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.
- NYU WIRELESS
  - Director, 9/2016 to 9/2018, and 8/2025 to present
  - Associate Director, 4/2013 to 9/2016, and 9/20218 to 8/2025
- 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 April 3, 2026

Apple EX1003
Apple Inc. v. Secure Comm. Techs., LLC
IPR2026-00445

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.
- O'Melveny and Myers, Expert witness retained by Samsung in *Empire vs. Samsung, No. 2:23-cv-00427-JRG-RSP* in U.S. District Court for the Eastern District of Texas. Prepared expert reports, gave depositions and testified in trial. 2025.
- 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` (2025/7/8):

Citation indices	All	Since 2020
Citations	32682	16796
h-index	77	49
i10-index	217	137

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. Rasteh, Ali, and Sundeep Rangan. "Computationally efficient signal detection with unknown bandwidths." IEEE Open Journal of the Communications Society (2026).
2. Bazzi, A., Bomfin, R., Mezzavilla, M., Rangan, S., Rappaport, T., Chafii, M. (2025). Upper mid-band spectrum for 6G: Vision, opportunity and challenges. IEEE Communications Magazine.
3. 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 23, no. 8 (2024): 9759-9775.
4. 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.
5. Hao, Y., Yang, F., Huang, H., Yuan, S., Rangan, S., Rizzo, J.R., Wang, Y. and Fang, Y., 2024. A multi-modal foundation model to assist people with blindness and low vision in environmental interaction. Journal of Imaging, 10(5), p.103.
6. 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.
7. Hu, Q., Azar, G. A., Fletcher, A., Rangan, S., Atashzar, S. F. (2024). 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, 18(3), 419-430.

8. 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.
9. 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.
10. Li, T., Lei, H., Guo, H., Yin, M., Hu, Y., Zhu, Q., Rangan, S. (2025). Digital twin-enhanced wireless indoor navigation: Achieving efficient environment sensing with zero-shot reinforcement learning. IEEE Open Journal of the Communications Society.
11. Azar, Golara Ahmadi, Qin Hu, Melika Emami, Alyson Fletcher, Sundeep Rangan, and S. Farokh Atashzar. "A deep learning sequential decoder for transient high-density electromyography in hand gesture recognition using subject-embedded transfer learning." IEEE Sensors Journal 24, no. 9 (2024): 14778-14791.
12. Azar, Golara Ahmadi, Qin Hu, Melika Emami, Alyson Fletcher, Sundeep Rangan, and S. Farokh Atashzar. "A deep learning sequential decoder for transient high-density electromyography in hand gesture recognition using subject-embedded transfer learning." IEEE Sensors Journal 24, no. 9 (2024): 14778-14791.
13. Becker, E., Pandit, P., Rangan, S., Fletcher, A. K. (2024). GAN Training With Kernel Discriminators: What Parameters Control Convergence Rates?. IEEE Transactions on Signal Processing, 73, 433-445.
14. 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 13, no. 4 (2024): 1158-1162.
15. 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.
16. Lozano, Angel, and Sundeep Rangan. "Spectral vs Energy Efficiency in 6G: Impact of the Receiver Front-End," *IEEE BITS the Information Theory Magazine*," 2023.
17. Pizzo, A., Lozano, A., Rangan, S., Marzetta, T. L. "Wide-Aperture MIMO via Reflection off a Smooth Surface," *IEEE Transactions on Wireless Communications*, 2023.
18. 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.
19. 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.
20. C. Slezak [PhD]and S. Rangan, "Measurement-Based Indoor Millimeter Wave Blockage Models," in *IEEE Transactions on Wireless Communications*, 2022.
21. 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.
22. 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.
23. 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.
24. 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.
25. Syed Hashim Ali Shah [PhD], Sundar Aditya, Sundeep Rangan, "Power-Efficient Beam Tracking During Connected Mode DRX in mmWave and Sub-THz Systems,"
26. 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.

27. 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.
28. 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.
29. 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.
30. 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.
31. 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.
32. 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.
33. 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.
34. 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.
35. 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.
36. S. Rangan, P. Schniter and A. K. Fletcher, "Vector Approximate Message Passing," *IEEE Transactions on Information Theory*, June 2019.
37. 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.
38. 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.
39. 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.
40. 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.
41. 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.
42. 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**
43. 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.
44. 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.
45. 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.
46. 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.

47. 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.

48. 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

49. 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.

50. 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.

51. 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

52. 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.

53. 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.

54. 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.

55. 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

56. 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.

57. 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.

58. 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.

59. 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

60. 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**

61. 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**

62. 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.

63. 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

64. 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.
65. 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**
66. 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.
67. 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.
68. 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**
69. 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.
70. 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.

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79. 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.
80. 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.
81. 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.
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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.
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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.
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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.
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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.
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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.
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(Acceptance rate: 17%)

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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. Yin, M., Li, T., Lei, H., Hu, Y., Rangan, S., Zhu, Q. (2024, May). Zero-shot wireless indoor navigation through physics-informed reinforcement learning. In 2024 IEEE International Conference on Robotics and Automation (ICRA) (pp. 5111-5118). IEEE.
2. Kang, S., Geraci, G., Mezzavilla, M. and Rangan, S., 2024, June. Terrestrial-satellite spectrum sharing in the upper mid-band with interference nulling. In ICC 2024-IEEE International Conference on Communications (pp. 5057-5062). IEEE.
3. 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.
4. 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.
5. 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.
6. 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.
7. 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.
8. 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
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10. 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**
11. 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.
12. 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
13. 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.
14. 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.
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- **Third place in Student Best Paper Award**

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19. 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.
20. 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.
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23. 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.
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25. 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.
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27. 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.
28. 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.
29. 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.
30. 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.
31. 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.
32. 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.
33. 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.
34. 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.

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35. 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.
36. 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.

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38. 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.
39. 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.
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41. 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.
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44. 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.
45. 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.
46. 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.
47. 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.
48. 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.
49. 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.
50. 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.
51. 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.
52. 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.
53. A. K. Fletcher and S. Rangan, "Hybrid approximate message passing for generalized group sparsity," Proc. SPIE Wavelets & Sparsity XV, San Diego, CA, September 2013.
54. 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.
55. 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.

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57. 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.

58. 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.

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60. 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.

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62. 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.

63. 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.

64. 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.

65. 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.

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76. 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.
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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

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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.