "Robust Adaptive Stabilization with Multiple H_∞ Uncertainty Models and Switching," Proc. Amer. Control Conf. (ACC), Philadelphia, PA, vol. 6, pp. 3644–3648 June 1998.
82. S. Rangan and K. Poolla, "Weighted Optimization for Multiobjective Full-Information Control Problems," Proc. 36th IEEE Conf. Decision and Control (CDC), San Diego, CA, vol. 1, pp. 289–294, December 1997.
83. S. Rangan and K. Poolla, "Multiobjective H_∞ Problems: Linear and Nonlinear Control," Proc. 36th IEEE Conf. Decision and Control (CDC), San Diego, CA, vol. 1, pp. 458–459, December 1997.
84. S. Rangan, C. Spanos, and K. Poolla, "Modeling and Filtering of Optical Emission Spectroscopy Data for Plasma Etching Systems," Proc. IEEE Int. Symp. Semiconductor Manufacturing, pp. B41–B44, October 1997.
85. R. Chen, S. Rangan, and C. J. Spanos, "Spatially Resolved Endpoint Detector for Plasma Etcher," Proc. IEEE Int. Symp. Semiconductor Manufacturing, San Francisco, CA, pp. B45–B48, October 1997.
86. J. Musacchio, S. Rangan, C. Spanos, and K. Poolla, "On the Utility of Run to Run Control in Semiconductor Manufacturing," Proc. IEEE Int. Symp. Semiconductor Manufacturing, San Francisco, CA, pp. D9–12, October 1997.
87. S. Rangan, C. Spanos, and K. Poolla, "Modeling and Filtering of Optical Emission Spectroscopy Data for Plasma Etching Systems," Proc. Amer. Control Conf. (ACC), Albuquerque, NM, vol. 1, pp. 627–628, June 1997.
88. G. Wolodkin, S. Rangan, and K. Poolla, "An LFT Approach to Parameter Estimation," Proc. Amer. Control Conf. (ACC), Albuquerque, NM, vol. 3, pp. 2088–2092, June 1997.
89. S. Rangan and K. Poolla, "Multimodel Adaptive and $\mathcal{H}_\infty$ Control," Proc. 35th IEEE Conf. Decision and Control (CDC), Kobe, Japan, vol. 2, pp. 1928–1933, December 1996.
90. S. Rangan and K. Poolla, "Asymptotic Performance in $\mathcal{H}_\infty$ Control," Proc. 35th IEEE Conf. Decision and Control (CDC), Kobe, Japan, vol. 4, pp. 3755–3759, December 1996.
91. S. Rangan, G. Wolodkin, and K. Poolla, "New Results for Hammerstein System Identification," Proc. 34th IEEE Conf. Decision and Control (CDC), New Orleans, LA, vol. 1, pp. 697–702, December 1995.
92. S. Rangan and K. Poolla, "Time-Domain Validation for Sample-Data Uncertainty Model," Proc. Amer. Control Conf. (ACC), Seattle, WA, vol. 2, pp. 1140–1144, June 1995.
93. S. Rangan and W. Ren, "Stochastic H_∞ Identification: An Iteratively Weighted Least Squares Algorithm," Proc. 33rd IEEE Conf. Decision and Control (CDC), Lake Buena Vista, FL, vol. 4, pp. 3374–3379, December 1994.
94. S. Rangan and B. Leung, "Quantization Noise Spectrum of Double-Loop Sigma-Delta Converter with Sinusoidal Input," Proc. 36th Midwest Symp. on Circuits and Systems, Detroit, MI, vol. 1, pp. 216–219, August 1993.

arXiv E-Prints (excluding those substantially identical to papers above)

1. S. Rangan, P. Schniter, and A. K. Fletcher, "On the Convergence of Approximate Message Passing with Arbitrary Matrices," arXiv:1402.3210, February 2014.
2. M. R. Akdeniz and S. Rangan, "Wireless Scheduling with Dominant Interferers and Applications to Femtocellular Interference Cancellation," arXiv:1207.6808, July 2012.
3. S. Rangan, "Estimation with Random Linear Mixing, Belief Propagation and Compressed Sensing," arXiv:1001.2228, January 2010.
4. A. K. Fletcher, S. Rangan, and V. K. Goyal, "On-off random access channels: A compressed sensing framework," arXiv:0903.1022, March 2009.

PATENTS

Issued patents:

1. Sourjya Dutta, Russell Ford, Sundeep Rangan, Marco Mezzavilla, "Systems, methods, and computer-readable media utilizing an improved radio frame design and mac layer for ultra-low latency," US Patent no. 10,419,191, issued 9/17/2019 (filed Jan 1, 2017).
2. Marco Mezzavilla, Aditya Dhananjay, Dennis Shasha, Sundeep Rangan, "System, method and computer-accessible medium for power measurement for mmWave cellular system," US Patent no. 11,452,031, issued 9/20/2022 (filed 10/11/2019)
3. Dennis Shasha, Aditya Dhananjay, Marco Mezzavilla, Sundeep Rangan, "System, method and computer-accessible medium for predicting wireless signal degradation," US Patent no. 11, 523, 399, issued 12/16/2022 (filed 9/25/2019)
4. Aditya Dhananjay, Sundeep Rangan, Dennis Shasha, "System, method and computer-accessible medium for simulation and emulation of wireless cluster and/or tapped delay line models" US Patent no. 10,841,026, issued 11/17/2020 (filed 3/8/2019)
5. Menglei Zhang, Marco Mezzavilla, Sundeep Rangan, Shivendra S. Panwar, "Determining a receive window of a receiving device that reduces bufferbloat in a wireless communications system, such as that caused by TCP dynamics over millimeter wave links," US Patent no. 11,063,879, issued 7/23/2021 (filed 4/12/2018)
6. Aditya Dhananjay, Sundeep Rangan, Dennis Shasha, "System and method for mitigating frequency offsets in wireless systems" US Patent no. 9,912,510, issued 3/6/2018 (filed 8/25/2016)
7. Aditya Dhananjay, Jinyang Li, Sundeep Rangan, "System and method for providing channel equalization in orthogonal frequency division multiplexing (OFDM) wireless systems," US Patent no. 9,369,328, issued 6/14/2016 (filed 3/10/2015)
8. A. Das, S. Rangan, Y. Hussain, and S. Celebi, "Methods and apparatus for communicating backlog related information," US Patent no. 9,119,220, issued August 25, 2015 (filed December 13, 2006).
9. A. Das, R. Madan, S. Rangan, Sanjay Shakkottai, and S. Ray, "Scheduling QoS Flows in Broadband Wireless Communication Systems," U.S. Patent no. 8,923,157, issued December 30, 2014 (filed November 3, 2008).
10. A. Sampath, S. Rangan, and R. S. Bachu, "Systems, Apparatus and Methods for Interference Management in Wireless Networks," US Patent no. 9,402,193, issued July 26, 2016 (filed March 18, 2010).
11. S. Rangan, R. Laroia, A. Das, J. Li, and J. Fan, "Methods and apparatus for generating, communicating, and/or using information relating to self-noise," U.S. Patent no. 8,811,348, issued August 19, 2014 (filed January 17, 2006).
12. S. Rangan and J. Li, "Uplink Access Request in an OFDM Communication Environment," U.S. Patent no. 9,014,134. issued July 14, 2014 (filed December 2, 2010).
13. R. Laroia, S. Rangan, A. Das, F. A. Lane, and J. Li, "Methods and apparatus relating to wireless terminal beacon signal generation, transmission, and/or use," U.S. Patent no. 8,774,846, issued July 8, 2014 (filed January 10, 2007).
14. S. Ray, R. K. Madan, A. Sampath, S. Rangan, and A. Das, "Utility maximization scheduler for broadband wireless communication systems," U.S. Patent no. 8,750,232, issued June 10, 2014 (filed July 24, 2012).
15. P. Hande, X. Wu, and S. Rangan, "Methods and apparatus for communicating and/or using load information in support of decentralized traffic scheduling decisions," U.S. Patent no. 8,750,116, issued June 10, 2014 (filed November 10, 2008).
16. S. Rangan, A. Maharshi, F. Lane, and O. Koymen, "Apparatus and methods for update of symbol information," U.S. Patent no. 8,750,091, issued June 10, 2014 (filed March 23, 2009).
17. R. Laroia, S. Rangan, A. Das, F. A. Lane, and J. Li, "Methods and apparatus relating to timing and/or synchronization including the use of wireless terminals beacon signals," U.S. Patent no. 8,743,843, issued June 3, 2014 (filed January 10, 2007).
18. R. Laroia, J. Li, S. Rangan, and P. Hande, "Efficient paging in a wireless communication system," U.S. Patent no. 8,712,448, issued April 29, 2014 (filed March 31, 2010).
19. R. Laroia, J. Li, S. Rangan, and P. Hande, "Efficient paging in a wireless communication system," U.S. Patent no. 8,670,789, issued March 11, 2014 (filed March 23, 2010).
20. R. K. Madan, A. Das, S. Rangan, and S. Ray, "Scheduling best effort flows in broadband wireless network," U.S. Patent no. 8,619,572, issued December 31, 2013 (filed October 30, 2008).

21. R. Laroia, J. Li, S. Rangan, and M. Srinivasan, "Methods and apparatus of providing transmit diversity in a multiple access wireless communication system," U.S. Patent no. 8,582,536, issued November 12, 2013 (filed December 3, 2009).
22. R. Laroia, J. Li, S. Rangan, M. Srinivasan, F. A. Lane, and P. Hande, "Methods and apparatus of providing transmit and/or receive diversity with multiple antennas in wireless communication systems," U.S. Patent no. 8,571,493, issued October 29, 2013 (filed October 26, 2009).
23. S. Celebi, C. Stanski, and S. Rangan, "Open loop power offset update," U.S. Patent no. 8,548,515, issued October 1, 2013 (filed April 15, 2011).
24. X. Wu, S. Rangan, P. Hande, A. Das, and J. Li, "Opportunistic uplink scheduling," U.S. Patent no. 8,547,857, issued October 1, 2013 (filed November 20, 2007).
25. S. Rangan, P. Hande, N. N. Ratnakar, O. Koymen, R. K. Madan, A. Maharshi, S. P. Roy, and S. Ray, "Universal real-time interface for wireless modems," U.S. Patent no. 8,520,723, issued August 27, 2013 (filed December 9, 2010).
26. N. N. Ratnakar, P. Hande, S. Rangan, A. Maharshi, S. P. Roy, R. K. Madan, O. Koymen, and S. Ray, "Apparatus and methods for providing a communication quality feedback of an end-to-end communication path," U.S. Patent no. 8,520,699, issued August 27, 2013 (filed December 9, 2010).
27. A. Das and S. Rangan, "Methods and apparatus for communicating and/or using transmission power information," U.S. Patent no. 8,514,771, issued August 20, 2013 (filed January 17, 2006).
28. R. Laroia, J. Li, S. Rangan, M. Srinivasan, P. Hande, and A. Das, "Methods and apparatus for determining, communicating and using information including loading factors which can be used for interference control purposes," U.S. Patent no. 8,514,692, issued August 20, 2013 (filed October 14, 2005).
29. R. Laroia, J. Li, S. Rangan, M. Srinivasan, P. Hande, and A. Das, "Methods and apparatus for determining, communicating and using information including loading factors which can be used for interference control purposes," U.S. Patent no. 8,503,938, issued August 6, 2013 (filed July 14, 2006).
30. A. Khandekar, A. Gorokhov, A. Agrawal, S. Rangan, and A. Das, "Acknowledgement of control messages in a wireless communication system," U.S. Patent no. 8,477,684, issued July 2, 2013 (filed November 20, 2007).
31. R. Laroia, S. Rangan, J. Li, T. Richardson, and S. Tavildar, "Method of reducing interference," U.S. Patent no. 8,451,961, issued May 28, 2013 (filed November 21, 2007).
32. S. Rangan and J. Li, "Uplink timing control signal," U.S. Patent no. 8,432,852, issued April 30, 2013 (filed July 14, 2006).
33. X. Wu, S. Rangan, P. Hande, A. Das, and J. Li, "Opportunistic uplink scheduling," U.S. Patent no. 8,411,646, issued April 2, 2013 (filed November 20, 2007).
34. M. M. Mansour, S. Rangan, S. Ray, V. Loncke, P. K. A. Rao, and J. L. Koslov, "Using channel estimates associated with OFDM pilot symbols to estimate additional parameter," U.S. Patent no. 8,355,455, issued January 15, 2013 (filed April 28, 2009).
35. S. Ray and S. Rangan, "Methods and apparatus for reducing or avoiding use of non-shift based divisions in a communications device," U.S. Patent no. 8,346,829, issued January 1, 2013 (filed March 26, 2009).
36. R. Laroia, P. Anigstein, A. Das, and S. Rangan, "Methods and apparatus for use in a wireless communications system that uses a multi-mode base station," U.S. Patent no. 8,340,703, issued December 25, 2012 (filed July 9, 2010).
37. X. Wu, S. Rangan, P. Hande, A. Das, and J. Li, "Opportunistic uplink scheduling," U.S. Patent no. 8,320,928, issued November 27, 2012 (filed August 26, 2011).
38. S. Ray and S. Rangan, "Scaling methods and apparatus using SNR estimate to avoid overflow," U.S. Patent no. 8,311,143, issued November 13, 2012 (filed March 16, 2009).
39. R. K. Madan, A. Das, S. Rangan, and S. Ray, "Scheduling a mix of best effort (BE) and delay QoS flows," U.S. Patent no. 8,265,019, issued September 11, 2012 (filed October 30, 2008).
40. S. Rangan and F. Lane, "Time stamped packet data interface between a modem and an RF unit," U.S. Patent no. 8,208,497, issued June 26, 2012 (filed December 19, 2008).
41. X. Wu, S. Rangan, P. Hande, A. Das, and J. Li, "Opportunistic uplink scheduling," U.S. Patent no. 8,160,602, issued April 17, 2012 (filed November 20, 2007).
42. X. Wu, S. Rangan, P. Hande, A. Das, and J. Li, "Opportunistic uplink scheduling," U.S. Patent no. 8,160,007, issued April 17, 2012 (filed November 20, 2007).

43. S. Roy, N. N. Ratnakar, and S. Rangan, "Simplified interference suppression in multi-antenna receivers," U.S. Patent no. 8,150,345, issued April 3, 2012 (filed March 28, 2009).

44. R. K. Madan, A. Das, S. Rangan, and S. Ray, "Division of the scheduling algorithm into background and foreground algorithms," U.S. Patent no. 8,139,533, issued March 20, 2012 (filed October 30, 2008).

45. A. Das, P. Hande, S. Rangan, and X. Wu, "Uplink scheduling for OFDM systems," U.S. Patent no. 8,116,805, issued February 14, 2012 (filed December 17, 2006).

46. A. Das, P. Hande, S. Rangan, X. Wu, and J. Cezanne, "Power-based rate signaling for cellular uplink," U.S. Patent no. 8,036,151, issued October 11, 2011 (filed December 17, 2006).

47. S. Celebi, C. Stanski, and S. Rangan, "Open loop power offset update," U.S. Patent no. 7,957,757, issued June 7, 2011 (filed July 5, 2007).

48. S. Rangan and J. Li, "Uplink access request in an OFDM communication environment," U.S. Patent no. 7,869,421, issued January 11, 2011 (filed July 14, 2006).

49. N. N. Ratnakar, R.K.Madan, and S. Rangan, "Computing the Burst Size for High Speed Packet Networks with Queues," WO2011056801, 05/12/2011.

50. A. Das, S. Rangan, and S. Celebi, "Methods and apparatus for tracking wireless terminal power information," U.S. Patent no. 7,853,281, issued December 14, 2010 (filed July 14, 2006).

51. R. Laroia, P. Anigstein, A. Das, and S. Rangan, "Methods and apparatus for use in a wireless communications system that uses a multi-mode base station," U.S. Patent no. 7,756,548, issued July 13, 2010 (filed September 19, 2005).

52. R. Laroia, J. Li, S. Rangan, and P. Hande, "Efficient paging in a wireless communication system," U.S. Patent no. 7,711,377, issued May 4, 2010 (filed June 10, 2004).

53. R. Laroia, J. Li, S. Rangan, and M. Srinivasan, "Methods and apparatus of providing transmit diversity in a multiple access wireless communication system," U.S. Patent no. 7,630,339, issued December 8, 2009 (filed January 23, 2004).

54. R. Laroia, J. Li, S. Rangan, M. Srinivasan, F. A. Lane, and P. Hande, "Methods and apparatus of providing transmit and/or receive diversity with multiple antennas in wireless communication systems," U.S. Patent no. 7,610,024, issued October 27, 2009 (filed November 21, 2005).

55. R. Laroia, P. Anigstein, A. Das, and S. Rangan, "Wireless terminal methods and apparatus for use in a wireless communications system that uses a multi-mode base station," U.S. Patent no. 7,567,791, issued July 28, 2009 (filed September 19, 2005).

56. R. Laroia, J. Li, S. Rangan, and H. T. Sampath, "Method and apparatus for time and frequency synchronization of OFDM communication systems," U.S. Patent no. 7,558,245, issued July 7, 2009 (filed December 30, 2005).

57. R. Laroia, J. Li, J. L. Fan, S. Rangan, and P. Hande, "Methods and apparatus of power control in wireless communication systems," U.S. Patent no. 7,420,939, issued September 2, 2008 (filed August 13, 2003).

58. R. Laroia, J. Li, S. Rangan, and P. Viswanath, "Base station identification in orthogonal frequency division multiplexing based spread spectrum multiple access systems," U.S. Patent no. 7,397,838, issued July 8, 2008 (filed June 27, 2005).

59. R. Laroia, J. Li, S. Rangan, M. Srinivasan, and F. A. Lane, "Methods and apparatus of providing transmit and/or receive diversity with multiple antennas in a wireless system," U.S. Patent no. 7,039,370, issued May 2, 2006 (filed October 14, 2004).

60. R. Laroia, J. Li, S. Rangan, and H. T. Sampath, "Method and apparatus for time and frequency synchronization of OFDM communication systems," U.S. Patent no. 7,027,429, issued April 11, 2006 (filed June 19, 2001).

61. R. Laroia, J. Li, S. Rangan, and H. T. Sampath, "Synchronization of a pilot assisted channel estimation orthogonal frequency division multiplexing system," U.S. Patent no. 7,023,928, issued April 4, 2006 (filed August 6, 2001).

62. R. Laroia, J. Li, S. Rangan, and S. V. Uppala, "Uplink timing synchronization and access control for a multi-access wireless communication system," U.S. Patent no. 6,967,936, issued November 22, 2005 (filed February 11, 2000).

63. R. Laroia, J. Li, S. Rangan, and P. Viswanath, "Base station identification in orthogonal frequency division multiplexing based spread spectrum multiple access systems," U.S. Patent no. 6,961,364, issued November 1, 2005 (filed April 18, 2000).

64. R. Laroia, J. Li, S. Rangan, and S. V. Uppala, "Signal construction, detection and estimation for uplink timing synchronization and access control in a multi-access wireless communication system," U.S. Patent no. 6,922,388, issued July 26, 2005 (filed February 11, 2000).
65. R. Laroia and S. Rangan, "Adaptive antenna array methods and apparatus for use in a multi-access wireless communication system," U.S. Patent no. 6,920,192, issued July 19, 2005 (filed August 3, 2000).
66. R. Laroia, J. Li, S. V. Uppala, and S. Rangan, "Communication system employing orthogonal frequency division multiplexing based spread spectrum multiple access," U.S. Patent no. 6,553,019, issued April 22, 2003 (filed December 23, 1999).

Pre-grant patent applications

1. Sundeep Rangan, Theodore S. Rappaport, Dennis Shasha, "Switched analog-digital architecture for wireless antenna arrays and methods for use thereof," Application number US20160302146A1, filed April 7, 2016.
2. Aditya Dhananjay, Sundeep Rangan, Dennis Shasha, "System and method for emulation of wireless channels and multi-antenna transmit and receive circuits," Application number WO2017091713A1, filed November 23, 2016.
3. S. Ray, R. K. Madan, A. Sampath, S. Rangan, and A. Das, "Utility Maximization Scheduler for Broadband Wireless Communication Systems," Application number 12/783 467, filed May 19, 2010.
4. P. Hande, A. Das, J. Li, S. Rangan, and R. Laroia, "Methods and apparatus for broadcasting loading information corresponding to neighboring base stations," Application number 11/549 604, filed October 13, 2006.
5. R. Laroia, J. Li, S. Rangan, M. Srinivasan, and P. Hande, "Methods and apparatus for determining, communicating and using information which can be used for interference control purposes," Application number 11/251 069, filed October 14, 2005.

PRESS COVERAGE

1. "Trump Shouldn't Plan to Tweet From a 6G Phone Anytime Soon," Wired, Feb 21, 2019 https://www.wired.com/story/trump-shouldnt-plan-tweet-from-6g-phone-soon
2. "NYU series tackles next spectrum frontier: terahertz," FierceWireless, Aug 24, 2018, https://www.fiercewireless.com/wireless/nyu-series-tackles-next-spectrum-frontier-terahertz
3. "What Does California's Proposed Texting Tax Mean for Apps Like WhatsApp and FB Messenger?", Observer, Dec 2018, https://observer.com/2018/12/text-message-tax-proposal-california-whatsapp-facebook-messenger/
4. "It's Never Too Early to Think About 6G," IEEE Spectrum, May 22, 2018, https://spectrum.ieee.org/tech-talk/telecom/wireless/its-never-too-early-to-think-about-6g
5. "Could antenna fatigue be holding up 5G technology?", Interview on NPR's Marketplace, Jan 31, 2018 https://www.marketplace.org/2018/01/31/could-antenna-fatigue-be-holding-5g-technology/
6. "NYU Wireless, Partners to Develop Communication Technology with NIST Award," Photonics Media, Aug. 2, 2017 https://www.photonics.com/Article.aspx?AID=62304
7. Kelly Hill, "Certifying Wi-Fi home network design; mmwave research for public safety comms," Carrier Wrap Ep. 69, RCR Wireless, June 22, 2017. http://www.rcrwireless.com/rcrtv/rcrtvrcrtvcertifying-wi-fi-home-network-design-mmwave-research-for-public-safety-comms-carrier-wrap-ep-69
8. Monica Alleven, "NYU Wireless part of team awarded NIST grant to study mmWave for first responders," Fierce Wireless, June 16, 2016. http://www.fiercewireless.com/wireless/nyu-wireless-part-team-awarded-nist-grant-to-study-mmwave-for-first-responders
9. Monica Alleven, "Sprint joins NYU Wireless as industry affiliate sponsor," Fierce Wireless, May 24, 2017. http://www.fiercewireless.com/wireless/nyu-wireless-part-team-awarded-nist-grant-to-study-mmwave-for-first-responders
10. David Ndichu, "OPPO advances 5G research and development", ITP.net, May 30, 2017. http://www.itp.net/612978-oppo-advances-5g-research-and-development
11. Tyler Woods, "At Brooklyn summit, a new world of 5G on display," Technical.ly Brooklyn, April 21, 2017, https://technical.ly/brooklyn/2017/04/21/5g-summit-new-world/
12. "NI Donates Nearly $1 Million in Hardware and Software to NYU WIRELESS to Accelerate 5G Research," Business Wire, April 11, 2017. https://finance.yahoo.com/news/ni-donates-nearly-1-million-140000558.html
13. Tyler Woods, "At Brooklyn summit, a new world of 5G on display," Technical.ly Brooklyn, April 21, 2017. https://technical.ly/brooklyn/2017/04/21/5g-summit-new-world/
14. Aaron Tilley, "Two Ways To Make Sure You Don't Buy The Inferior iPhone 7 With An Intel Modem," Forbes, Oct. 21, 2016. https://www.forbes.com/sites/aarontilley/2016/10/21/how-to-buy-iphone-7-intel-qualcomm-modem
15. Aaron Tilley, "Does The New iPhone 7 Have Intel Inside? This Evidence Suggests It Does," Forbes, Sept. 9, 2016. https://www.forbes.com/sites/aarontilley/2016/09/09/does-the-new-iphone-7-have-intel-inside-evidence-suggests-it-does
16. Maria Guerra, "MM-Wave Radio Spectrum Becomes Tangible 5G Path," Electronic Design, March 3, 2016 http://www.electronicdesign.com/communications/mm-wave-radio-spectrum-becomes-tangible-5g-path
17. "Wireless: the next generation," The Economist, Feb. 20, 2016. https://www.economist.com/news/business/21693197-new-wave-mobile-technology-its-way-and-will-bring-drastic-change-wireless-next
18. Ben Popper, "Super high-speed internet delivered over the air isn't as crazy as it sounds", The Verge, Jan 29, 2016. http://https://www.theverge.com/2016/1/29/10868232/starry-high-speed-internet-millimeter-wave
19. Monica Alleven, "NYU Wireless spearheads new testbed for mmWave spectrum", Jan. 20, 2016 http://www.fiercewireless.com/tech/nyu-wireless-spearheads-new-testbed-for-mmwave-spectrum
20. Ivan Pereira, "City begins rollout of LinkNYC Wi-Fi kiosks", AM New York, Jan. 5, 2016. http://www.amny.com/news/city-begins-rollout-of-linknyc-wi-fi-kiosks-1.11292364
21. Carl Weinschenk, "5G: It's About the Use Cases," IT Business Edge, May 1, 2015 http://www.itbusinessedge.com/articles/5g-its-about-the-use-cases.html
22. Katherine Finnell, "Where 5G technology is headed and when," TechTarget, Feb 25, 2015 http://searchtelecom.techtarget.com/news/2240241231/Where-5G-technology-is-headed-and-when
23. "5G Research Underway to Enable the Next Leap in Wireless Technology," PR Newswire, Feb 5, 2015 http://www.prnewswire.com/news-releases/5g-research-underway-to-enable-the-next-leap-in-wireless-technology-300031153.html

24. Monica Alleven, "NYU Wireless pushes for FCC to act fast on releasing mmW spectrum", Feb 11, 2015
http://www.fiercewireless.com/tech/story/nyu-wireless-pushes-fcc-act-fast-releasing-mmw-spectrum/2015-02-11

25. "NYU Poly Given $2M Grant to Develop 5G Network," New York Convergence, July 23, 2012
http://nyconvergence.com/2012/07/nyu-poly-given-2-mill-grant-to-develop-5g-network.html

26. "Brooklyn's NYU-Poly aims to birth 5G," Matthew Flamm, Crain's New York, July 19, 2012
http://www.crainsnewyork.com/article/20120719/TECHNOLOGY/120719853

27. "Searching for 5G," Carolyn Mathas, EE Times, July 19, 2012.
http://www.eetimes.com/electronics-blogs/other/4390740/Searching-for-5G

FUNDING

NYU WIRELESS funding:

I am currently the Associate Director of NYU WIRELESS, a university research center funded from annual memberships with industrial affiliates in the wireless space.

- Approximate total annual funding $1,300,000
- Annual portion: $85,000

Other active grants and funding:

1. NSF RINGS: Building Next Generation Resilient Wireless Systems from Unsecure Hardware, Award number 2148293, 10/1/2021–9/30/2024
   - Total award: $999,000, my lab's portion: Approx. $150,000
   - PI: Sundeep Rangan, Co-PIs: Elza Erkip, Siddharth Garg, Ramesh Karri, Farshad Khorrami
2. NSF-AoF: CNS Core: Small: AERIAL: Air-to-Ground Channel Modeling and Tracking at Millimeter-Wave, 10/1/2021–9/30/2024
   - Total award: $464,000.00, my lab's portion: entire grant
   - PI: Marco Mezzavilla, Co-PI: Sundeep Rangan
3. NSF Convergence Accelerator Track H: Smart Wearables for Expanding Workplace Access for People with Blindness and Low Vision, Award number 2236097, 12/15/2022 – 11/30/2023.
   - Total award: $743,000, my lab's portion: Approx. $150,000
   - PI: JR Rizzo, Co-PIs: Yao Wang, Sundeep Rangan, Yi Fang, Maurizio Porfiri, Chen Feng
4. NSF SCC-IRG Track 2: Transportation Gaps and Disability-Related Unemployment: Smarter Cities and Wearables combating Commuting Challenges for the Blind, Award number 1952180, 10/01/2020 - 9/30/2023
   - Total award: $1,499,038, my lab's portion: Approx. $177,345
   - PI: JR Rizzo, Co-PIs: Yao Wang, Sundeep Rangan, Yi Fang, Maurizio Porfiri

Past grants and one-time donations:

1. NSF NRI: FND: Action-perception loops over 5G mmWave wireless for cooperative manipulation, Award number 1925079, 10/2019 to 9/2022
   - Total award: $750,000, my lab's portion: Approx. $187,000
   - PI: Righetti, Co-PI: Garg, Erkip, Rangan
2. NSF SpecEES: Collaborative Research: Energy Efficient Millimeter Wave Cellular Networks, Award number 1824434, 9/2018 to 8/2021
   - NYU award: $450,000, my lab's portion: Approx. $225,000
   - PI: Rangan, Co-PI: E. Erkip, J. Buckwalter (UCSB)
3. DARPA/SRC ComSenTer: A Center for Converged TeraHertz Communications and Sensing, Award number KK1839, 1/2018 to 12/2022
   - My lab's portion: $609,000.
   - Multi-university grant. Lead: Rodwell, UCSB.
   - I am the systems lead for the grant.
4. OPPO Electronics, Benchmarks and Evaluation of 5G Edge Enabled High Performance Mobile Robots, 4/17/2020 - 4/16/2021.
   - Total award: $299,362, my lab's portion: Approx. $75,000
   - PI: L. Righetti, Co-PIs: Erkip, Garg, Rangan
5. OPPO Electronics, Benchmarks and Evaluation of 5G Edge Enabled High Performance Mobile Robots, 3/1/2019 - 1/31/2020
   - Total award: $150,000, my lab's portion: Approx. $35,000
   - PI: L. Righetti, Co-PIs: Erkip, Garg, Rangan
6. NSF COSMOS: Cloud-Enhanced Open Software-Defined Mobile-Wireless Testbed, 05/14/2018 - 9/30/2020

- My lab component: $373,000
- Multi-university program. Rutgers (lead) with Columbia and U. Arizona

7. NIST: End-to-End Research Platform for Public Safety Millimeter Wave Communications, Award number 70NANB17H166, 06/01/2017 to 05/31/2020.
   - Total award: $2,265,051, my lab's portion: Approx. $1,472,283
   - PI: Rangan, Co-PI: T.S.Rappaport, M.Zorzi (U. Padova)
   - Research scientists: M. Mezzavilla, A. Dhananjay, A. Zanella (U. Padova)
   - My lab is responsible for three of the four thrusts plus overall supervision and project management.
8. Sony Research: A 60GHz Wireless Home Entertainment Network, NYU award number A17-0483-001, 6/1/2017 to 5/31/2018.
   - Total award: $150,000, My portion: Approx. $50,000
   - PI: Panwar. Co-PI: Yong Liu, S. Rangan
   - My lab is responsible for half the deliverables, including those that concern the mmWave measurements.
9. NSF EARS: Spectrum and Infrastructure Sharing in Millimeter Wave Cellular Networks, Award number 1547332, 02/01/2016 – 01/31/2018
   - Total award: $749,999, my portion: $250,000
   - PI: Rangan, Co-PI: Elza Erkip, Nicholas Economides (NYU-Stern) I am the lead PI, oversee the project and will conduct at least one third of the work.
10. NSF CIF: Medium: Collaborative Research: Scalable Learning of Nonlinear Models in Large Neural Populations, Award Number:1564142, 07/15/2016 – 07/14/2020
    - Total award: $1,200,000, my portion: $400,000
    - PI: A.K.Fletcher (UCLA), Co-PI: S. Rangan, J.Viventi. I oversee the algorithm development and implementation, approximately one third of the project.
11. NSF NeTS: Medium Massive Mobile Broadband Communications with Millimeter Wave Picocellular Networks, Award number 1302336, 09/01/2013 to 08/31/2018.
    - Total award: $1.2 million, my portion: $400,000.
    - PI: Rangan, Co-PIs: Rappaport, Erkip. I wrote the majority of this grant, and am the lead PI responsible for the oversight of the project and at least one third of the work.
12. NSA: Millimeter Wave adaptive Beamforming Algorithms and Prototyping Award number H98230-16-C-0250, 6/1/2017 to 5/31/2018.
    - Total award: $112,125
    - PI: Rangan (Sole PI)
13. National Instruments equipment donation, April 2016, $891,098.
14. NYU: TAC: Building Millimeter Wave Channel Sounders and Channel Emulators, Award number A16-0317-001, 03/16/2016 to 03/15/2017
    - Total award: $50,000
    - PI: Rangan. I am the sole PI.
15. NSF EAGER: Development of a Millimeter Wave Software Defined Radio, Award number 1602173, 12/01/2015 to 11/31/2016.
    - Total award: $98,094
    - PI: Rangan. Co-PI: Rappaport
16. NSF CIF: Small: Approximate Message Passing for Systems with Linear Mixing and Randomization, award number 1116589, 09/01/2011 to 08/31/2015 (extended one year).
    - Total award: $481,472
    - PI: Rangan. I am the sole PI.
17. NSF PFI-AIR: Architectures for the Future Cellular Networks, award number 0933985, 07/01/2012 to 07/01/2014.
    - Total award: $2 million, my portion: $400,000 (estimated).
    - PIs: Rappaport, Panwar, Co-PIs: Rangan, Erkip, Knox, Pei Liu. I wrote the majority of this grant and was responsible for at least one fifth of the work. However, I was not able to be listed as an official PI since the solicitation required that only NSF IUCRC directors could be listed in that role.

18. National Instruments, equipment donation for LTE MAC-layer experimentation, 05/01/2011.
    - Estimated value: $125,000 (Two NI PXI chassis with hardware). I am the sole recipient of this donation.
19. NYU Poly-Angel award, "Wireless Network Discovery and Signaling via Compressed Sensing", 08/01/2010.
    - Total award: $80,000, my portion: $27,000.
    - PI: Rangan, Co-PI: E. Erkip, S. Günturk (NYU-Courant). I wrote the majority of this award and have conducted at least one third of the work.

INVITED PRESENTATIONS

Panel discussions

1. Department of Energy, 6G-THz panel, Sept 2020
2. "State of mmW Technology and Outlook: A View from Industry", mmWave RCN, Panel moderator, Brooklyn, NY July 12, 2018
3. "Future X Radio: 5G New Radio Phase 1 and Phase 2," Moderator for Panel Discussion, Brooklyn 5G Summit April 24, 2018.
4. "5G New Technologies Panel Discussion," panel moderator, Ericsson / Qualcomm 5G Workshop, June 2016.
5. "SDR Prototyping challenges for dense deployments for next generation wireless networks (LTE, WiFi)", Globecom Industry Panel, Austin, Texas, December 2014.
6. "Big Data in Communication Networks," Panel discussion at Communication Theory Workshop, Curacao, May 2014.
7. "Views on Beyond-4G/5G," Panel discussion at IEEE Globecom Workshop on Emerging Technologies for LTE-Advanced and Beyond-4G, December 13, 2013.
8. "Massive MIMO vs. Dense Cells," Panel discussion in the Small Cell Workshop, ICC, Ottawa, Canada, June 15, 2012.
9. "Challenges for Cellular Wireless," Moderator, WiOpt Panel Discussion, Princeton, NJ, May 2011.

Plenary and keynote talks

1. "Understanding Ultra-Low Latency in 5G Cellular," IEEE ComSoc Webinar, April 19, 2018
2. "Perspectives on 5G: Standards for 5G", Webinar broadcast as part of the Tech Insiders Series for IEEE Spectrum, Dec. 14, 2016
3. "System Level Challenges for Millimeter Wave Cellular," Keynote talk for the International Workshop on Emerging Technologies for 5G Wireless Cellular Networks, Dec. 4, 2016.
4. "Distributed Cellular Backhaul Architectures," Globecom FemNET workshop, Houston, TX, December 5, 2011.
5. "Femtocells, Interference Coordination and Open Access," Workshop on Cooperative Heterogeneous Networks (coHetNet) in conjunction with ICCCN, Maui, Hawaii, July 31, 2011
   https://sites.google.com/site/cohetnet2011.

Seminars

1. "Challenges and New Technologies for 5G and Beyond", Princeton University Seminar, Oct 2020 [Online]
2. "Understanding Millimeter Wave Channel Dynamics", UPF, Barcelona, Spain, January 2020
3. "Understanding Millimeter Wave Channel Dynamics", ECE Seminar, Technical University of Munich, October 24, 2019
4. "Understanding Millimeter Wave Channel Dynamics", ECE Seminar, University of Toronto, May 3, 2019
5. "Beyond 4G: Millimeter Wave Picocellular Wiereless Networks," Rutgers University, Department Colloquia, March 11, 2015.
6. "Approximate Message Passing for Inference in Generalized Linear Models", Columbia University, November 4, 2014
7. "Approximate Message Passing: Can it Work?," Ecole Normale Superieur, Paris, France, November 18, 2013
8. "Beyond 4G: Millimeter Wave Picocellular Wiereless Networks," Boston University, CISE Seminar, September 13, 2013.
9. "Beyond 4G: Millimeter Wave Picocellular Wiereless Networks," University of Toronto, July 16, 2013.
10. "GAMP: Graphical Model Methods for Compressed Sensing and Beyond," Rutgers University, Electrical Engineering Seminar, October 24, 2012.
11. "Generalized Approximate Message Passing and Applications in Interference Coordination," Summer Research Institute, EPFL, Lausanne, Swizerland, July 2011.
12. "Generalized Approximate Message Passing and Applications in Interference Coordination," LIDS Seminar, MIT, March 2011.

13. "Heterogenous Networks and Open Cellular Architectures," Texas Wireless Summit, Austin, TX, November 2010.
14. "Femtocells, Interference Coordination and Belief Propagation," Bell Labs, Alcatel-Lucent, August 2010.
15. "Femtocells, Interference Coordination and Next-Generation Wireless Systems," Microsoft Research, Redmond, WA, May 2010.
16. "Interference Management in Next-Generation Wireless Systems," Summer Research Institute, EPFL, Lausanne, Switzerland, June 2009.

Invited conference and industry event talks and

1. "Challenges and New Technologies for 5G and Beyond", US State Department Briefing, Hosted by US Embassy, Paris, June 18, 2020. [Online]
2. "Challenges and New Technologies for 5G and Beyond", French Government and Industry Briefing, Hosted by US Embassy, Paris, June 30, 2020. [Online]
3. "Challenges and New Technologies for 5G and Beyond", Workshop on New Trajectories for Communication, San Diego, Feb 2020
4. "Challenges and New Technologies for 5G and Beyond", Presentation to TE Connectivity TAB, October 21, 2019
5. "Challenges and New Technologies for 5G and Beyond", IEEE Sarnoff 5G Summit, September 23, 2019
6. "Machine Learning and 5G Wireless", Presentation to InterDigital board, Willmington, Delaware, June 13, 2019
7. "COSMOS overview", Presentation at the Akraino Edge Stack Launch Event, Brooklyn, NY, June 27, 2019
8. "NYU WIRELESS Research", Verizon 5G Healthcare Summit, New York City, Nov 2018.
9. "Understanding channel dynamics in millimeter wave cellular", Thematic Talk, IEEE SPAWC, June 26, 2018
10. "Millimeter Wave Research at NYU WIRELESS", National Instruments Week, May 23, 2017
11. "Statistical Modeling of Millimeter Wave Channel Dynamics," ITA, San Diego, CA, February 2017.
12. "Return of the VAMPire", Lecture at the School for Statistical Inference, Les Houches, France, March 2017.
13. "Millimeter Wave Cellular Wireless Networks for 5G", Tutorial for ACM WiSec Conference, New York City, June 2015.
14. Invited participant, IMA Annual Program Year Workshop Graphical Models, Statistical Inference, and Algorithms (GRAMSIA), Minneapolis, MN, May 18-22, 2015
15. "Cellular Communication in the Wideband Regime: Scaling Laws and Design Implications," ITA, San Diego, CA, February 2015.
16. "Millimeter Wave Cellular Wireless Networks and Multi-Hop," CISS Invited Session, Princeton, NJ, March 2014.
17. "Millimeter Wave Cellular Wireless: Potentials and Challenges," ITA, San Diego, CA, February 2014.
18. "Beyond 4G: Millimeter Wave Picocellular Wiereless Networks," NJ ACS, Hoboken, NJ, September 2013.
19. "Energy Efficient Methods for Millimeter Wave Picocellular Systems," Comm. Theory Workshop, Phuket, Thailand, June 2013.
20. "Optimized Cell Selection in Emerging Wireless Networks," ITA, San Diego, CA, February 2013.
21. "Optimized Cell Selection with Heterogeneous Backhaul Networks," CISS Invited Session, Princeton, NJ, March 23, 2012.
22. "Hybrid Approximate Message Passing and Structured Sparsity," CISS Invited Session, Princeton, NJ, March 23, 2012.
23. "Generalized Approximate Message Passing for Interference Coordination," ITA, San Diego, CA, February 7, 2012.
24. "Coherent Heterogenous Integrated Cellular Networks," InterDigital, Melville, NY, March 2011.
25. "Generalized Approximate Message Passing and Applications in Interference Coordination," ITA, San Diego, CA, February 2011.

TEACHING

Newly Developed Courses

EL 4432, Introduction to Machine Learning (Undergraduate)

Semesters: F16, F18

Description: Introductory undergraduate class to provides a hands on approach to machine learning and statistical pattern recognition. The course provides an introduction to fundamental algorithms for linear regression, classification, model selection, support vector machines, dimensionality reduction and clustering. The material is developed with hands on python-based exercises on real and synthetic data. Applications are demonstrated in audio and image processing, robotic control, and text and web analysis. *Comments*: I developed this class from scratch with all the labs.

ECE-GY 6143, Introduction to Machine Learning (Graduate)

Semesters: F17, S19, S20

Description: Introductory undergraduate class to provides a hands on approach to machine learning and statistical pattern recognition. The course provides an introduction to fundamental algorithms for linear regression, classification, model selection, support vector machines, dimensionality reduction and clustering. The material is developed with hands on python-based exercises on real and synthetic data. Applications are demonstrated in audio and image processing, robotic control, and text and web analysis. *Comments*: I developed this class from scratch with all the labs.

EL 2233, Introduction to Probability

Semesters: F14

Description: Standard first course in probability, recommended for those planning further work in probability or statistics. Probability of events, random variables and expectations, discrete and continuous distribution, joint and conditional distribution, moment generating functions, central limit theorem. *Comments*: Developed this new core undergraduate course. Probability was previously taught as a half semester class.

EL 6323, Introduction to Wireless Networking

Semesters: W12, F12

Description: An introduction to wireless communications with a focus on the MAC, networking and application layers. Topics include channel and rate modeling, interference and spatial reuse, ARQ, buffer management, QoS, random access, scheduling, mobility, and intermittent communication. Overviews and examples from state-of-the-art cellular and wireless LAN systems will be provided. The course is designed for students both intending to specialize in wireless communications as well as students who are interested in the consequences of wireless communications in other areas including multimedia delivery, networking or mobile applications.

Comments: Developed this new graduate-level course. Ran initially as EL9983.

Existing Courses

EL 3404, Digital Communications

Semester: F14,S16,S17

Description: The course covers bandpass signal representation and quadrature receivers; noise in communication systems; Digital Modulation Schemes, coherent and noncoherent receivers; coding fundamentals, block and convolutional codes; higher-order modulation schemes, QAM, M-PSK; intersymbol interference and equalization techniques; and carrier and symbol synchronization. Alternate-week computer laboratory projects analyze and design computer packages. The course teaches principles of various modulation and coding techniques and their relative effectiveness under transmission-environments constraints and uses math packages to analyze and simulate communication systems.

EL 6333, Detection and Estimation

Semester: F15

Description: Basic principles of statistical estimation and learning theory including multivariable Gaussian

estimation, linear models, linear regression, maximum likelihood estimation, Bayesian parameter estimation, linear filtering (including Wiener filtering), hidden Markov models, detection and classification. Applications are presented in communications, signal processing and machine learning. Some material in related optimization methods are also covered.

EL 6303, Probability Theory

Semester: S13, F14

Description: Introductory graduate-level probability including random variables; distributions; conditional distributions; functions of random variables; random vectors; multivariable Gaussian distributions; linear estimation; convergence.

EL 6013, Principles of Digital Communications, Modulation and Coding

Semester: S12, F13, S14, S19

Description: Introductory graduate-level digital communications class including basics of modulation, detection, error rate calculations and a brief introduction to channel coding. Some review of probability and stochastic processes will be included.

EL 5013, Introduction to Wireless Communications

Semesters: F10, F11, F13

Description: Introduction to wireless communications including wireless channel modeling, review of digital communications, coding and high-level description of commercial cellular and wireless LAN systems.

EL 6023, Introduction to Wireless Communications

Semesters: F15, S20

Description:This course covers the fundamentals of wireless communications including statistical descriptions of the wireless channel (path loss models, large-scale and small-scale fading), digital communication over fading channels (channel estimation, receiver design and performance, Shannon theory of time-varying channels, channel coding, diversity and related MAC-layer concepts), introduction to cellular systems and multiple access (frequency reuse, OFDM, CDMA, capacity analysis and basics of multiuser information theory) and MIMO communications. Examples will be provided from state-of-the-art cellular and wireless LAN standards.

EL 6373, Local and Metropolitan Networks

Semesters: W10, W11

Description: Survey class of wired and wireless modern network technologies including wireless LANs, PANs, 3G and 4G cellular standards, Ethernet, Metro-Ethernet, mobile IP, SIP and SoNET.

STUDENTS SUPERVISED

Current post-doctoral fellows

1. Aditya Dhananjay – Post-doctoral fellow since 2015
2. Marco Mezzavilla – Research Scientist since 2017, post-doctoral fellow 2015–2017.

Current Ph.D. Students

1. Syed Hashim Ali Shah, since 2018.
2. William Xia, since 2018.
3. Panagnotis Skrimponis, since 2018.
4. Yaqi Hu, since 2019.
5. Mingsheng Yin, since 2019.

Graduated Ph.D. Students

1. Chris Slezak, "Measurement Based Blockage Models for Millimeter Wave Indoor Communications," May 2020. Joined Qualcomm.
2. Sourjya Dutta, "Energy Efficient Millimeter-Wave Radio Access for 5G Cellular Networks," Jan 2020. Joined Qualcomm.
3. Menglei Zhang, "Will TCP work in Low Latency Networks?", May 2019. Joined Intel Labs.
4. Parisa Amirieliasi, "Structured Estimation for Wireless Communications and Magnetic Resonance Imaging," Jan 2018.
5. Nico Barati, "Initial Access in Millimeter Wave Cellular Systems," Jan 2018 (with T. Korakis). Joined as post-doc at Rice University.
6. Mustafa Riza Akdeniz, "Interference Management in Small Cells," Ph.D. May 2016. Joined Intel Labs.
7. Russell Ford, Joined Samsung Research.
   - PhD: "Low-Latency Fifth Generation Cellular Networks," May 2016.
   - MS: "A Software Testbed for Simulation of Cellular Wireless Networks", January 2012
8. Changkyu Kim, "Joint Interference and User Association Optimization in Cellular Wireless Networks," Ph.D. Jan. 2015.

Masters Theses and Projects

1. Manali Sharma, "Closed Loop Automation Control Systems over Future Wireless Communication: Robotics," May 2020.
2. Oday Bshara, "LabView FPGA Simulation for Primary Synchronization Signals in an LTE-like Network with Directional Gain", Masters Thesis, 2014.
3. James Muldoon, "Real-time Optimizations for the ns-3 Simulator and LTE Module Testbed", Masters thesis, 2014.
4. Aswathi Kumar, "Handover Optimization in Distributed Cellular Core Networks," Masters project, 2012.
5. Kirtan Juthani, "Emulation of the LTE RLC layer in ns3," Masters project, 2012.
6. Trisharan Singh Kapoor, "Implementation of an LTE transceiver in National Instruments Platform," Masters Project, 2012.

Previous visiting students and postdocs

1. David Ramirez, Post-doctoral fellow 2017-2018. Joined Visiting Assistant Professor, Reed College.
2. Felipe Gomez Cúba, visiting Ph.D. student from U. Vigo, Spain, 2014.

Ph.D. Proposal / Dissertation Committee:

1. Shu Luo, "Robust Cooperative Communications and Full-Duplex Relaying in Wireless Networks', May 2013. Advisor: Shivendra Panwar.
2. Ayaskant Rath, "Realizing the Potential of the Network Edge", May 2013. Advisor: Shivendra Panwar.

3. Ping Xia, University of Texas, Austin. "Managing Heterogeneous Cellular Networks," November 2012. Advisor: Jeff Andrews.
4. Kagan Bakanoglu, "Resource Allocation and Interference Mitigation for Cooperative Network," January 2012. Advisor: Elza Erkip.
5. Sha Hua, "Exploiting the Benifits of Cooperation in Wireless Networks," October 2011. Advisor: Shivendra Panwar.
6. Tan Ba Le, "Exploring the Gain of the Opportunistic Routing in Wireless Network," January 2011. Advisor: Yong Liu.
7. Prashanth Hande, Princeton University, "Network Resource Allocation: Distributed Algorithms and Pricing Schemes," August 2009. Advisor: Mung Chiang.

SERVICE

- Guest Editor, IEEE J. Special Topics in Millimeter Wave Networking, to appear approximately Jan 2020 (Joerg Widmer lead editor).
- Guest Editor, IEEE J. Special Topics in Signal Processing in Millimeter Wave Wireless Communications, December 2015 (Robert Heath lead editor).
- Workshop co-chair, Globecom, Austin, Texas, December 2014.
- TPC, IEEE ISIT, 2014, 2015, 2018, 2019.
- Associate Editor, Signal Processing Letters, 2012 to 2013.
- Guest Editor, IEEE J. Selected Areas in Communications Special Issue on Femtocell Networks, April 2012 (Jeff Andrews, lead editor).
- Finance Chair, WiOpt, Princeton, NJ, 2011.
- TPC, IEEE Vehicular Technology Conference, Spring 2012.
- Journal Reviewer: IEEE Trans. Communications, Trans. Information Theory, IEEE Trans. Signal Process., IEEE Trans. Automatic Control.
- Conference Review: IEEE Int. Symp. Information Theory (ISIT)

Departmental service

- Faculty search committee (with three others), 2013
- Post-doctoral fellowship search committee (with two others), 2012.

PROFESSIONAL AND HONORARY MEMBERSHIPS

Institute of Electrical and Electronics Engineers, Fellow.